

Standard and Reference Materials for Environmental Science



Silver Spring, Maryland
November, 1995

United States
Department of Commerce

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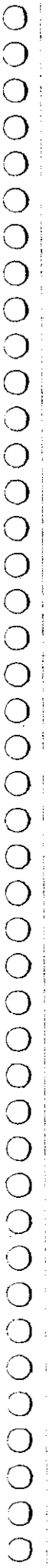
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ACRONYMS

AAFC	Agriculture and Agri-Food (Canada)
ANRT	Association Nationale de la Recherche Technique (France)
ASSO	Association of Russian Reference Materials Producers (Russia)
BAS	Bureau of Analysed Samples Ltd. (UK)
BCR	Community Bureau of Reference (Belgium)
CAL-NRI	Central Analytical Laboratory, Nuclear Research Institute (Czech Republic)
CANMET	Canada Centre for Mineral and Energy Technology (Canada)
CAS	Chemical Abstracts Service
CRM	Certified reference material
CRPG	Centre de Recherches Pétrographiques et Géochimiques (France)
CSK	Cooperative Study of the Kuroshio and Adjacent Regions Program
GEMSI	Group of Experts on Methods, Standards and Intercalibration
GESREM	Group of Experts on Standards and References Materials
GIPME	Global Investigation of Pollution in the Marine Environment
GIT-IWG	International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)
GSJ	Geological Survey of Japan (Japan)
IAEA	International Atomic Energy Agency
IAPSO	International Association for Physical Sciences of the Ocean
ICES	International Council for the Exploration of the Sea
ICHTJ	Instytut Chemii i Techniki Jadrowej (Poland)
IGEM	Institute of Geology of Ore Deposits, Petrology, Mineralogy and Geochemistry, Russian Academy of Sciences (Russia)
IGI	Institute of Geochemistry, Russian Academy of Sciences (Russia)
IOC	Intergovernmental Oceanographic Commission
IOS	Institute of Oceanographic Sciences (UK)
IPT	Instituto de Pesquisas Tecnológicas (Brazil)
IRMM	Institute for Reference Materials and Measurements (Belgium)
LGC	Laboratory of the Government Chemist (UK)
MACSP	Marine Analytical Chemistry Standards Program (Canada)
NIES	National Institute for Environmental Studies (Japan)
NIST	National Institute of Standards and Technology (USA)
NMI	Nederlands Meetinstituut (The Netherlands)
NOAA	National Oceanic and Atmospheric Administration (USA)
NRC	National Research Council of Canada (Canada)
NRCCRM	National Research Center for Certified Reference Materials (China)
NWRI	National Water Research Institute (Canada)
OSI	Ocean Scientific International Ltd. (UK)
RIAP	Research Institute of Applied Physics, Irkutsk State University (Russia)
RM	Reference or research material
SABS	South Africa Bureau of Standards (South Africa)
SRM	Standard reference material
UNEP	United Nations Environment Programme
UNS	Institute of Mineral Raw Materials (Czech Republic)
USGS	United States Geological Survey (USA)
VNIIMSO	All-Union Research Institute of Metrology of Certified Reference Materials (Russia)

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Standard and Reference Materials for Environmental Science

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Office of Ocean Resources Conservation and Assessment
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ABSTRACT

This is the fourth edition of the catalog of reference materials suited for use in environmental science, originally compiled in 1986 for NOAA, IOC, and UNEP. The catalog lists more than 1200 reference materials from 28 producers and contains information about their proper use, sources, availability, and analyte concentrations. Indices are included for elements, isotopes, and organic compounds, as are cross references to CAS registry numbers, alternate names, and chemical structures of selected organic compounds.

1. INTRODUCTION

The Thirteenth Session of the Assembly of the Intergovernmental Oceanographic Commission (IOC), which met March 12-28, 1985, recognized that the availability and adequacy of standards and certified reference materials are key components in the conduct of intercalibration exercises, regional contaminant assessments, and marine chemistry research in general. The Assembly instructed the Working Committee for the Global Investigation of Pollution in the Marine Environment (GIPME), through the IOC/UNEP [IOC/United Nations Environment Programme Group of Experts on Methods, Standards, and Intercalibration (GEMSI)] to conduct an in-depth study on the matter.

At the Sixth Session of GEMSI, in November 1985, an Ad Hoc Group on the Coordination of International Activities on the Preparation and Distribution of Reference Materials for Marine Chemistry was constituted. The first meeting of the Ad Hoc Group took place in Geneva at the UNEP - Oceans and Coastal Areas Programme Activity Centre, June 3-4, 1985. It was decided at that time to convene a meeting with representatives from a number of national and international agencies and institutions involved in the production of reference materials. This meeting took place in Washington, D.C., October 28-30, 1985. One of the recommendations arising from this meeting was the preparation and maintenance of a publication that assembles and updates all information available on reference materials for use in marine chemistry and marine pollution research and monitoring (IOC, 1985). In response to this recommendation, the Office of Ocean Resources Conservation and Assessment of the National Oceanic and Atmospheric Administration (NOAA) undertook the project. This was accepted by IOC and UNEP, the co-sponsors of GEMSI. The Ad Hoc Group that met in Washington, D.C. subsequently was established as the IOC/UNEP Group of Experts on Standards and References Materials (GESREM). At its first formal meeting (Paris, July 1987), GESREM noted the great value of the catalog and recommended that NOAA periodically update it.

This document is the fourth edition of the compendium of information originally published in 1986 on various types of reference materials. In answer to user needs, materials of terrestrial origin have been included resulting in a compilation of standard and reference materials for use in environmental science, not just marine studies. The instrument performance materials are of special interest since they span a variety of analytical techniques

from scanning electron microscopy to spectrophotometry. Coal and ore reference materials are not included. This catalog is available from NOAA/NOS/ORCA in electronic form.

2. REFERENCE MATERIALS SOURCES, TYPES, AND USE

2.1. Sources

Agriculture and Agri-Food Canada
Centre for Land and Biological Resources Research
Ottawa, Ontario K1A 0C6
CANADA
Telephone: 613 759 1880, Fax: 613 759 1924

Agriculture and Agri-Food Canada (AAFC) has prepared 12 reference materials in cooperation with some 161 analysts in 73 laboratories worldwide. The culmination of this endeavor was a Technology Licensing Agreement between AAFC and National Institute of Standards and Technology (NIST) allowing NIST to market worldwide this series of Reference Materials over a five year period. The conception, research, development, coordination of the interlaboratory analytical campaign, and completion of the commercialization of the 12 technologies was by Dr. Milan Ihnat of the Centre for Land and Biological Resources Research.

Bureau of Analysed Samples Ltd.
Newham Hall, Newby
Middlesbrough, Cleveland TS8 9EA
ENGLAND
Telephone: 0642 300500, Fax: 0642 315209

The materials provided by Bureau of Analysed Samples Ltd. (BAS) are prepared under the auspices of an Honorary Advisory Committee and a body of 250 cooperating analysts representing government departments, manufacturers, and users. The British Chemical Standard Certified Reference Materials (BCS-CRMs) are analyzed by eight analysts, and a certificate showing the mean values obtained by each analyst and a summary of the methods used is made available with each material. BAS also provides EURONORM certified reference materials which are analyzed by 20 European laboratories and approved by the European Committee for Iron and Steel Standardization.

Association of Russian Reference Materials Producers
4 Krasnoasmeyskaya Str.
Yekaterinburg 620219
RUSSIA
Distributed by:
Breitländer GmbH
Postfach 8046
D-59035 Hamm, Germany
Telephone: 0 23 81 40 40 00, Fax: 0 23 81 40 31 89

Various Russian organizations, such as the All-Union Research Institute of Metrology of Certified Reference Materials (VNIIMSO), the Research Institute of Applied Physics (RIAP) (Irkutsk State University), the Institute of Geochemistry (IGI), and the Institute of Geology of Ore Deposits, Petrology, Mineralogy and Geochemistry (IGEM) of the Russian Federation Academy of Sciences produce reference materials of a variety of matrices. These producers do no foreign trade and the reference materials are commercialized under the umbrella of the

Association of Russian Reference Materials Producers (ASSO). The sole distributor of the ASSO materials is Breitländer. The materials are stocked Germany and Breitländer provides translations of certificates into English. Contact Breitländer for a complete listing of these and other reference materials.

Canada Centre for Mineral and Energy Technology
555 Booth Street
Ottawa K1A 0G1
CANADA
Telephone: 613 995 4738, Fax: 613 943 0573

The Canada Centre for Mineral and Energy Technology (CANMET) Certified Reference Materials Project (CCRMP) identifies, prepares, and certifies compositional reference materials to ensure reliability and quality of chemical measurements carried out by Canadian minerals and metallurgical industries. CCRMP Certified Reference Materials (CRMs) have certified concentrations established from measurements carried out by 10 or more independent laboratories using a variety of methods. Values are certified only if definite standards of consensus between the results of the contributing laboratories are met. The Certification Report provided with each CRM contains information on analytical methods, measurement results, the procedures used to establish the recommended values, estimates of uncertainty, and statistical information by which a user may judge if the results of a method under testing are in accord with consensus results. CANMET CCRMP makes available more than 60 CRMs representative of mineralogical and metallurgical matrices.

Central Analytical Laboratory
Nuclear Research Institute Řež
250 68 Řež
CZECH REPUBLIC
Telephone: 42 2 66 41 21 71, 6857 526, Fax: 42 2 6857 567

The Central Analytical Laboratory of the Nuclear Research Institute (CAL-NRI) produces, within its nuclear and environmental analytical activities, some certified reference materials (CRMs) of environmental matrices such as yeast and mushrooms, with certified contents of some radionuclides and toxic and/or essential elements. Intercomparison runs by an international network of experienced analytical laboratories, typically 30 to 40 laboratories, using different analytical methods analyze the candidate CRMs and produce the needed data. The Certification Reports are approved by the Czech State official body, the Czech Institute of Metrology.

Community Bureau of Reference
Commission of the European Communities
Directorate General for Science
Research and Development
200 rue de la Loi
B-1049 Brussels
BELGIUM
Telephone: 33 2 235 31 15, Fax: 32 2 235 80 72

An objective of the Community Bureau of Reference (BCR), a department of the Commission of the European Communities, is the general improvement of the quality of measurements and of the consistency of the results of these measurements throughout the Community (Community Bureau of Reference, 1985). The certified values of BCR reference materials are based on the results of measurements by expert laboratories of the member countries using different methods. The certified value is the mean of all the acceptable results. BCR also produces

various types of reference materials, including ores, fertilizers, and soils. The series of polynuclear aromatic hydrocarbons, sewage sludges, and particle size reference materials are described in this catalog. Responsibility of sales of the BCR CRMs was transferred to the European Commission Institute for Reference Materials and Measurements (IRMM) in Geel, Belgium.*

Geological Survey of Japan
Geochemistry Section
Higashi 1-1-3, Tsubuka, Ibaraki 305
JAPAN
Telephone: 0298-54-3533, Fax: 0298-54-3533

The Geological Survey of Japan (GSJ) has produced a variety of geochemical reference samples since 1967 for the analyses of major, minor, and trace elements; isotopic compositions, and isotopic ages. These samples are composed of powdered igneous and sedimentary rocks, and sediments. Certified values are not available for the GSJ reference samples. Recommended values are based on the data of collaborative studies and have been reported in several papers.

Geostandards
CNRS/CRPG
BP 20 54501
Vandœuvre - Nancy Cedex
FRANCE
Telephone: 33 83 59 42 00, Fax: 33 83 51 17 98
E-mail: geostand@crpg.cnrs-nancy.fr

In 1977, the International Working Group on "Analytical Standards of Minerals, Ores, and Rocks" (GIT-IWG) was formed and the journal Geostandards Newsletter launched to promote the preparation, study and use of geological reference materials. IWG-GIT has produced nine geological reference materials and has cooperated with the Centre de Recherches Pétrographiques et Géochimiques (CRPG) and the Association Nationale de la Recherche Technique (ANRT) of France in the production of 14 others. These geostandards are available to members in the Working Group. Membership in the Working Group is US\$125. Please contact Dr. K. Govindaraju at Geostandards for further information. In 1994, working values for over 380 international geostandards were published as a special issue of Geostandards Newsletter. Another special issue, dated July 1995, is devoted specifically to the French standards and is entitled "1995 working values with confidence limits for twenty-six CRPG, ANRT and GIT-IWG geostandards." An electronic database of geostandard data, GeoStan, is available from Geostandards (Govindaraju, 1993).

International Atomic Energy Agency
Analytical Quality Control Service
Laboratory Seibersdorf
P.O. Box 100
A-1400 Vienna
AUSTRIA
Telephone: 43 1 2360, Fax: 43 1 234564

The International Atomic Energy Agency (IAEA) has established the Analytical Quality Control Service Program to enable laboratories engaged in the analysis of nuclear materials,

* Dr. J. Pauwels, Institute for Reference Materials and Measurements, Retieseweg, B-2440, Geel, Belgium. Tel: 32 014 571 211. Fax: 32 014 590 406.

radionuclides, and trace elements to check the quality of their work and maintain high standards of analytical performance. Elemental, organic, and radioisotope concentrations are available for IAEA reference materials. Values are based on data acquired during intercalibration exercises by various laboratories. These exercises are accessible to all laboratories and are free of charge.

Institute of Mineral Raw Materials
Kutná Hora
CZECH REPUBLIC
Distributed by:
Breitländer GmbH
Postfach 8046
D-59035 Hamm, Germany
Telephone: 0 23 81 40 40 00, Fax: 0 23 81 40 31 89

No information is available from the Institute of Mineral Raw Materials (UNS) at Kutná Hora in the Czech Republic. The UNS materials are available through Breitländer.

Instituto de Pesquisas Tecnológicas
Agrupamento de Materiais de Referência
Cidade Universitária Armando de Salles Oliveira
05508 São Paulo - SP
BRAZIL
Telephone: 011 268 2211 x 544/545, Fax: 011 869 3353

The Instituto de Pesquisas Tecnológicas (IPT) is a non-profit corporation established in 1899 and owned by the São Paulo State Government. IPT areas of expertise include engineering, ship and ocean research, applied geology, and chemistry. The Agrupamento de Materiais de Referência (Reference Materials Group) makes available many certified reference materials, including ores, steels, refractories, and minerals analyzed for major and trace elements. Of these, the clay and limestone reference materials are included in this catalog. All analyses are performed by IPT scientists.

Instytut Chemii i Techniki Jadrowej
Department of Analytical Chemistry
03-195 Warszawa
POLAND
Telephone: 48 22 11 27 37, Fax: 48 22 11 15 32
E-mail: RAJDYB at PLEARN.PL.EDU

In 1988, the Department of Analytical Chemistry of the Instytut Chemii i Techniki Jadrowej (ICHTJ) (Institute of Nuclear Chemistry and Technology) began the development of reference materials primarily for trace element analysis. The Instytut, led by Dr. R. Dybczyński, has prepared three materials using an approach similar to that used by IAEA (Dybczyński, 1980; Dybczyński *et al.*, 1991; Dybczyński *et al.*, 1993).

Laboratory of the Government Chemist
Office of Reference Materials
Queen's Road
Teddington, Middlesex TW 11 OLY
UNITED KINGDOM
Telephone: 44 181 943 7565, Fax: 44 181 943 7554
E-mail: orm@lgc.co.uk

The Office of Reference Materials of the Laboratory of the Government Chemist (LGC) markets a variety of reference materials produced by LGC and other producers, and operates REMAS (Reference Materials Advisory Service). LGC makes available pesticide samples of certified purity for use in the analysis of technical grade pesticides and formulations, and residue analysis. In recent years, work at LGC on the production of CRMs has expanded to cover calibration standards and matrix reference materials including development of pure pesticides, metal decanoates certified for metal content, environmental radiochemical materials, and others. REMAS is an LGC service providing information on specifications, applications, and availability of LGC reference materials as well as those produced in Europe and America. As part of this service, LGC makes use of the COMAR reference materials database developed by the Laboratoire National d'Essais in Paris. COMAR contains information on more than 7,000 reference materials.

National Institute for Environmental Studies
Yatabe-machi
Tsukuba, Ibaraki, 305
JAPAN

Telephone: 81 0298 51 6111, Fax: 81 0298 51 4732

The National Institute for Environmental Studies (NIES) of Japan has produced a variety of reference materials certified for elemental composition over the past several years (Okamoto and Fuwa, 1985). Certification of reference materials is based on collaborative studies performed by 20-30 qualified participating laboratories. The resulting analytical data are subjected to statistical treatment, and certified values are provided for elements determined by at least three independent analytical techniques. NIES currently has under preparation NIES 12 (marine sediment), NIES 14 (brown alga), and NIES 15 (scallop). Please contact Dr. Jun Toshinaga for further information on availability of these CRMs.

National Institute of Standards and Technology
Office of Standard Reference Materials
Gaithersburg, MD 20899
USA

Telephone: 301 975 6776, Fax: 301 948 3730
E-mail: srinfo@enh.nist.gov

NIST has distributed reference materials for the last 80 years and now provides 50 broad categories of materials ranging from engineering mechanics to cement. The reference materials produced by NIST have certified values determined by at least two independent analytical methods or by one definitive method. NIST also offers a variety of calibration services for such devices as thermometers.

National Research Center for Certified Reference Materials
No. 7, District 11
Heping Street, Chaoyangqu
Beijing 100013
CHINA

Telephone: 421 3149, Fax: 86 1 422 8404

The production of CRMs by the National Research Center for Certified Reference Materials (NRC-CRM) is under the supervision of the State Bureau of Technical Supervision of China. The CRMs are prepared by professional research institutes or factories. [At the time of completion

of this compilation, information about some CRMs produced by NRC-CRM had not been received. These materials can also be obtained through Breitländer GmbH (address listed previously).]

National Research Council of Canada
Marine Analytical Chemistry Standards Program
Division of Chemistry
Montreal Road
Ottawa, Ontario K1A 0R9
CANADA
Telephone: 613 993 2359, Fax: 613 993 2451
E-mail: crm.iert@nrc.ca

National Research Council of Canada
Marine Analytical Chemistry Standards Program
Atlantic Research Laboratory
1411 Oxford Street
Halifax, Nova Scotia B3H 3Z1
CANADA
Telephone: 902 426 8280, Fax: 902 426 9413

An important aspect of the National Research Council of Canada's (NRC) Marine Analytical Chemistry Standards Program (MACSP) is the development, production, and distribution of reference materials to support the analysis of marine materials. NRC certified reference materials (CRMs), like the NIST SRMs, have certified values determined by at least two independent analytical methods. All analyses are performed by NRC scientists.

National Water Research Institute
Canada Centre for Inland Waters
867 Lakeshore Road, P. O. Box 5050
Burlington, Ontario L7R 4A6
CANADA
Telephone: 905 336 4869, Fax: 905 336 4989
E-mail: yvonne.stokker@cciw.ca

One of the functions of the National Water Research Institute (NWRI) is to develop and improve analytical chemistry methods and to design and conduct quality assurance programs. As part of the QA program, NWRI has developed and prepared a series of reference materials (RMs) for water analyses, and CRMs for sediment analyses. They include lake sediment CRMs for PAHs, chlorobenzenes, PCBs and Se. These RMs and CRMs were developed to serve various Canadian national, as well as international, laboratory performance assessments.

Nederlands Meetinstituut
PO Box 654
2600 AR Delft
THE NETHERLANDS
Telephone: 31 15 69 15 00, Fax: 31 15 61 29 71

As a national metrology institute, Nederlands Meetinstituut (NMI) makes it possible to perform traceable measurements in the chemical field. The gaseous reference materials provided by NMI are used as standards in the calibration of analytical instruments or for evaluation and validation of methods of analysis. The use of these standards, which are directly traceable to national standards, provides a guarantee of quality. Practical applications include measurements carried out during production processes, energy accountancy, air pollution testing, and odor nuisance assessment. Among other activities, NMI specializes in the

preparation of reference materials of granular substances. The original bulk materials (soil, sediment, coal, waste- and building materials) are processed in such a way that a large number of representative samples can be made for laboratory analysis. In order to investigate one or more characteristics of these materials, the samples taken may be subjected to an interlaboratory study. The results of this "round robin" exercise are then used to assign consensus values for the relevant parameters and possibly for the certification of such a material.

Ocean Scientific International Ltd.
South Down House, Station Road
Petersfield, Hampshire, GU32 3ET
UNITED KINGDOM
Telephone: 01730 265015, Fax: 01730 265011
E-mail: osil@soc.soton.ac.uk

The International Association for Physical Sciences of the Ocean (IAPSO) has authorized the Ocean Scientific International Ltd. (OSI) to assume responsibility for the production of the Standard Seawater Service formerly provided by the Institute of Oceanographic Sciences (IOS) at Wormley. Ocean Scientific International Ltd. is on the site of IOS and continues to employ former IOS Standard Seawater Service staff. The calibrated standards produced by this organization are used worldwide for calibration of salinity determination instrumentation. The production of standard seawater operated from Copenhagen until 1975 when this service was assumed by the ISO at the request of IAPSO. In addition to the salinity determination standards, OSI produces low nutrient seawater for the preparation of standards.

Sagami Chemical Research Center
Nishi-Ohnuma 4-4-1
Sagamihara-shi 229
JAPAN

The Sagami Chemical Research Center of Japan prepared standard solutions of nutrient elements in both saline and fresh water and potassium iodate solutions for dissolved oxygen analysis for use in the Cooperative Study of the Kuroshio and Adjacent Regions Program (CSK) and other international oceanographic programs. These reference materials are available through Wako Chemicals worldwide. [◇] A range of nutrient concentrations is available.

South Africa Bureau of Standards
Private Bag X191
Pretoria, Transvaal 0001
Republic of South Africa
Telephone: 012 428 7911, Fax: 012 344 1568

The South African certified reference materials are produced and issued under the guidance and control of the South African Committee for Certified Reference Materials. This committee was appointed in 1974 by the Council of the South African Bureau of Standards, which is the statutory standards organization in South Africa. The South African Bureau of Standards (SABS) is internationally recognized and is also a member of ISO/REMCO, a committee of the International Organization for Standardization, Geneva, dealing with reference materials. The committee concentrates on the preparation of certified reference materials specific to

[◇] Wako Chemicals USA, 1600 Bellwood Rd., Richmond, VA 23237, USA; Wako Chemicals GmbH, Nissenstr. 2, 4040 Neuss 1, Germany; Wako Pure Chemical Industries Ltd., 1-2, Doshomachi 3-Chome, Chuo-Ku, Osaka, Japan.

minerals, ores, and intermediate and final products that are produced by and exported from South Africa and for which no equivalent internationally recognized certified reference materials are available. A complete and comprehensive report, which is obtainable on request, is issued for each certified reference material describing the method of preparation, packaging, analysis, and statistical evaluation of observed analytical results. These reports are available from the Council for Mineral Technology, Private Bag X3015, Randburg, 2125, Republic of South Africa.

US Geological Survey
Branch of Geochemistry
Box 25046, Federal Ctr., MS 973
Denver, CO 80225
USA
Telephone: 303 236 2454

The US Geological Survey (USGS) has prepared a series of reference materials of geologic origin for inorganic analyses. These materials are composed of powdered rocks collected from various locations in the USA. Detailed mineralogical descriptions are available for these materials. No certified values are available for the USGS standard rocks as in the case of NIST or NRC materials. "Accepted values" for these rocks are based on the results of various analysts and have been compiled in several publications.

2.2. Types

The reference materials are listed in this catalog by type: ashes (including air particulate materials), gases, instrument performance materials (including calibration standards and single element/compound solutions), oils, physical properties (including color and size reference materials), rocks, sediments, sludges, soils, tissues, and waters (natural and simulated). All of the materials described in the catalog are listed in the index. Many other RMs, including a wide variety of alloys, ores, and minerals, are available from the producers described in this catalog. These may be useful to the marine scientist in specialized studies. Please contact the producing organizations for complete listings.

Source, description and preparation, analytes and values, cost, references, and comments are given for each reference material. Elements are listed in order of atomic number. Organic compounds are listed in alphabetical order. Confidence intervals listed are generally at the 95% significance level and are obtained from the producers' literature. The distribution by type, analyte, and producer of the reference materials described in this catalog are listed in Tables 1, 2, and 3. Registry numbers and alternate names of elements and organic compounds in the catalog are listed in Appendix I and II, and selected structures are shown in Appendix III. Indices are available to facilitate search matrix and analyte combinations.

Reference material users should use the analyte values listed by the producing organizations. These organizations can, at times, change accepted values or issue new ones as appropriate. The values listed in this catalog are to be used only as a reference.

2.3. Use

Until recently, only a few reference materials of marine origin existed, and their use by the marine science community was limited. The use of reference materials is part of good quality assurance practices that include evaluation of instrument performance independent of the methodology used. An excellent discussion of various aspects of quality assurance and of the use of reference materials can be found in Taylor (1985).

Table 1. Distribution of reference materials by matrix and analyte

Source	Analytes					
	Elements	Isotopes	Inorganics	Organics	Others	Total
Ashes	18	-	-	3	-	21
Gases	-	-	117	52	-	169
Inst. perf.	187	50	15	208	39	499
Oils	2	-	-	8	-	10
Physical prop.	-	-	-	-	44	44
Rocks	202	-	-	-	-	202
Sediments	58	11	-	20	-	89
Sludges	3	-	-	2	-	5
Soils	47	5	-	1	-	53
Tissues	69	13	-	19	-	101
Waters	28	1	5	-	7	41
Total	614	80	137	313	90	1234

NOTE: Several RMs are counted twice if more than one type of analyte is reported for each.

When using reference materials, it is important to follow certain guidelines:

- The matrix of the reference material should be as similar as possible to that of the samples. If such reference materials are not available, the user should be aware of possible matrix effects.
- Reference materials should not be used as primary standards. Rather, they should be analyzed as part of the sample set.
- The results of analyses should not be corrected based on recovery results from reference materials. Rather, the results of both samples and reference materials should be reported as part of the data set along with any corrections based on percent recoveries. Such reference material results are invaluable when comparing data sets generated using different analytical methods as they provide a common reference point.
- Sample homogeneity as described by the reference material producer should be taken into account in determining minimum sample size of the reference material.
- Reference materials should be used on a regular basis so changes in the analytical procedure over time can be noted and documented.
- There is a lack of reference materials with low and high concentrations of any given analyte in a matrix. Methodology, therefore, can only be tested at one concentration level, and possible problems at low or high concentrations cannot be documented.

Table 2. Distribution of reference materials by source and matrix

Source	Matrix										
	Ashes	Gases	Instr. perf.	Oils	Phys. prop.	Rocks	Sedi- ments	Sludges	Soils	Tissues	Waters
AAFC											
AAFC	-	-	3	-	-	-	-	-	-	6	-
ANRT	-	-	1	-	-	7	-	-	-	-	-
BAS	-	-	-	-	-	8	-	-	-	-	-
BCR	3	-	92	2	17	-	4	5	4	29	8
CAL-NRI	-	-	-	-	-	-	-	-	-	4	-
CANMET	1	-	-	-	-	14	8	-	7	4	-
CRPG	-	-	-	-	-	5	-	-	-	-	-
GIT-IWG	-	-	-	-	-	9	-	-	-	-	-
GSJ	-	-	-	-	-	22	4	-	-	-	-
IAEA	-	-	1	-	-	-	15	-	6	23	1
ICHTJ	1	-	-	-	-	-	-	-	-	1	-
IGEM	-	-	-	-	-	24	-	-	-	-	-
IGI	-	-	-	-	-	8	-	-	-	-	-
IPT	-	-	-	-	-	10	-	-	-	-	-
LGC	-	-	120	-	8	-	-	-	-	3	-
NIES	1	-	-	-	-	-	1	-	-	2	-
NIST	8	95	213	8	19	15	7	-	5	11	1
NMI	4	34	-	-	-	-	-	-	-	-	-
NPC	-	-	5	-	-	-	11	-	-	7	4
NRCCRM	2	40	63	-	-	21	20	-	18	11	-
NWRI	-	-	-	-	-	-	15	-	-	-	18
OSI	-	-	-	-	-	-	-	-	-	-	5
RIAP	-	-	-	-	-	22	-	-	-	-	-
SABS	-	-	-	-	-	16	3	-	1	-	-
SAGAMI	-	-	1	-	-	-	-	-	-	-	4
UNS	-	-	-	-	-	6	-	-	-	-	-
USGS	-	-	-	-	-	15	1	-	-	-	-
VNIIMSO	-	-	-	-	-	12	-	-	1	-	-
Total	20	169	499	10	44	214	89	5	42	101	41

NOTE: Several RMs are counted twice if more than one type of analyte is reported for each.

Table 3. Distribution of reference materials by source and analyte

Source	Analytes					Total
	Elements	Isotopes	Inorganics	Organics	Others	
AAFC	9	-	-	-	-	9
ANRT	8	-	-	-	-	8
BAS	8	-	-	-	-	8
BCR	49	-	-	96	19	164
CAL-NRI	4	-	-	-	-	4
CANMET	32	2	-	-	-	34
CRPG	5	-	-	-	-	5
GIT-IWG	9	-	-	-	-	9
GSJ	26	-	-	-	-	26
IAEA	17	23	-	6	-	46
ICHTJ	2	-	-	-	-	2
IGEM	24	-	-	-	-	24
IGI	8	-	-	-	-	8
IPT	10	-	-	-	-	10
LGC	31	-	-	89	11	131
NIES	4	-	-	-	-	4
NIST	128	54	87	58	55	382
NMI	4	-	22	12	-	38
NRC	11	-	-	16	-	27
NRCCRM	124	1	23	27	-	175
NWRI	24	-	-	9	-	33
OSI	-	-	-	-	5	5
RIAP	22	-	-	-	-	22
SABS	20	-	-	-	-	20
SAGAMI	-	-	5	-	-	5
UNS	6	-	-	-	-	6
USGS	16	-	-	-	-	16
VNIIMSO	13	-	-	-	-	13
Total	614	80	137	313	90	1234

NOTE: Several RMs are counted twice if more than one type of analyte is reported for each.

- The concentrations of analytes in a reference material are not necessarily representative of the concentrations of those analytes as they existed at the time of collection. Rather, the analyte levels in the reference materials are representative of the final concentrations after any changes in the original concentrations due to sample processing (e.g., contamination during handling).
- The elemental concentrations listed for the USGS rock standards are based on the analyses of various laboratories over a period of years. The quality of the data varies and the user of such "best" or "consensus" values should be aware of the methodology used in their determination, and, most importantly, the number of individual analytical results used.

3. SOURCES OF NON-CERTIFIED REFERENCE MATERIALS

The US National Cancer Institute maintains a repository of reference-grade radio-labelled and unlabeled compounds for cancer research. The repository is operated under contract by the Midwest Research Institute[◇] and the Chemsyn Science Laboratories.^Δ The repository includes more than 800 chemicals, including: benzo[a]pyrenes, benz[a]anthracenes, benzo[fluoranthene], benzo[e]pyrenes, chrysenes, heterocyclic PAHs, nitrosamines and other nitroso compounds, aromatic amines, aromatic amine metabolites, aflatoxins, dioxins, pesticides, herbicides, fungicides, pharmaceuticals, chlorinated hydrocarbons, dyes, organometallics, selected inorganic compounds, and others. Due to chemical decomposition and radioactive decay, the chemicals are periodically purified or resynthesized. Therefore, the purity of the chemicals may change by the time of shipment. These are not CRMs or SRMs. Unlabeled compounds may be ordered from the Midwest Research Institute, and radiolabeled ones from Chemsyn Science Laboratories.

4. LITERATURE ON QUALITY ASSURANCE AND REFERENCE MATERIALS

4.1. NIST^Δ

The NIST Special Publication 829 describes the use of NIST standard reference materials for decisions on performance of analytical chemical methods and laboratories (Becker *et al.*, 1992). The general principles of SRM used are described in NBS Special Publication 260-100 (Taylor, 1985).

4.2. ISO/REMCO[◇]

REMCO is the International Organization for Standardization (ISO) Council Committee on reference materials. The aim of this organization is to carry out and encourage a broad international effort for harmonization and promotion of CRMs and their applications. REMCO has published five guides related to CRMs and quality assurance: ISO Guide 6 (ISO, 1978) discusses information necessary to describe reference materials in standards; ISO Guide 30 (ISO, 1981) lists terms and definitions used in connection with reference materials; ISO Guide 31 (ISO,

[◇] NCI Chemical Carcinogen Radio Repository, c/o Midwest Research Institute, 425 Volker Blvd., Kansas City, MO 64110, USA.

^Δ NCI Chemical Carcinogen Radio Repository, c/o Chemsyn Science Laboratories, 13605 W. 96 Terr., Lenexa, KS 66219, USA.

^Δ National Institute of Standards and Technology, Gaithersburg, MD 20899, USA.

[◇] ISO Central Secretariat, Case Postale 56, CH-1211 Genève 20, Switzerland.

1981) recommends content of certificates of reference materials; ISO Guide 33 (ISO, 1989) discusses the use of CRMs; and ISO Guide 35 (ISO, 1989) discusses the certification process including general and statistical principles. Other ISO/REMCO publications of interest are ISO/REMCO 240 on linear calibration using reference materials (ISO, 1992), the proceedings of the symposium on Harmonization of Quality Assurance Systems in Chemical Analysis (ISO/REMCO, 1991), worldwide production of reference materials (ISO/REMCO, 1994), list of producers of reference materials (ISO/REMCO 330), and others.

4.3. UNEP*

UNEP makes available a variety of publications on various aspects of quality assurance in environmental analyses (UNEP/IOC/IAEA, in prep., a and b), including: reference methods descriptions (UNEP/IOC/IAEA, 1988; UNEP/IOC/FAO/IMO/IAEA, in prep.), chemical contaminant monitoring guidelines (UNEP/IOC/IAEA/FAO, 1989; UNEP/FAO/IOC/IAEA, 1990), sampling protocols (UNEP/FAO/IAEA, 1984; UNEP/FAO/IOC/IAEA, 1984), and data analyses and interpretation (UNEP/IOC/IAEA, 1990; UNEP/IOC/FAO/IMO/IAEA, in prep.). These publications are available in English, French, or Spanish.

5. ACKNOWLEDGEMENTS

We wish to thank the organizations that provided the necessary information in the compilation of this catalog. We would especially like to acknowledge the assistance of: M. Ihnat of AAFC; V. Leonov and S. Serov of ASSO; R. P. Meeres of BAS; Ph. Quevauviller and J. Pauwels of BCR; R. Breitländer of Breitländer; M. Beran of CAL-NRI; M. Leaver of CANMET; M. Horvat and J. W. Readman of IAEA; R. Dybczyhski of ICHTJ; S. Moro, N. D. S. Pereira and T. S. M. Lee of IPT; S. Terashima and N. Imai of GSJ; K. Govindaraju of Geostandards; A. Jones and J. Hayman of LGC; T. Horiguchi and J. Yoshinaga of NIES; the staff of NIST; R. Kaarls and D. Verkuil of NMI; S. Berman, and S. Willie of NRC; Wang Hao Kun and H. Yongzhi of NRC CRM; Y. Stokker of NWRI; P. Ridout of OSI; A. J. Viljoen of SABS; M. Ambe of Sagami; B. Brock of Wako Chemicals USA; S. Wilson of USGS; S. Baker of NIH; and D. Harriss of NOAA.

6. REFERENCES

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* UNEP Regional Seas, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

Dybczyński, R., H. Polkowska-Motrenko, Z. Samczyński, and Z. Szopa (1993) New Polish certified reference materials for multielement inorganic trace analysis. Fresenius J. Anal. Chem., 345:99-103.

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International Organization for Standardization (1981) Contents of certificates of reference materials. ISO/REMCO Guide 31. ISO Central Secretariat, 1 rue de Varembé, Case Postale 56, Ch-1211, Genève, Switzerland. 8 pp.

International Organization for Standardization (1989) Uses of certified reference materials. ISO/REMCO Guide 33. ISO Central Secretariat, 1 rue de Varembé, Case Postale 56, Ch-1211, Genève, Switzerland. 12 pp.

International Organization for Standardization (1989) Certification of reference materials - general and statistical principles. ISO/REMCO Guide 35. ISO Central Secretariat, 1 rue de Varembé, Case Postale 56, Ch-1211, Genève, Switzerland. 32 pp.

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International Organization for Standardization (1995) List of producers of certified reference materials. ISO/REMCO 330. ISO Central Secretariat, 1 rue de Varembé, Case Postale 56, Ch-1211, Genève, Switzerland. 26 pp.

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UNEP/FAO/IAEA (1984) Sampling of selected marine organisms and sample preparation for analysis of chlorinated hydrocarbons. UNEP no. 12 (English). UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya. (Spanish version published in 1987.)

UNEP/FAO/IOC/IAEA (1984) Sampling selected marine organisms and sample preparation for trace metal analysis. UNEP no. 7 (English). UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya. (Spanish version published in 1988.)

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UNEP/FAO/IOC/IAEA (1990) Guidelines for monitoring chemical contaminants in marine organisms. UNEP no. 6 (English). UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

UNEP/IOC/IAEA (in prep., a) Reagent and laboratory ware clean-up procedures for low-level contaminant monitoring. UNEP no. "QB." UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

UNEP/IOC/IAEA (in prep., b) Quality assurance and good laboratory practice for the measurement of contaminants in marine sediments. UNEP no. "QB." UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

UNEP/IOC/FAO/IMO/IAEA (in prep.) Statistical analysis and interpretation of marine community data. UNEP no. "JA." UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

UNEP/IOC/IAEA (1990) Guidelines for collecting and interpreting data on estuaries. UNEP no. "C" (English). UNEP, Programme Activity Centre for Oceans and Coastal Areas, PO Box 30552, Nairobi, Kenya.

ASHES



**A
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CRM 542CO39 through 550DE38

Coal Fly Ash

Netherlands Meetinstituut (The Netherlands)

Description:

These CRMs are coal from various sources. CRM 542CO39 is coal from El Cerrejón, Colombia; 548GB41 is from Dawn Mill, UK; 549FR15 is from Blanzy, France; and 550DE38 is from Goettelborn, Germany. The samples have been certified on ash composition.

Elemental composition of coal (percent):

Component	CRM 542CO39	CRM 548GB41	CRM 549FR15	CRM 550DE38
H (%)	5.12	4.87	3.58	4.75
C (%)	-	76.63	79.15	75.20
N (%)	-	1.22	1.54	1.40
S (%)	0.65	1.72	1.61	1.07
Cl (%)	-	0.21	0.02	0.15

Elemental composition of ash (percent):

Component	CRM 542CO39	CRM 548GB41	CRM 549FR15	CRM 550DE38
Na ₂ O (%)	0.52	1.10	0.49	0.39
MgO (%)	1.51	3.47	1.45	2.94
Al ₂ O ₃ (%)	16.60	24.43	24.03	24.41
SiO ₂ (%)	61.83	32.19	52.08	44.39
P ₂ O ₅ (%)	0.22	0.40	0.38	0.16
SO ₃ (%)	3.28	12.38	5.24	4.24
K ₂ O (%)	1.68	0.38	2.90	3.29
CaO (%)	2.73	10.97	5.36	4.28
TiO ₂ (%)	0.76	1.00	0.88	0.96
MnO ₂ (%)	0.07	0.37	0.05	0.14
Fe ₂ O ₃ (%)	9.48	13.05	5.28	13.36

Order information:

These PRMs are available for between US\$100 and US\$150 unit (60-g bottles). Please contact NMI.

CRM 038

Coal Fly Ash

Community Bureau of Reference (Belgium)

Description:

This material consists of fly ash from pulverized coal:

Certified concentrations ($\mu\text{g/g}$ dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Na (mg/g)	3.74	0.15	Zn	581	29
Mn	479	16	As	48.0	2.3
Fe (mg/g)	33.8	0.7	Cd	4.6	0.3
Co	53.8	1.	Hg	2.10	0.15
Cu	176	9	Pb	262	11

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element Value

V	334
Cr	178
Ni	194
Th	17.3

Order information:

CRM 038 can be purchased for ECU100 per unit (5 g) respectively. Price includes handling and normal postage and it is subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 176

City Waste Incineration Ash

Community Bureau of Reference (Belgium)

Description:

This material consists of ash from city waste incineration.

Certified concentrations ($\mu\text{g/g}$ dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Cr	863	30	Se	41.2	2.1
Fe (mg/g)	21.3	1.1	Cd	470	9
Co	30.9	1.3	Sb	412	18
Ni	123.5	4.2	Hg	31.4	1.1
Cu	1302	26	Tl	2.85	0.19
Zn (mg/g)	25.77	0.38	Pb	10.87	0.17

Noncertified concentrations (mg/g dry weight unless noted):

Element	Value	Element	Value
Na ₂ O	58.0	K ₂ O	54.2
MgO	36.2	CaO	123.1
Al ₂ O ₃	191.9	TiO ₂	14.2
SiO ₂	300.3	V ($\mu\text{g/g}$)	43
P ₂ O ₅	12.7	Mn ($\mu\text{g/g}$)	1.5
S	44.6	As ($\mu\text{g/g}$)	93.3

Order Information:

CRM 176 can be purchased for ECU150 per unit (30 g). Price includes handling and normal postage and it is subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 429

Polychlorodibenzo-p-dioxins and Polychlorodibenzo Furans in Fly Ash Extract

Community Bureau of Reference (Belgium)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$ dry weight):

Congener	Value	Uncertainty (\pm)	Congener	Value	Uncertainty (\pm)
2,3,7,8-T4CDD	4.8	0.4	2,3,7,8-T4CDF	16.2	1.1
1,2,3,7,8-P5CDD	24.8	1.6	1,2,3,7,8-P5CDF	40.7	2.8
1,2,3,4,7,8-H6CDD	66	6	2,3,4,7,8-P5CDF	71	5
1,2,3,6,7,8-H6CDD	145	5	1,2,3,6,7,8-H6CDF	165	18
1,2,3,7,8,9-H6CDD	79	4	1,2,3,7,8,9-H6CDF	15.2	1.8
			2,3,4,6,7,8-H6CDF	299	30

Order Information:

CRM 429 is available in sealed glass ampoules containing approximately 1.2 mL of the isooctane extract. These CRMs can only be ordered via authorized distributors. Please contact BCR for prices and availability.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CTA-FFA-1

Fine Fly Ash

Polish Academy of Science and the Institute of Nuclear Chemistry and Technology (Poland)

Description:

Fine fly ash originating from the third zone of electrofilters at the Kozienice Power Station, Poland, was sieved to pass through a 0.06 mm sieve. The material was homogenized by mixing for 16 hrs in a plastic drum rotated in three directions. Distribution of 50-g portions into wide-mouthed, air-tight polyethylene bottles was achieved using a specially constructed scoop.

Recommended concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Li	128	22	Cs	48.2	2.6
F	198	39	Ba	835	56
Na (%)	2.19	0.08	La	60.7	4.0
Al (%)	14.87	0.39	Ce	120	7
Si (%)	22.48	0.92	Nd	56.8	3.7
P	725	74	Sm	10.9	0.6
Sc	24.2	1.1	Eu	2.39	0.06
V	260	10	Gd	10.0	2.6
Cr	156	8	Tb	1.38	0.14
Mn	1066	41	Dy	9.09	1.45
Fe (%)	4.89	0.14	Er	4.52	1.12
Co	39.8	1.7	Tm	0.705	0.200
Ni	99.0	5.8	Yb	4.24	0.19
Cu	158	9	Lu	0.658	0.043
Zn	569	58	Hf	6.09	0.45
As	53.6	2.7	Ta	2.11	0.16
Pb	185	5	W	10.5	1.1
Sr	250	13	Pb	369	46
Y	45.0	13.5	Th	29.4	0.7
Sb	17.6	2.5	U	15.1	0.8

Information values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value
Be	27	Ga	49
Mg (%)	1.55	Se	4.6
K (%)	2.20	Cd	2.8
Ca (%)	2.29	In	0.34
Ti (%)	0.58	Mo	17

Order information:

CTA-FFA-1 can be purchased for US\$110 per unit (50-g bottle) plus 10 - 15% for air mail costs. Please contact ICHTJ.

References:

Dybczyński, R. (1980) Comparison of the effectiveness of various procedures for the rejection of outlying results and assigning consensus values in interlaboratory programs involving determination of trace elements or radionuclides. Anal. Chim. A., 117:53-70.

Instytut Chemii i Techniki Jądrowej (1995) Fine fly ash (CTA-FFA-1). Polish Certified Reference Material for multielement analysis. Description sheet. Instytut Chemii i Techniki Jądrowej, Department of Analytical Chemistry, 03-195 Warszawa, Poland.

GBW 08401 - 08402

Coal Fly Ashes

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations for GBW 08401 ($\mu\text{g/g}$ dry weight unless noted):

Element	Value
GBW 08401	
Be	10.7
V	95
Cr	60
Mn	1178
Fe (%)	7.65
Co	33.2
Cu	53
Zn	61
As	11.4
Se	1.13
Cd	0.16
Pb	33.8

Element	Value
GBW 08402	
F	114

Noncertified concentrations for GBW 08401 ($\mu\text{g/g}$ dry):

Element	Value
Ba	1450
Hg	0.039

Order information:

GBW 08401 is available for US\$30 per unit (35 g), and GBW 08402 for US\$50 per unit (50 g)..
Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

NIES 8

Vehicle Exhaust Particulates

National Institute for Environmental Studies (Japan)

Description:

This material was prepared from particulate matter collected from electrostatic precipitators in very large ventilators connected to a highway tunnel. The collected material was mixed by making a paste with 35% ethanol, air dried, oven dried, ground, sieved, and homogenized in a polyethylene container in a ball-mill apparatus. The material contains approximately 80% C.

Certified concentrations ($\mu\text{g/g}$ unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Na (%)	0.192	0.008	Ni	18.5	1.5
Mg (%)	0.101	0.005	Cu	67	3
Al (%)	0.33	0.02	Zn (%)	0.104	0.005
K (%)	0.115	0.008	As	2.6	0.2
Ca (%)	0.53	0.02	Sr	89	3
V	17	2	Cd	1.1	0.1
Cr	25.5	1.5	Sb	6.0	0.4
Co	3.3	0.3	Pb	219	9

Reference concentrations ($\mu\text{g/g}$ unless noted):

Element	Value	Element	Value
P	510	Cs	0.24
Sc	0.55	La	1.2
Se	1.3	Ce	3.1
Br	56	Sm	0.20
Rb	4.6	Eu	0.05
Mo	6.4	Lu	0.02
Ag	0.20	Th	0.35

Order information:

NIES 8 is available free of charge. Please contact Dr. Jun Yoshinaga at NIES.

References:

National Institute for Environmental Studies (1987) NIES certified reference material "Vehicle Exhaust Particulates." Information sheet. National Institute for Environmental Studies, Yatabe-machi, Tsukuba, Ibaraki, 305, Japan.

Okamoto, K. (1987) A new certified reference material, vehicle exhaust particulates. Analytical Sciences, 3:(191-2)

PD-1

Non-Ferrous Dust

Canada Centre for Mineral and Energy Technology (Canada)

Description:

PD-1 is the result of cooperative effort, between CCRMP and the Air Pollution Technology Centre of Environment Canada, to prepare a non-ferrous dust from a base-metal smelter for use in a nation-wide, analytical quality-assurance program operated by the Federal/Provincial Committee on Air Pollution, and also to provide a reference material for laboratories concerned with the analysis of similar environmental samples. PD-1 is a composite of samples of dusts from numbers 1 and 2 baghouses, and of a smaller sample of electrostatic-precipitator dusts collected from the zinc and copper roaster stacks of Hudson Bay Mining and Smelting Company Limited in Flin Flon, Manitoba, Canada. The material is essentially zincite containing varying minor to trace amounts of chalcocite, chalcopyrite, covellite, ferrites, galena, iron oxides, quartz, pyrite, pyrrhotite, sphalerite, elemental sulphur, and complex sulphates, silicates, and arsenates. Twenty-six laboratories provided analytical results for one or more of Pb, As, and Hg.

Recommended values (percent dry weight):

Element	Value	Uncertainty (\pm)
As	0.77	0.02
Hg ($\mu\text{g/g}$)	389.0	18.0
Pb	2.75	0.02

Approximate chemical composition (percent dry weight unless noted):

Element	Value	Element	Value
H ₂ O (105°C)	0.4	Zn	35.9
Si	3.05	As	0.76
S (total)	8.23	Cd	0.28
S (sulphate)	4.27	Hg ($\mu\text{g/g}$)	389
Fe	12.2	Pb	2.75
Cu	7.03		

Order information:

This CRM can each be purchased for Canadian \$70 per unit (100 g). Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

SRM 1633b

Trace Elements in Coal Fly Ash

National Institute of Standards and Technology (USA)

Description:

The fly ash was obtained from a coal fired power plant and is a product of Pennsylvania and West Virginia, USA, coals. It was selected as a typical bituminous coal fly ash and is not intended as a fly ash from a specific coal or combustion process. The ash was air dried, sieved and bottled.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Na (%)	0.201	0.003	Ni	120.6	1.8
Mg (%)	0.482	0.008	Cu	112.8	2.6
Al (%)	15.05	0.27	As	136.2	2.6
Si (%)	23.02	0.08	Se	10.26	0.17
S (%)	0.2075	0.0011	Sr	1041	14
K (%)	1.95	0.03	Cd	0.784	0.006
Ca (%)	1.51	0.06	Ba	709	27
Ti (%)	0.791	0.014	Hg	0.141	0.019
V	295.7	3.6	Pb	68.2	1.1
Cr	198.2	4.7	Th	25.7	1.3
Mn	131.8	1.7	U	8.79	3.6
Fe (%)	7.78	0.23			

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
P	2300	La	94	Hb	3.5
Sc	41	Ce	190	Tm	2.1
Co	50	Nd	85	Yb	7.6
Zn	210	Sm	20	Lu	1.2
Br	2.9	Eu	4.1	Hf	6.8
Pb	140	Gd	13	Ta	1.8
Sb	6	Tb	2.6	W	5.6
Cs	11	Dy	17	Tl	5.9

Order information:

SRM 1633b can be purchased for US\$274 per unit (75-g bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 1633b. Trace elements in coal fly ash. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1648

Urban Particulate Matter

National Institute of Standards and Technology (USA)

Description:

This material was prepared from urban particulate matter collected in the St. Louis, Missouri, USA, area using filter bags. The collected particulate matter was sieved, blended and bottled. The material was collected over a period of 12 months and is, therefore, time integrated.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Na (%)	0.425	0.002	Cu	609	27
Al (%)	3.42	0.11	Zn (%)	0.479	0.014
K (%)	1.05	0.01	As	115	10
V	140	3	Se	27	1
Cr	403	12	Cd	75	7
Fe (%)	3.91	0.10	Pb (%)	0.655	0.008
Ni	82	3	U	5.5	0.1

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Mg (%)	0.8	Pb	52	Ce	55
S (%)	5.0	Ag	6	Sm	4.4
Cl (%)	0.45	In	1.0	Eu	0.8
Sc	7	Sb	45	Hf	4.4
Ti (%)	0.40	I	20	W	4.8
Mn	860	Cs	3	Th	7.4
Co	18	Ba	737		
Br	500	La	42		

Order Information:

SRM 1648 can be purchased for US\$196 per unit (2-g vials). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 1648. Urban particulate matter. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1649

Urban Dust/Organics

National Institute of Standards and Technology (USA)

Description:

This material was prepared from urban particulate matter collected in the St. Louis, Missouri, USA, area using filter bags. The collected particulate matter was sieved, blended and bottled. The material was collected over a period of 12 months and is, therefore, time integrated. Fluorescent conditions for liquid chromatography determination of selected PAHs in this SRM and reference values for mutagenic activity are listed in the Certificate of Analysis.

Certified concentrations ($\mu\text{g/g}$):

Compound	Value	Uncertainty (\pm)
Benz[a]anthracene	2.6	0.3
Benzo[a]pyrene	2.9	0.5
Benzo[ghi]perylene	4.5	1.1
Indeno[1,2,3-cd]perylene	3.3	0.5
Fluoranthene	7.1	0.5

Noncertified concentrations ($\mu\text{g/g}$ unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
S (%)	3.27	0.08	Cd	18	3
Cl (%)	0.282	0.014	Sn	56	26
Sc	8.73	0.08	Sb	29.9	0.7
Cr	211	3	Cs	2.85	0.10
Co	16.4	0.3	Ba	569	35
Fe (%)	3.00	0.02	La	33.3	0.3
Zn (%)	0.167	0.003	Ce	51.6	1.1
As	67.0	1.4	Sm	4.71	0.05
Se	25.6	0.5	Eu	0.87	0.04
Br (%)	0.119	0.001	Hf	4.41	0.10
Pb	47	5	W	3.8	0.9
Mo	14	3	Th	6.63	0.14
Ag	3.5	0.3	U	2.65	0.16

Compound	Value	Uncertainty (\pm)
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Leacheable anions

Sulfate	9.40	0.22
Nitrate	0.68	0.04
Phosphate	0.32	0.03
Chloride	0.086	0.004

SRM 1649 (cont.)

Compound	Value	Uncertainty (\pm)
Organic compounds		
Benzo[<i>a</i>]pyrene	3.3	0.2
Benzo[<i>b</i>]fluoranthene	6.2	0.3
Benzo[<i>k</i>]fluoranthene	2.1	0.1
Chrysene	3.7	0.2
Dibenz[<i>a,h</i>]anthracene	0.41	0.07
Perylene	0.65	0.02
Phenanthrene	4.5	0.3
Pyrene	6.2	0.2
Triphenylene	1.7	0.1

Order information:

SRM 1649 can be purchased for US\$260 per unit (10 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) SRM 1649. Urban dust/organics. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1650

Diesel Particulate Matter

National Institute of Standards and Technology (USA)

Description:

This material was collected from the heat exchangers of a dilution tube facility following 200 engine hours of particle accumulation. More than one four-cycle diesel engine, operating under a variety of conditions, was used to generate the particulate material. reference values for mutagenic activity are listed in the Certificate of Analysis.

Certified concentrations ($\mu\text{g/g}$):

Compound	Value	Uncertainty (\pm)
1-Nitropyrene	19	2
Benz[a]anthracene	6.5	1.1
Benzo[a]pyrene	1.2	0.3
Benzo[ghi]perylene	2.4	0.6
Fluoranthene	51	4
Pyrene	48	4

Noncertified concentrations ($\mu\text{g/g}$):

Compound	Value	Compound	Value
2-Nitrofluorene	0.2	Benzo[e]pyrene	9.6
6-Nitrobenzo[a]pyrene	1.6	Chrysene	22
7-Nitrobenz[a]anthracene	2.8	Indeno[1,2,3-cd]pyrene	2.3
9-Fluorenone	33	Perylene	0.13
Benzo[k]fluoranthene	2.1	Phenanthrene	71

Order information:

SRM 1650 can be purchased for US\$437 per unit (5 vials). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 1650. Diesel particulate matter. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2689 - 2691

Coal Fly Ashes

National Institute of Standards and Technology (USA)

Description:

Fly ashes were obtained from three different coal-fired power plants and are products of Kentucky, Colorado and Wyoming, USA, coals. Coarse particles found in the ash, mostly quartz and partially burned fragments, were ground to pass through a No. 100 (150 μm) sieve and blended back into the rest of the ash. The material was then homogenized in a ribbon blender and hermetically sealed in glass vials under controlled temperature and humidity conditions. These SRMs are intended for use in the evaluation of analytical methods and techniques used in the classification of coal fly ash and for the determination of constituent elements in coal fly ash and/or materials of similar matrix.

SRM		
2689	2690	2691

Certified concentrations (weight percent):

Element	Value	Uncertainty (\pm)	Value	Uncertainty (\pm)	Value	Uncertainty (\pm)
Na	0.25	0.03	0.24	0.02	1.09	0.05
Mg	0.61	0.05	1.53	0.05	3.12	0.08
Al	12.94	0.21	12.35	0.28	9.81	0.39
Si	24.06	0.08	25.85	0.17	16.83	0.12
P	0.10	0.01	0.52	0.01	0.51	0.02
S	-	-	0.15	0.01	0.83	0.05
K	2.20	0.03	1.04	0.04	0.34	0.01
Ca	2.18	0.06	5.71	0.13	18.45	0.32
Ti	0.75	0.01	0.52	0.01	0.90	0.02
Fe	9.32	0.06	3.57	0.06	4.42	0.03

Noncertified concentrations ($\mu\text{g/g}$):

Element	Value	Value	Value
Be	21	8	8
Sc	32	17	24
Cr	170	67	68
Mn	300	300	200
Co	48	19	26
Ni	122	46	53
Zn	240	120	120
As	200	26	30
Se	7	0.8	17
Sr	700	2000	2700
Sb	9	6	3
Cs	11	8	1

Element	SRM		
	2689	2690	2691
Value	Value	Value	Value
Ba	800	5800	5900
Eu	3	2	2
Hf	7	8	10
Cd	3	0.7	0.9
Hg	<0.003	<0.003	<0.003
Pb	52	39	29
Th	25	25	26
LOI (750°C)	1.76	0.53	0.23

Source and description of raw materials:

Coal type	Bituminous	Sub-bituminous	Sub-bituminous
Mine	Western Kentucky	Craig, Colorado	Gillette, Wyoming
Btu/lb	12,000	9,700	8,800
Ash (wt. %)	12	5.3	4.8
S (wt. %)	1.5	0.3	0.3

Order information:

Each of these SRMs can be purchased for US\$174 per unit (3 10-g vials). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 2689, 2690, and 2691. Coal fly ashes. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

ZUK-1

Coal Ash

Russian Federation Academy of Sciences (Russia)

Description:

This brown coal ash of the Kansk-Achinsk basin was collected from the layered sequence of fine-dispersed sediments of the pond collector ash removal system of the Galachinsk power station in Bratsk city, Russia. This CRM was prepared in 1994. This material is also known as CRM No. 7125-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	32	4	Ga	9	1
Be	2.9	0.5	Ge	2.3	0.4
B	97	14	Pb	15	2
CO ₂ (%)	13.20	0.25	Sr (%)	0.33	0.03
Na ₂ O (%)	0.22	0.02	Y	29	4
MgO (%)	6.70	0.10	Zr	119	15
Al ₂ O ₃ (%)	6.79	0.14	Nb	8.4	1.5
SiO ₂ (%)	35.80	0.30	Mo	1.4	0.2
P ₂ O ₅ (%)	0.059	0.003	Ag	0.16	0.03
S (%)	0.17	0.01	Sn	2.7	0.5
K ₂ O (%)	0.51	0.02	Ba (%)	0.225	0.023
CaO (%)	20.91	0.21	La	20	3
Sc	11	1	Ce	38	5
TiO ₂ (%)	0.35	0.01	Nd	20	3
V	61	8	Sm	411	0.5
Cr	45	5	Eu	0.9	0.1
MnO (%)	0.094	0.005	Tb	0.68	0.12
FeO (%)	0.40	0.04	Yb	2.6	0.3
Fe ₂ O ₃ (%)	6.28	0.08	Lu	0.40	0.05
Co	16	2	Hf	2.6	0.4
Ni	49	6	Pb	13	2
Qz	45	7	Th	5.8	1.0
Zn	65	7	U	3.3	0.4

ZUK-1 (cont.)

Information concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁻ (%)	2.41	Gd	4.2
H ₂ O ⁺ (%)	5.74	Dy	3.8
C (%) org	1.33	Ho	0.87
F	230	Er	2.4
SO ₃ (%)	0.40	Tm	0.38
Cs	1.1	Ta	0.53
As	10	W	1.1
Au	0.003	Hg	0.03
Pr	4.3	LOI (%)	21.29

Mineral composition

The sample consists of three mineral associations. The first contains new formed minerals: calcite, magnesite, gypsum, ettringite, tobermorite, brown millerite, melilitite, wollastonite, monticellite, alite and $\text{Ca}_4\text{Al}_2\text{O}_7 \cdot \text{H}_2\text{O}$, $\text{Ca}_3\text{Si}_2\text{O}_7$, $13\text{Al}_2\text{O}_3 \cdot 6\text{SO}_3 \cdot \text{H}_2\text{O}$ compounds. The sample involves the glass phase of variable composition. The sample contains also some nonaltered primary minerals: coal particles, quartz, feldspars, pyroxenes, hornblendes, ore minerals and burnt clay.

Granumetric composition:

Fraction size (μm)	Percent
-80 + 71	0.8
-71 + 63	0.7
-63 + 50	1.8
-50 + 45	0.7
-45 + 40	0.5
-40 + 36	1.2
-36 + 25	4.8

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

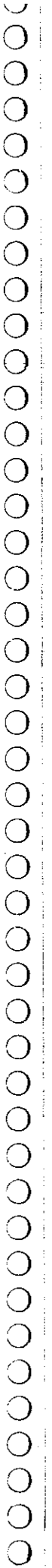
Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Geochemistry (1981?) Coal ash CRM No. 7125-94 (ZUK-1). Institute of Geochemistry, Russian Academy of Sciences, Irkutsk, Russia.

GASES



GASES



GBW 08101 through 08134

Gases in Nitrogen

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Nominal concentrations ($\mu\text{mol/mol}$ unless noted):

Methane in nitrogen

GBW 08101	10
GBW 08102	50
GBW 08103	100
GBW 08104	500
GBW 08105	1000

Sulfur hexafluoride in nitrogen

GBW 08124	5000 ~ 6000
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Carbon monoxide and propane in nitrogen

GBW 08133	CO	16000
	Propane	800

Carbon monoxide in nitrogen

GBW 08106	10
GBW 08107	50
GBW 08108	100
GBW 08109	500
GBW 08110	1000

Propane in nitrogen

GBW 08134	800 - 1300
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Ethane in air

GBW 08125	1 - 10
GBW 08126	10 - 10000

Carbon dioxide in nitrogen

GBW 08111	10
GBW 08112	50
GBW 08113	100
GBW 08114	500
GBW 08115	1000

Ethylene in air

GBW 08127	1 - 10
GBW 08128	10 - 10000

Propane in air

GBW 08129	1 - 10
GBW 08130	10 - 10000

Nitrogen monoxide in nitrogen

GBW 08116	50 - 200
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Organic gases in air

GBW 08131	Ethane	1000
	Methane	1000
	Propane	1000
	Ethylene	10
	Isobutane	10
GBW 08132	Ethane	500
	Methane	500
	Propane	10
	Propylene	10

Oxygen in nitrogen

GBW 08117	21 mole percent
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Carbon dioxide in nitrogen

GBW 08118	1 mole percent
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Hydrogen sulfide in nitrogen

GBW 08122	100 - 300
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Order Information:

These CRMs are available for between US\$300 and 1000 per cylinder (4 L except for GBW 08122 which is available in an 8 L cylinder). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GBW 08119 through 08123

Gases in Air or Argon

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Nominal concentrations ($\mu\text{mol/mol}$ unless noted):

Methane in air
GBW 08119 1 - 100

Methane in argon
GBW 08121 10

Carbon monoxide in air
GBW 08120 5 - 50

Methane in air
GBW 08123 0.5 ~ 3. mole percent

Order information:

These CRMs are available for between US\$300 and 350 per cylinder (4 L). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

Gas Permeation Tubes

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Permeation rates ($\mu\text{g}/\text{min}$ at 25°C):

CRM	Compound	Value	Cost
GBW 08201	Sulfur dioxide	0.37 - 1.4	300
GBW 08202	Nitrogen dioxide	0.6 - 2.0	300
GBW 08203	Hydrogen sulfide	0.1 - 1.0	320
GBW 08204	Ammonia	0.1 - 1.0	320
GBW 08205	Chlorine	0.2 - 2	300

Order Information:

Prices for each CRM are listed above and are subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

PRM AB21 through BI23

Gases in Air

Netherlands Meetinstituut (The Netherlands)

Description:

Primary Reference Materials (PRMs) are intended as calibration gases for traceable measurements of gaseous samples from various emissions or related sources. Each PRM is prepared independently by gravimetric procedures in accordance with International Standard ISO 6142-1981(E) (Gas analysis - Preparation of calibration gas mixtures - Weighing methods). After preparation the composition is verified against Dutch Primary Standard gas Mixtures (PSMs). The composition of the pure gases has been analyzed extensively on all constituents. The composition of the PRM and its expanded uncertainty is reported in a certificate. Within the stated ranges, any composition can be supplied. The stability of PRM's is guaranteed for a period of 2 years, unless noted otherwise. PRMs are supplied in aluminum cylinders with deliverable volumes of 0.6 m³ at NTP.

Nominal fraction ranges ($\mu\text{mol/mol}$ unless noted) and maximum uncertainties (\pm in % relative):

PRM	Concentration	Uncertainty	PRM	Concentration	Uncertainty
Methane in air			Nitrous oxide in air		
PRM AB21	2	≤ 1.0	PRM BI21	0.3	≤ 1.0
PRM AB22	10	≤ 1.0	PRM BI22	3	≤ 1.0
PRM AB23	100	≤ 0.8	PRM BI23	30	≤ 1.0
Carbon dioxide in air					
PRM AD21	200 - 400	≤ 0.5			

Order information:

Please state the needed concentration of PRM AD21 as follows: 320 ppm Carbon dioxide in air = PRM AD21 (320). These PRMs are available for between US\$1000 and US\$2000 per cylinder. Please contact NMI.

Note:

Other compositions, components, and combinations of components are available on request. Please contact NMI for further information.

PRM AC11 through B012

Gases in Nitrogen

Netherlands Meetinstituut (The Netherlands)

Description:

Primary Reference Materials (PRMs) are intended as calibration gases for traceable measurements of gaseous samples from various emissions or related sources. Each PRM is prepared independently by gravimetric procedures in accordance with International Standard ISO 6142- 1981(E) (Gas analysis - Preparation of calibration gas mixtures - Weighing methods). After preparation the composition is verified against Dutch Primary Standard gas Mixtures (PSM's). The composition of the pure gases has been analyzed extensively on all constituents. The composition of the PRM and its expanded uncertainty is reported in a certificate. Within the stated ranges, any composition can be supplied. The stability of PRMs is guaranteed for a period of 2 years, unless noted otherwise. PRMs are supplied in aluminum cylinders with deliverable volumes of 0.6 m³ at NTP.

Nominal fraction ranges ($\mu\text{mol/mol}$ unless noted) and maximum uncertainties (\pm in % relative):

PRM	Concentration	Uncertainty	PRM	Concentration	Uncertainty
Carbon monoxide in nitrogen			Propane in nitrogen		
PRM AC11	10 - 100	≤ 0.8	PRM AL11	50 - 500	≤ 0.6
PRM AC12 *	100 - 1000	≤ 0.5	PRM AL12 *	500 - 5000	≤ 0.4
PRM AC13 *	1000 - 10000	≤ 0.4	PRM AL13	0.5 - 5% (mol/mol)	≤ 0.3
PRM AC14 *	1 - 10% (mol/mol)	≤ 0.2	Sulfur dioxide in nitrogen		
Carbon dioxide in nitrogen			PRM BH11	10 - 100	≤ 1.0
PRM AD11	10 - 100	≤ 0.8	PRM BH12	100 - 1000	≤ 0.8
PRM AD12 *	100 - 1000	≤ 0.6	PRM BH13	1000 - 8000	≤ 0.5
PRM AD13 *	1000 - 10000	≤ 0.5	Hydrogen sulfide in nitrogen		
PRM AD14 *	1 - 10% (mol/mol)	≤ 0.2	PRM BN11	10 - 100	≤ 2.0
Nitric oxide in nitrogen			PRM BN12	100 - 1000	≤ 2.0
PRM BD11	10 - 100	≤ 1.0	Halocarbon R22 (CHClF ₂)		
PRM BD12	100 - 1000	≤ 1.0	PRM BO11	10	≤ 2.0
PRM BD13	1000 - 8000	≤ 0.6	PRM BO12	100	≤ 1.0
Oxygen in nitrogen (mol/mol)					
PRM BG11	0.1 - 2%	≤ 0.4			
PRM BG12	2 - 22%	≤ 0.2			

* NMI and NIST have agreed on a Declaration of Equivalence for these materials, based on annual comparison programs.

Order information:

Please state the needed concentrations of some PRMs as follows: 500 ppm Carbon monoxide in nitrogen = PRM AC12 (500). These PRMs are available for between US\$1000 and US\$1500 per cylinder. Please contact NMI.

Note:

Other compositions, other components and combinations of components are available on request. NMI can also certify gas mixtures supplied by third parties (CRMs). Normally this gives an additional uncertainty. Cylinders must be acceptable for road transport in the Netherlands. Please contact NMI for further information.

PRM AZ11 through AZ14

Synthetic Natural Gases

Netherlands Meetinstituut (The Netherlands)

Description:

These Primary Reference Materials (PRMs) are intended as calibration gases for traceable measurements of natural gas. Each PRM is prepared independently by gravimetric procedures in accordance with International Standard ISO 6142-1981(E) (Gas analysis - Preparation of calibration gas mixtures - Weighing methods). After preparation the composition is verified against Dutch Primary Standard gas Mixtures (PSM's). The composition of the pure gases has been analyzed extensively on all constituents. The composition of the PRM and its expanded uncertainty is reported in a certificate. The listed PRMs are examples of synthetic natural gas samples covering the nominal concentration range found in natural gas. Other composition, including other components, are available on request. The stability of PRM's is guaranteed for a period of 2 years, unless noted otherwise. PRMs are supplied in aluminum cylinders with deliverable volumes of 0.6 m³ at NTP.

Nominal fractions (mol/mol):

Compound	Nominal fraction	Compound	Nominal fraction
PRM AZ11		PRM AZ13	
CO ₂	7%	CO ₂	5%
C ₂ H ₆	5%	C ₂ H ₆	2%
C ₃ H ₈	3%	C ₃ H ₈	1%
n-C ₄ H ₁₀	0.5%	n-C ₄ H ₁₀	0.1%
i-C ₄ H ₁₀	0.5%	i-C ₄ H ₁₀	0.1%
N ₂	5%	N ₂	1%
CH ₄	79%	CH ₄	90.8%
PRM AZ12		PRM AZ14	
CO ₂	3%	CO ₂	1%
C ₂ H ₆	3%	C ₂ H ₆	1%
C ₃ H ₈	2%	C ₃ H ₈	0.5%
n-C ₄ H ₁₀	0.2%	n-C ₄ H ₁₀	0.3%
i-C ₄ H ₁₀	0.3%	i-C ₄ H ₁₀	0.2%
N ₂	7%	N ₂	3%
CH ₄	84.5%	CH ₄	94%

Uncertainties:

The expanded uncertainties for PRM AZ11 through AZ14 are: for fraction of constituent $\geq 1\%$, the uncertainty is 0.5 % relative; and for fraction of constituent $< 1\%$, the uncertainty is 1.0% relative.

PRM AZ11 through AZ14 (cont.)

Order information:

These PRMs are available for between US\$3000 and US\$4000 per cylinder. Please contact NMI.

Note:

Other compositions, other components (up to C5) and combinations of components are available on request. Please contact NMI for further information.

SRM 1625 through 1629a

Gas Permeation Tubes

National Institute of Standards and Technology (USA)

Description:

These SRMs are used in the preparation of mixtures of known gaseous content for calibrating air pollution monitoring apparatus. Each permeation tube is individually calibrated and certified permeation rates are reported for temperatures in the range of 20° to 30°C.

SRM	Gas	Approximate permeation rate (µg/min) at 25°C
1625	SO ₂	2.8
1626	SO ₂	1.4
1627	SO ₂	0.56
1629a	NO ₂	1.0

Order Information:

These SRMs are in preparation. Please contact NIST.

References:

National Institute of Standards and Technology (1991) SRM 1627. Sulfur dioxide permeation tube 2-cm. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1629a. Nitrogen dioxide permeation device. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 1625. Sulfur dioxide permeation tube - 10 cm. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 1626. Sulfur dioxide permeation tube - 5 cm. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1658a through 2751

Gases in Air

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended primarily for the calibration of instruments used for the determination of gases in mobile source emissions and related uses. They are supplied in aluminum cylinders with deliverable volumes of 0.85 m³ (30 cubic ft.) at NTP. Each cylinder is individually analyzed and the certified value provided in each Certificate of Analysis.

Certified concentrations of methane and propane (μmole/mole):

Methane in air			Carbon dioxide and nitrous oxide in air		
SRM 1658a	1		SRM 2607	CO ₂	340
SRM 1659a	10			N ₂ O	300
SRM 2750	50		SRM 2609	CO ₂	380
SRM 2751	100			N ₂ O	330
Methane and propane in air			SRM 2610	CO ₂	380
SRM 1660a	Methane	4		N ₂ O	330
	Propane	1			
Propane in air			Carbon monoxide in air		
SRM 1665b	3		SRM 2612a	10	
SRM 1666b	10		SRM 2613a	20	
SRM 1667b	50		SRM 2614a	45	
SRM 1668b	100		Nitrogen dioxide in air		
SRM 1669b	500		SRM 2656	2500	

Order information:

Please contact NIST for purchasing information.

References:

National Institute of Standards and Technology (1992) SRM 1658a. Methane in air. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1665b. Propane in air. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1666b. Propane in air. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1667b. Propane in air. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1669b. Propane in air. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 1661a through 2745

Gases in Nitrogen

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended primarily for the calibration of instruments used for the determination of gases in mobile source emissions and related uses. They are supplied in aluminum cylinders with deliverable volumes between 0.85 m³ (30 cubic ft.) and 3.7 m³ (130 cubic ft.) at NTP. Each cylinder is individually analyzed and the certified value provided in each Certificate of Analysis.

Nominal concentrations (μ mole/mole unless noted):

Sulfur dioxide in nitrogen		SRM 2740	10 mole percent
SRM 1693a	50	SRM 2741	13 mole percent
SRM 1694a	100	Nitric oxide in nitrogen	
SRM 1661a	500	SRM 2627a	5
SRM 1662a	1000	SRM 2628a	10
SRM 1663a	1500	SRM 2629a	20
SRM 1664a	2500	SRM 1683b	50
SRM 1696a	3500	SRM 1684b	100
Carbon dioxide in nitrogen		SRM 1685b	250
SRM 2632a	300	SRM 1686b	500
SRM 2619a	0.5 mole percent	SRM 2735	800
SRM 2620a	1.0 mole percent	SRM 1687b	1000
SRM 2621a	1.5 mole percent	SRM 2630	1500
SRM 2622a	2.0 mole percent	SRM 2736	2000
SRM 2623a	2.5 mole percent	SRM 2631a	3000
SRM 2624a	3.0 mole percent	Volatile toxic organics in nitrogen	
SRM 2625a	3.5 mole percent	(nmole/mole)	
SRM 2626a	4.0 mole percent	SRM 1800	Ethane 5
SRM 1674b	7.0 mole percent		Propane 5
SRM 1675b	14.0 mole percent		Propene 5
SRM 2745a	16 mole percent		iso-Butane 5
Carbon monoxide in nitrogen			n-Butane 5
SRM 1677c	10		iso-Butylene 5
SRM 1678c	50		iso-Pentane 5
SRM 1679c	100		n-Pentane 5
SRM 1680b	500		1-Pentene 5
SRM 1681b	1000		n-Hexane 5
SRM 2635a	25		Benzene 5
SRM 2636a	250		n-Octane 5
SRM 2637a	2500		Toluene 5
SRM 2638a	5000		ortho-Xylene 5
SRM 2639a	1 mole percent		n-Decane 5
SRM 2640a	2 mole percent		
SRM 2641a	4 mole percent		
SRM 2642a	8 mole percent		

SRM 1677c through SRM 2745a (cont.)

SRM 1804a	1,1-Dichloroethane	5	SRM 2646a	1000
	1,1-Dichloroethene	5	SRM 2647a	2500
	1,2-Dibromoethane	5	SRM 2648a	5000
	1,2-Dichloroethane	5	SRM 2649a	1 mole percent
	1,2-Dichloropropane	5	SRM 2650	2 mole percent
	1,2-Dimethylbenzene	5		
	1,3-Butadiene	5	Propane and oxygen in nitrogen	
	1,1,1-Trichloroethane	5	SRM 2651	Propane 0.01
	Benzene	5		Oxygen 5.0
	Chlorobenzene	5	SRM 2652	Propane 0.01
	Chloroethane	5		Oxygen 10.0
	Dichloromethane	5		
	Ethylbenzene	5	Oxygen in nitrogen	
	Methylbenzene	5	SRM 2657a	2
	Tetrachloroethene	5	SRM 2658a	10
	Tetrachloromethane	5	SRM 2659a	21
	Trichloroethene	5		
	Trichlorofluoromethane	5	Oxides of nitrogen in air	
	Trichloromethane	5	SRM 2656	2500
Aromatic organic gases in nitrogen			Hydrogen sulfide in nitrogen	
SRM 1811	Benzene	0.25	SRM 2730	5
	Toluene	0.25	SRM 2731	20
	Chlorobenzene	0.25		
	Bromobenzene	0.25	Carbon dioxide, carbon monoxide and propane in nitrogen	
SRM 1812	Benzene	10	SRM 2727	CO ₂ 11 mole percent
	Toluene	10		CO 1.6 mole percent
	Chlorobenzene	10		C ₃ H ₈ 600
	Bromobenzene	10	SRM 2728	CO ₂ 14 mole percent
				CO 1.6 mole percent
				C ₃ H ₈ 3000
Propane in nitrogen				
SRM 2643a	100			
SRM 2644a	250			
SRM 2645a	500			

Order Information:

Please contact NIST for purchasing information.

References:

National Institute of Standards and Technology (1990) SRM 2626a. Carbon dioxide in nitrogen. (Nominal concentration - 4.0 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2632a. Carbon dioxide in nitrogen. (Nominal concentration: 300 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2643a. Propane in nitrogen. (Nominal concentration - 100 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2644a. Propane in nitrogen. (Nominal concentration - 250 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1661a through 2745 (cont.)

Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2649a. Propane in nitrogen. (Nominal concentration - 1.0 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2735. Nitric oxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2736. Nitric oxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2740. Carbon monoxide in nitrogen. (Nominal concentration: 10 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2741. Carbon monoxide in nitrogen. (Nominal concentration: 13 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2745. Carbon dioxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 2750. Methane in air. (Nominal concentration: 50 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1669b. Propane in air. (Nominal concentration 500 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1679c. Carbon monoxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1681b. Carbon monoxide in nitrogen. (Nominal concentration - 1000 μ mole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1681b. Carbon monoxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1685b. Nitric oxide in nitrogen. (Nominal concentration 250 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1686b. Nitric oxide in nitrogen. (Nominal concentration 500 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1687b. Nitric oxide in nitrogen. (Nominal concentration 1000 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1661a through 2745 (cont.)

National Institute of Standards and Technology (1992) SRM 1693a. Sulfur dioxide in nitrogen. (Nominal concentration - 50 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 1804a. Nineteen toxic volatile organic compounds in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2619a. Carbon dioxide in nitrogen. (Nominal concentration 0.5 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2620a. Carbon dioxide in nitrogen. (Nominal concentration 1.0 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2623a. Carbon dioxide in nitrogen. (Nominal concentration 2.5 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2627a. Nitric oxide in nitrogen. (Nominal concentration 5 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2629a. Nitric oxide in nitrogen. (Nominal concentration 20 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2636a. Carbon monoxide in nitrogen. (Nominal concentration - 250 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2637a. Carbon monoxide in nitrogen. (Nominal concentration - 2500 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2638a. Carbon monoxide in nitrogen. (Nominal concentration - 5000 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2639a. Carbon monoxide in nitrogen. (Nominal concentration - 1 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2727. Carbon dioxide, carbon monoxide and propane in nitrogen. Certificate of Analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 2728. Carbon dioxide, carbon monoxide and propane in nitrogen. Certificate of Analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1663a. Sulfur dioxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1661a through 2745 (cont.)

National Institute of Standards and Technology (1993) SRM 1668b. Propane in air. (Nominal concentration 100 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1678c. Carbon monoxide in nitrogen. (Nominal concentration - 50 μ mole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1694a. Sulfur dioxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1696a. Sulfur dioxide in nitrogen. (Nominal concentration 3500 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1800. Fifteen non-methane organic compounds in nitrogen. (Nominal concentration - 5.0 nanomole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1812. Benzene, toluene, chlorobenzene, bromobenzene in nitrogen. (Nominal concentration - 10.0 μ mole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2624a. Carbon dioxide in nitrogen. (Nominal concentration 3.0 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2642a. Carbon monoxide in nitrogen. (Nominal concentration 8 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2648a. Propane in nitrogen. (Nominal concentration - 5000 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2650. Propane in nitrogen. (Nominal concentration - 2 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2652. Carbon monoxide in nitrogen. (Nominal 100 μ propane and 10 mole percent oxygen.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2657a. Oxygen in nitrogen. (Nominal concentration 2.0 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2658a. Oxygen in nitrogen. (Nominal concentration 10 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2659a. Oxygen in nitrogen. (Nominal concentration 21 mole percent.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1661a through 2745 (cont.)

National Institute of Standards and Technology (1993) SRM 2756. Oxides of nitrogen (NO_x) in air. (Nominal concentration - 2500 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 1677c. Carbon monoxide in nitrogen. (Nominal concentration - 10 μ mole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 1679c. Carbon monoxide in nitrogen. (Nominal concentration - 100 μ mole/mole.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 1683b. Nitric oxide in nitrogen. (Nominal concentration 50 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 1684b. Nitric oxide in nitrogen. (Nominal concentration 100 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

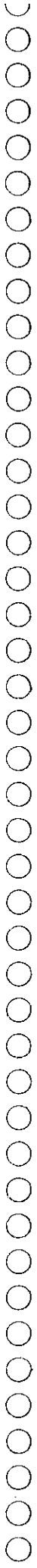
National Institute of Standards and Technology (1994) SRM 2625a. Carbon dioxide in nitrogen. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 2628a. Nitric oxide in nitrogen. (Nominal concentration 10 μ .) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 2731. Hydrogen sulfide in nitrogen. (Nominal concentration 20 μ mol/mol.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

I N S T R U M E N T A L P E R F O R M A N C E



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CLB-1 - CLB-2

Mixtures in Iso-octane of Individual Chlorinated Biphenyl (PCB) Compounds

National Research Council of Canada (Canada)

Description:

CLB-1 is a set of four mixtures of pure, synthetic chlorinated biphenyls (PCBs) in isooctane. The set includes 51 compounds, and composition of each mixture has been selected to assure easy chromatographic resolution of the components. To help assess the resolution of the separation, each mixture contains a pair of congeners which elute closely. CLB-1-D contains the group of PCBs which were tentatively determined in CRM HS-1 and HS-2. CLB-2 is a solution of all ^{13}C -labelled 2,2',4,4',5,5'-hexachlorobiphenyl (IUPAC 153) in iso-octane. This material is intended for use in quantitative analysis of PCBs using GC/MS techniques.

Certified concentrations of PCB congeners ($\mu\text{g/mL}$; * are resolution testing pairs):

PCB	Value	PCB	Value	PCB	Value	
CLB-1-A						
18	11.8	54	16.6	153	2.1	
31	6.6	77	5.5	156	1.5	
40	4.9	86	*	159	1.2	
44	5.9	87	*	209	1.7	
49	7.6	121	3.1			
CLB-1-B						
15	91.9	128	4.9	202	*	3.6
52	15.2	143	5.7	205		3.2
60	3.9	154	6.2	207		3.8
103	10.8	173	*	208		2.4
105	4	182	3.8	209		2.8
CLB-1-C						
15	138.5	171	*	199	*	4.8
114	6.3	183	6.6	201	*	7
129	8.3	185	3.5	203	*	5.1
137	8.3	189	4.7	206		6.7
153	7.4	191	5	209		5.1
CLB-1-D						
15	76.7	151	5	194		2.4
101	8.9	153	3.3	195		2.6
118	3.9	170	3	196	*	3.3
138	4.2	180	2.8	201	*	3.6
141	2.8	187	3.2	209		2.7

CLB-1 - CLB-2 (cont.)

CLB-2

PCB	Value
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153	23.1
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Order information:

CLB-1 can be purchased for C\$220 per unit (set of 4 1-mL ampoules), and CLB-2 for C\$250 per unit (set of 4 0.5-mL ampoules). Price subject to change without notice. Please contact NRCC.

References:

Ballschmiter, K., and M. Zell (1980) Analysis of polychlorinated biphenyls (PCB) by glass capillary gas chromatography. Fresenius Z. Anal. Chem., 302:20-31.

National Research Council Canada (1992) CLB-1. Mixtures in iso-octane of individual chlorinated biphenyl (PCB) compounds. Description sheet. National Research Council Canada, Marine Analytical Standards Program, Halifax, Nova Scotia, Canada.

National Research Council Canada (1992) CLB-2. Solution in iso-octane of ¹³C-labelled 2,2',4,4',5,5'-hexachlorobiphenyl. Description sheet. National Research Council Canada, Marine Analytical Standards Program, Halifax, Nova Scotia, Canada.

CRM 034 through 183

Organic Compounds for Elemental Analysis

Community Bureau of Reference (Belgium)

Description:

Homogeneity has been demonstrated at the 1 mg level. No further information available.

Certified concentrations ($\mu\text{g/g}$ dry weight):

	Element	Value	Uncertainty (\pm)
CRM 034	bis(Diethyltinchloride) oxide ($\text{C}_8\text{H}_{20}\text{Cl}_2\text{OSn}_2$)		
	C	218.1	0.4
	H	45.4	0.3
	Cl	160.8	0.5
	O	36.8	0.6
	Sn	538.0	0.7
CRM 035	Triphenylleadimidazole ($\text{C}_{21}\text{H}_{18}\text{N}_2\text{Pb}$)		
	C	498.7	0.5
	H	36.1	0.4
	N	54.9	0.3
	Pb	409.6	0.7
CRM 036	Mercurisuccinimide ($\text{C}_8\text{H}_8\text{HgN}_2\text{O}_4$)		
	C	242.3	0.4
	H	20.3	0.3
	N	70.6	0.4
	O	161.1	0.6
	Hg	505.7	0.6
CRM 071	N-(4-Bromophenyl)-N-(2-chloro-4-nitrophenyl) thiourea ($\text{C}_{13}\text{H}_9\text{BrClN}_3\text{O}_2\text{S}$)		
	C	403.9	0.3
	H	23.7	0.3
	Br	206.5	0.4
	Cl	91.7	0.5
	N	108.5	0.5
	O	82.8	0.4
	S	83.0	0.5
CRM 072	N-(4-Chloro-4-nitrophenyl)-N-(4-iodophenyl) thiourea ($\text{C}_{13}\text{H}_9\text{ClIN}_3\text{O}_2\text{S}$)		
	C	361.3	1.0
	H	21.0	0.4
	Cl	81.1	0.8
	I	293.2	0.8
	N	96.5	0.6
	O	73.3	0.6
	S	73.5	0.5

CRM 034 through 183 (cont.)

	Element	Value	Uncertainty (\pm)
CRM 073	1-[1-(4-Bromophenylmethyl)-4-piperidiny]-5-chloro-2-(trifluoromethyl)-1H-benzimidazole ($C_{20}H_{18}BrClF_3N_3$)		
	C	507.9	0.5
	H	38.4	0.2
	Br	169.0	0.5
	Cl	74.9	0.7
	F	120.7	0.4
	N	88.8	0.5
CRM 127	Tetramethylammonium tetrphenylborate		
	C	855.0	0.6
	H	82.1	0.3
	N	35.5	0.4
	B	27.4	0.1
CRM 183	Bis(triphenylphosphine)-copper-trifluoromethanesulfonate		
	C	602.9	0.4
	H	41.2	0.3
	F	77.1	0.6
	S	43.5	0.7
	P	84.2	0.6
	Cu	85.4	0.6

Order information:

These CRMs can be purchased for ECU100 per unit (1 - 5 g). Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 046 through 370

Polycyclic Aromatic Hydrocarbons

Community Bureau of Reference (Belgium)

Description:

These standards are representative of the many polycyclic aromatic compounds present in the environment which are known or suspected to be carcinogenic. The certified purity of these materials ranges from 99.0 to 99.8%. The standards are available in units of 100 mg of homogeneous powder in screw-capped amber vials unless noted.

Standards of certified purity:

Polycyclic aromatic hydrocarbons (100 mg vials)

CRM 046	Benzo[b]chrysene	CRM 134	Benzo[c]phenanthrene
CRM 047	Benzo[b]fluoranthene	CRM 135	Benzo[b]naphtho[2,1-d]thiophene
CRM 048	Benzo[k]fluoranthene	CRM 136	Benzo[b]naphtho[2,3-d]thiophene
CRM 049	Benzo[j]fluoranthene	CRM 137	Benzo[b]naphtho[1,2-d]thiophene
CRM 050	Benzo[e]pyrene	CRM 138	Dibenz[a,h]anthracene
CRM 051R	Benzo[a]pyrene	CRM 139	Benzo[ghi]fluoranthene
CRM 052	Benzo[ghi]perylene	CRM 140	Benzo[c]chrysene
CRM 053	Indeno[1,2,3-cd]pyrene	CRM 153	Dibenz[a,h]acridine
CRM 077	1-Methylchrysene	CRM 154	Dibenz[a,i]acridine
CRM 078	2-Methylchrysene	CRM 155	Dibenz[a,c]acridine
CRM 079	3-Methylchrysene	CRM 156	Dibenz[c,h]acridine
CRM 080	4-Methylchrysene	CRM 157	Benz[a]acridine
CRM 081R	5-Methylchrysene	CRM 158	Benz[c]acridine
CRM 091	Anthanthrene	CRM 159	Dibenzo[a,h]pyrene
CRM 092	10-Azabenzo[a]pyrene	CRM 160	Fluoranthene
CRM 093	1-Methylbenz[a]anthracene	CRM 168	1-Nitropyrene
CRM 094	Dibenz[a,c]anthracene	CRM 177	Pyrene
CRM 095	Dibenz[a,i]anthracene		
CRM 096	Dibenzo[a,i]pyrene		
CRM 097	Benzo[a]fluoranthene		
CRM 133	Dibenzo[a,e]pyrene		

Nitro-polycyclic aromatic hydrocarbons

20 mg vials

CRM 152	Dibenz[a,i]acridine
CRM 265	Dibenzo[a,e]fluoranthene
CRM 266	7H-Dibenzo[c,g]carbazole
CRM 267	Indeno[1,2,3-cd]fluoranthene
CRM 268	Dibenzo[a,i]pyrene
CRM 269	Chrysene
CRM 270	Triphenylene
CRM 271	Benz[a]anthracene
CRM 272	Coronene

10 mg vials

CRM 305	1-Nitropyrene
CRM 306	1-Nitronaphthalene
CRM 307	2-Nitronaphthalene
CRM 308	9-Nitroanthracene
CRM 309	6-Nitrochrysene
CRM 310	3-Nitrofluoranthene
CRM 311	6-Nitrobenzo[a]pyrene
CRM 312	2-Nitro-7-methoxy- naphtho[2,1-b]furan

Polychlorinated biphenyls (25 mg vials)

CRM 289	2,4'-Dichlorobiphenyl		biphenyl
CRM 290	2,3,3'-Trichlorobiphenyl	CRM 296	2,2',3,4,4',5-Hexachlo=- robiphenyl
CRM 291	2,4,4'-Trichlorobiphenyl		
CRM 292	3,3',4-Trichlorobiphenyl	CRM 297	2,2',4,4',5,5'-Hexachlo=- robiphenyl
CRM 293	2,2',5,5',-Tetrachloro=- biphenyl	CRM 298	2,2',3,4,4',5,5'-Heptachlo=- robiphenyl
CRM 294	2,2',4,5,5',-Pentachloro=-		

Oxygenated polycyclic aromatic hydrocarbons (10 mg vials)

CRM 337	Dibenzo[<i>b,d</i>]furan	CRM 340	Benzo[<i>b</i>]naphto[1,2- <i>d</i>]furan
CRM 338	4H-Cyclopenta[<i>def</i>]phe=- nanthrene-4-one	CRM 341	Benzo[<i>b</i>]naphto[2,1- <i>d</i>]furan
CRM 339	Benzo[<i>c,d</i>]pyren-6-one	CRM 342	Benzo[<i>a</i>]fluorenone
		CRM 343	3-Hydroxybenzo[<i>a</i>]pyrene

Order information:

These CRMs can only be ordered via authorized distributors. Please contact BCR for prices and availability.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 365

Polychlorinated Biphenyls in Isooctane

Community Bureau of Reference (Belgium)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$):

Congener	Value	Uncertainty (\pm)	Congener	Value	Uncertainty (\pm)
PCB 8	11.4	0.3	PCB 101	14.4	0.6
PCB 20	15.2	0.9	PCB 118	14.9	0.8
PCB 28	24.8	1.1	PCB 138	8.6	0.6
PCB 35	14.3	0.8	PCB 153	14.2	0.6
PCB 52	14.8	0.6	PCB 180	15.2	0.6

Order information:

These CRMs can only be ordered via authorized distributors. Please contact BCR for prices and availability.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CSK Potassium Iodate

Potassium Iodate

Sagami Chemical Research Center (Japan)

Available from:

Wako Chemicals USA
1600 Bellwood Rd.
Richmond, VA 23237
USA

Wako Chemicals GmbH
Nissanstr. 2, 4040 Neuss 1
WEST GERMANY

Wako Pure Chemical
Industries Ltd.
1-2, Doshomachi 3-Chome
Chuo-Ku, Osaka
JAPAN

Description:

The standard solution of 0.01000 N potassium iodate (KIO_3) for use in the analysis of dissolved oxygen is prepared by Wako under the supervision of the Sagami Chemical Research Center of Japan. The solution has the highest accuracy and stability possible. The solutions are sealed in glass bottles and sterilized. These standard solutions were used in the Cooperative Study of the Kuroshio and Adjacent Regions (CSK) Program of UNESCO/IOC, 1965-1979, and in other programs.

Order information:

CSK potassium iodate solution can be purchased for US\$190 per unit (300 mL) from Wako USA. Price subject to change without notice. Prices from Wako West Germany and Wako Japan not available.

References:

Ambe, M., J. Kajiwar, T. Yoshihara, and K. Sugawara (1975) Preparation of the standard solutions of nitrate and their application to seawater and freshwater. J. Oceanogr. Soc. Japan, 31:85-92.

Ambe, M. (1978) Note of the experience in the preparation of CSK standard solutions and the ICES-SCOR Intercalibration Experiment, 1969-1970. Mar. Chem., 6:171-8.

Sagami Chemical Research Center (1988?) General guide to the use of CSK standard solutions, No.1. Sagami Chemical Research Center, Sagami-hara, Kanagawa Prefecture, Japan.

DACS-1B, OACS-1 and PSP-1

Certified Calibration Solution for Domoic Acid, Okadaic Acid, and Paralytic Shellfish Poisoning Toxins

National Research Council (Canada)

Description:

Domoic acid (DACS-1B) and okadaic acid (OACS-1) were the toxins responsible for diarrhetic shellfish poisoning from the ingestion of toxic mussels in Canada in 1987. A major research effort was undertaken by NRCC on the chemistry and determination of domoic acid (1989), and a description of the analytical methodology used during the shellfish poisoning episode can be found in Quilliam and Wright (1989). PSP-1 contains individual solutions of saxitoxin (STX-1), neosaxitoxin (NEO-1), and a mixture of gonyautoxin 2 and 3 (GTX β -1), toxins associated with paralytic shellfish poisoning.

Domoic acid concentration ($\mu\text{g/mL}$):

89 $\mu\text{g/mL}$ in acetonitrile/water mixture (1:9 v/v).

Order information:

DACS-1B can be purchased for US\$190 per unit (set of 4 0.5-mL ampoules), OACS-1 for US\$220 per unit (set of 4 0.5-mL ampoules), and PSP-1 for US\$390 per unit (set of 4 0.2-mL ampoules). Price subject to change without notice. Please contact NRCC.

References:

National Research Council Canada (1995) DACS-1B. Certified calibration solution for domoic acid. Information sheet. National Research Council Canada, Marine Analytical Standards Program, Halifax, Nova Scotia, Canada.

National Research Council Canada (1995) OACS-1. Certified calibration solution for okadaic acid. Information sheet. National Research Council Canada, Marine Analytical Standards Program, Halifax, Nova Scotia, Canada.

National Research Council Canada (1995) PSP-1. Certified calibration solutions for paralytic shellfish poisoning toxins. Information sheet. National Research Council Canada, Marine Analytical Standards Program, Halifax, Nova Scotia, Canada.

National Research Council Canada (1989) MACSP Update. Instrument calibration solution for domoic acid, DACS-1. Information sheet. National Research Council Canada, Institute for Environmental Chemistry, Ottawa, Canada.

Quilliam, M. A., and J. L. C. Wright (1989) The amnesic shellfish poisoning mystery. Anal. Chem., 61(18):1053A-60A.

Organic Compounds

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Available compounds:

Compound	NRCCRM number	Purity (mole percent)	Price (US\$)
Benzene	GBW 06104	99.95	40
alpha-BHC	GBW 06401	99.9	45
beta-BHC	GBW 06402	99.2	45
gamma-BHC	GBW 06403	99.97	45
delta-BHC	GBW 06404	99.9	45
4,4'-DDT	GBW 06405	100	55
2,4'-DDT	GBW 06406	99.5	45
4,4'-DDE	GBW 06407	99.9	45
4,4'-DDD	GBW 06408	99.7	45

Order information:

These CRMs are available in 5 g quantities. Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

Minerals for Electron Microprobe Analyses

National Research Center for Certified Reference Materials (China)

Description:

No further information available.

Certified concentrations ($\mu\text{g/g}$):

CRM	Mineral	Element	Value
GBW 07501	Galena		
Pb	86.35	S	13.44
GBW 07502	Sphalerite		
S	32.76	Zn	66.33
GBW 07503	Cinnabar		
Hg	13.63		86.00
GBW 07504	Barite		
BaO	65.56	SO ₃	34.28
GBW 07505	Cerussite		
PbO	86.36	CO ₂	(16.82)
GBW 07506	Scheelite		
WO ₃	80.45	CaO	19.39
GBW 07507	Mangano-columbite		
NbO ₅	53.74	Ta ₂ O ₃	25.92
FeO	6.65	MnO	12.47

CRM	Mineral	Element	Value
GBW 07508	Cadmium telluride		
Cd	46.87	Te	53.39
GBW 07509	Cadmium selenide		
Cd	58.48	Se	40.88
GBW 07510	Gallium arsenide		
Ga	48.07	As	51.95
GBW 07511	Zinc selenide		
Se	54.44	Zn	45.38
GBW 07512	Indium antimonide		
In	48.59	Sb	51.45
GBW 07513	Indium phosphide		
In	78.51	P	21.12
GBW 07514	Indium arsenide		
As	39.60	In	60.97

Value in parenthesis is not certified.

Order Information:

These CRMs are available for US\$80 per unit except for GBW 07513 and 07514 which can be purchased for US\$100. Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GBW 07701 - 07711

Synthetic Silicates for Spectral Analysis

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$):

	GBW 07701	GBW 07702	GBW 07703	GBW 07704	GBW 07705	GBW 07706	GBW 07707	GBW 07708	GBW 07709	GBW 07710	GBW 07711
Component	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
Li	15	18	23	33	63	113	213	513	1010	-	-
Be	0.26	0.56	1.1	2.1	5.1	10	20	50	100	200	500
B	2.1	5.1	10.0	20	50	100	200	500	1000	-	-
Ti	24	54	104	204	504	1000	2000	5000	10000	20000	-
V	2.8	5.8	10.8	20.8	51	101	200	500	1000	-	-
Cr	2.3	5.3	10.3	20.3	50	100	200	500	1000	-	-
Mn	27	57	107	207	507	1000	2000	5000	10000	-	-
Co	2.6	5.6	10.6	20.6	50.6	101	200	500	-	-	-
Ni	2.6	5.6	10.6	20.6	50.6	101	200	500	-	-	-
Cu	2.0	5.0	10.0	20.0	50	100	200	500	1000	2000	5000
Zn	3.0	6.0	11.0	21	51	101	200	500	1000	2000	5000
As	2.0	5.0	10	20	50	100	200	500	-	-	-
Sr	5.0	8.0	13	23	53	103	203	500	1000	2000	5000
Y	2.0	5.0	10	20	50	100	200	500	-	-	-
Zr	2.2	5.2	10.2	20	50	100	200	500	1000	-	-
Nb	2.3	5.3	10.3	20.3	50	100	200	500	-	-	-
Mo	0.21	0.51	1.0	2.0	5.0	10	20	50	100	200	500
Ag	-	0.064	0.11	0.21	0.51	1.0	2.0	5.0	10.0	20	50
Cd	0.022	0.052	0.10	0.20	0.50	1.0	2.0	5.0	10.0	20	50
Sn	0.28	0.58	1.1	2.1	5.1	10	20	50	100	200	500
Sb	0.28	0.58	1.1	2.1	5.1	10	20	50	100	200	500
Ba	24	54	104	204	504	1000	2000	5000	10000	-	-
La	2.1	5.1	10	20	50	100	200	500	-	-	-
Ce	2.0	5.0	10.0	20	50	100	200	500	1000	-	-
Yb	0.2	0.50	1.0	20	5	10	20	50	100	-	-
W	0.20	0.50	1.0	2.0	5.0	10	20	50	100	200	500
Pb	2.5	5.5	10.5	20.5	50	100	200	500	1000	2000	5000
Bi	0.31	0.61	1.1	2.1	5.1	10	20	50	100	200	-

GBW 07701 - 07711 (cont.)

Noncertified concentrations ($\mu\text{g/g}$):

GBW 07701

Component Value

Ag 0.034

Order Information:

These CRMs are available for US\$70 per unit (60 g). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GBW 07712 - 07720

Synthetic Limestones for Spectral Analysis

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$):

	GBW 07712	GBW 07713	GBW 07714	GBW 07715	GBW 07716	GBW 07717	GBW 07718	GBW 07719	GBW 07720
Component	Value	Value	Value	Value	Value	Value	Value	Value	Value
Li	3.2	6.2	11.2	21	51	101	200	500	-
Be	0.22	0.52	1.0	2.0	5.0	10	20	50	100
B	2.2	5.2	10	20	50	100	200	500	-
Ti	31	61	111	210	510	1010	2000	5000	-
V	3.2	6.2	11.2	21	51	101	200	500	-
Cr	2.3	5.3	10.3	20.3	50	100	200	-	-
Mn	37	67	117	217	517	1020	2020	5000	10000
Co	2.3	5.3	10.3	20.3	50	100	200	-	-
Ni	2.1	5.1	10	20	50	100	200	500	-
Cu	2.2	5.2	10.2	20	50	100	200	500	1000
Zn	3.0	6.0	11	21	51	101	200	500	1000
Ga	2.8	5.8	10.8	20.8	51	101	200	-	-
As	2.2	5.2	10.2	20	50	100	200	500	-
Sr	170	200	250	350	650	1150	2150	5150	-
Y	2.1	5.1	10	20	50	100	200	-	-
Zr	4.0	7.0	12	22	52	102	202	500	-
Nb	2.5	5.5	10.5	20.5	50.5	100	200	-	-
Mo	0.21	0.51	1.0	2.0	5.0	10	20	50	100
Ag	-	0.06	0.11	0.21	0.51	1.0	2.0	5.0	10
Cd	-	0.05	0.1	0.2	0.5	1.0	2.0	5.0	10
Sn	0.28	0.58	1.1	2.1	5.1	10	20	50	100
Sb	0.21	0.51	1.0	2.0	5.0	10	20	50	100
Ba	24	54	104	204	504	1000	2000	5000	-
La	2.6	5.6	10.6	20.6	50.6	101	200	-	-
Ce	2.8	5.8	11	21	51	101	200	500	-
Yb	0.22	0.52	1.0	2.0	5.0	10	20	50	100
W	0.22	0.52	1.0	2.0	5.0	10	20	50	100
Pb	2.4	5.4	10.4	20.4	50	100	200	500	1000
Bi	0.23	0.53	1.0	2.0	5.0	10	20	50	100

GBW 07712 - 07720 (cont.)

Noncertified concentrations ($\mu\text{g/g}$):

GBW 07712

Component	Value
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Ag	0.030
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Cd	0.023
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Order information:

These CRMs are available for US\$60 per unit (70 g). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GBW 08601 - 08620

Elements in Water

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$ unless noted):

CRM	Component	Value	CRM	Component	Value
GBW 08601	Pb	1.00	GBW 08608 (ng/g)	Cd	10.0
GBW 08602	Cd	0.100		Pb	50
GBW 08603	Hg	0.0100		Cu	30
GBW 08604	F	1.00		Cr	50
GBW 08605	As	0.500		Zn	90
GBW 08606	Chloride	22.0		Ni	60
	Nitrate	4.50	GBW 08609	Hg	1.00
	Sulfate	38.0	GBW 08610	Ag	1000 (mg/L)
GBW 08607	Cd	0.100	GBW 08611	As	1000 (mg/L)
	Pb	1.00	GBW 08612	Cd	1000 (mg/L)
	Cu	1.00	GBW 08613	Co	1000 (mg/L)
	Cr	0.500	GBW 08614	Cr	1000 (mg/L)
	Zn	5.00	GBW 08615	Cu	1000 (mg/L)
	Ni	0.500	GBW 08616	Fe	1000 (mg/L)
			GBW 08617	Hg	1000 (mg/L)
			GBW 08618	Ni	1000 (mg/L)
			GBW 08619	Pb	1000 (mg/L)
			GBW 08620	Zn	1000 (mg/L)

Order information:

These CRMs are available for US\$30 per unit (100 mL except for GBW 08605 and 08609 which are available in 20 mL quantities). Price subject to change without notice. Please contact NRC CRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

LGC1000 - LGC1006

Pesticide Solutions

Laboratory of the Government Chemist (UK)

Description:

These CRMs are a series of mixed pesticide solutions with certified values for each pesticide concentration.

Available solutions:

CRM	Matrix	Unit	Pesticides
LGC1000	Organochlorines pesticides in trimethylpentane - Soln. 1 (~10 µg/g)	3 mL	2,4'-DDT 4,4'-DDE 4,4'-DDT 4,4'-TDE alpha-HCH beta-HCH Dieldrin gamma-HCH HCB
LGC1001	Organochlorines pesticides in trimethylpentane - Soln. 2 (~10 µg/g)	3 mL	Aldrin Endosulfan I Endosulfan II Endosulfan sulphate Endrin Heptachlor Heptachlor epoxide
LGC1002	Organophosphorus pesticides in acetonitrile - Soln. 1 (~10 µg/g)	3 mL	Chlorpyrifos-methyl Etrimfos Fenitrothion Malathion Methacrifos Pirimiphos-methyl
LGC1003	Organophosphorus pesticides in acetonitrile - Soln. 2 (~10 µg/g)	3 mL	Chlorfenvinphos Chlorpyrifos Diazonon Ethion Fenthion Mecarbam Parathion-methyl Triazophos

LGC1000 - LGC1006 (cont.)

CRM	Matrix	Unit	Pesticides
LGC1004	Triazines in water (~25 µg/L)	50 mL	Atrazine Siamizine Terbutylazine Trietazine
LGC1005	Urons in water (~25 µg/L)	50 mL	Chlortoluron Diuron Isoproturon
LGC1006	Phenoxy acids in water (~25 µg/L)	50 mL	2,4-D MCPA Mecaprop

Order Information:

These CRMs can be purchased for £175 per unit. Price subject to change without notice. Please contact LGC.

Reference:

Laboratory of the Government Chemist (1995) Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

LGC1007

Pesticide Impregnated Cartridge

Laboratory of the Government Chemist (UK)

Description:

To supplement the range of aqueous pesticide solution CRMs, solid phase extraction cartridges (C18 Bond-Elut) impregnated with organochlorine pesticides have been produced. These can be used to assess the efficiency of the desorption procedures applied to such cartridges.

LGC1007	Organochlorine pesticides on C18 cartridges	4,4'-DDE (~1.5 µg) Dieldrin (~1.5 µg) gamma-HCH (~1.5 µg)
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Order Information:

This CRM can be purchased for £135 per unit (4 0.5-g cartridges). Price subject to change without notice. Please contact LGC.

Reference:

Laboratory of the Government Chemist (1995) Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

LGC1101 - LGC1801

Pure Pesticides

Laboratory of the Government Chemist (UK)

Description:

These pesticide samples of certified purity are intended for use as certified reference materials in the analysis of technical grade pesticides, formulations and residues. They are approved by the Collaborative International Pesticides Analytical Council Limited (CIPAC).

Available compounds:

Compound	LGC number	Purity (mole percent)	Price (£)
Chlorinated compounds			
2,4'-DDE	LGC1109	99.3	60
2,4'-DDT	LGC1111	99.6	60
4,4'-DDT	LGC1112	99.8	40
Aldrin	LGC1123	99.5	60
alpha-Endosulfan	LGC1119	99.7	40
alpha-HCH	LGC1101	99.8	60
beta-Endosulfan	LGC1120	99.9	40
beta-HCH	LGC1102	98.9	60
Chlorbenseide	LGC1106	99.4	40
Chlordane	LGC1108	Technical	40
delta-HCH	LGC1103	99.6	60
Dichlobenil	LGC1113	99.4	40
Dichlone	LGC1114	99.9	40
Dicloran	LGC1116	99.9	40
Dieldrin *	LGC1122	99.5	40
Endrin	LGC1121	99.5	40
gamma-BHC	LGC1104	99.7	40
Hexachlorobenzene	LGC1131	99.9	40
o,p'-TDE	LGC1126	99.4	60
p,p'-TDE (olefin)	LGC1129	99.7	40
p,p'-TDE	LGC1127	99.3	60
p-Dichlorobenzene	LGC1115	99.7	40
Quintozone	LGC1125	99.3	40
Tecnazene	LGC1130	99.8	40
Organophosphorus compounds			
Ethion	LGC1212	99.6	60
Mecarbam	LGC1206	99.6	40
Methidathion	LGC1207	99.4	40
Propetamphos	LGC1209	99.0	40
Thiabendazole	LGC1210	99.7	40

Phenoxy-acids and related compounds

4-CPA	LGC1301	99.8	40
2,4-D (acid)	LGC1302	99.7	40
2,4-D (methyl ester)	LGC1303	99.7	40
2,4-DB	LGC1304	99.2	40
2,4-Dichlorobenzoic acid	LGC1305	99.7	40
2,4,5-T (acid)	LGC1310	99.8	40
2,4,5-T (methyl ester)	LGC1311	99.7	40
2,4,6-TBA (acid)	LGC1312	99.0	40
Dichlorprop (2-ethylhexyl ester)	LGC1317	99.4	40
Dichlorprop	LGC1313	99.7	40
Fenoprop	LGC1306	99.5	40
MCPA (2-butoxyethyl ester)	LGC1316	99.8	40
MCPA (acid)	LGC1307	99.7	40
MCPB (acid)	LGC1308	99.9	40
Mecoprop (2-butoxyethyl ester)	LGC1315	99.5	40
Mecoprop (MCP)	LGC1309	99.7	40

Substituted urea compounds

Chlorobromuron	LGC1401	99.8	40
Chlorotoluron	LGC1402	99.8	40
Isoproturon	LGC1406	99.5	60
Linuron	LGC1404	99.5	40
Monuron	LGC1405	99.8	40

Heterocyclic and miscellaneous compounds

2,2'-Bipyridyl	LGC1607	99.9	25
4,4'-Bipyridyl	LGC1608	99.9	25
Anthraquinone	LGC1601	99.8	40
Asulam	LGC1602	99.5	40
Atrazine	LGC1603	99.3	40
Azobenzene	LGC1604	99.9	40
Bentranil	LGC1605	99.3	40
Biphenyl	LGC1606	99.9	40
Bromoxynil octanoate	LGC1610	99.5	40
Bupirimate	LGC1636	99.9	40
Carbaryl	LGC1611	99.6	40
cis-Permethrin	LGC1701	99.1	30
Clofentezine	LGC1637	99.8	40
Cyanazine	LGC1635	99.4	40
DEET	LGC1612	99.0	40
Desmetryn	LGC1632	98.5	25
Dimethirimol	LGC1633	99.7	40
Dinobuton	LGC1613	98.1	40
Dinoseb	LGC1614	99.5	40
Dinoterb acetate	LGC1616	99.9	40
Dinoterb	LGC1615	99.7	40
Diphenyl sulphone	LGC1617	99.9	40
Diquat dibromide	LGC1618	100.0	40
Ethirimol	LGC1634	99.6	40

Heterocyclic and miscellaneous compounds (cont.)

loxynil	LGC1620	99.9	40
loxynil octanoate	LGC1621	99.2	40
Metalaxyl	LGC1638	99.7	60
Methyl mercury chloride	LGC1502	>98	40
Nicotine	LGC1801	99.4	65
Paraquat dichloride	LGC1622	100.0	40
Pentachlorophenol	LGC1623	99.3	40
Piperonyl butoxide	LGC1625	94.8	40
Pirimicarb	LGC1626	99.8	40
Prometryn	LGC1627	99.6	40
Trietazine	LGC1631	99.3	25

Order information:

These samples are available in 0.25-g quantities in screw capped vials unless noted. Price subject to change without notice. Please contact LGC.

Reference:

Laboratory of the Government Chemist (1995) Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

LGC1301 - LGC1314

Spectrochemical Materials

Laboratory of the Government Chemist (UK)

Description:

These CRMs are intended for use in the analysis of low concentrations of metals in oils and similar organic matrices using techniques that require oil-based calibrating solutions. These materials consist of stable solids (decanoates or chelates) with certified metal content. The certificates of analysis include recommended methods of preparing 100 ppm solutions by dissolving the solid in a solubiliser (naphthenic acid or 2-ethylhexanoic acid and xylene) and adding a diluent (such as white spirit, dioctyl sebacate or a mineral oil).

Available compounds:

Compound	LGC number	Metal content (mg/g)
Aluminum tris(ethyl acetoacetate)	LGC1301	66
Barium (II) decanoate	LGC1302	285
Cadmium (II) decanoate	LGC1303	247
Calcium (II) decanoate	LGC1304	105
Chromium (III) decanoate	LGC1307	107
Cobalt (II) decanoate	LGC1305	144
Copper (II) decanoate	LGC1306	159
Iron (III) decanoate	LGC1308	101
Lead (II) decanoate	LGC1309	377
Magnesium (II) decanoate	LGC1310	66
Manganese (II) decanoate	LGC1311	136
Nickel (II) decanoate	LGC1312	154
Silver decanoate	LGC1313	386
Vanadyl bis(acetoacetate)	LGC1316	192
Zinc (II) decanoate	LGC1314	162

Order information:

These CRMs can be purchased for £40 per unit (5-g vials). Price subject to change without notice. Please contact LGC.

Reference:

Laboratory of the Government Chemist (1995) Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

LGC2008 - LGC2012

Spectroscopic Certified Reference Materials

Laboratory of the Government Chemist (UK)

Description:

These CRMs are intended for use in calibrating spectroscopic techniques.

Available CRMs:

LGC2010 UV-VIS Wavelength standard

This CRM is for use in the verification and calibration of the wavelength scale of ultraviolet-visible absorption spectrometers. It is a sealed silica cuvette containing a solution of Ho and Nd oxides in a dilute perchloric acid matrix. The standard has been certified for wavelength location for sixteen peaks in the spectral range from 219 to 865 nm at three spectral bandwidths (0.5, 1 and 2 nm).

LGC2011 UV-VIS Wavelength standard

This CRM is for use in the verification and calibration of the wavelength scale of ultraviolet-visible absorption spectrometers. It is a set of four sealed cuvettes consisting of three solutions of varying concentrations and a blank. The three solutions provide a range of certified absorption values when measured against the blank supplied. Each solution is certified at four wavelengths (299, 394, 512 and 719 nm) at a bandwidth of 1 nm. Instrumental thermostating is required.

LGC2010 IR Wavelength standard

This CRM is for use in the verification and calibration of the wavelength scale of mid infrared absorption spectrometers. It is a solution of polystyrene in hexane in a sealed glass ampoule. The user is required to prepare a coating of a specified IR transparent substrate. The standard has been certified for wavelength location of four peaks: 3026, 1601, 1028 and 699 cm^{-1} .

LGC2008 SEM-EDX Metal standard

This CRM is for use in the verification of results obtained when determining a light element in a heavy element matrix by energy dispersive x-ray microanalysis and is normally 1% Al in Fe. It is 5 x 5 x 10 mm ingots. One of the 5 x 5 mm faces has been highly polished.

Order information:

The price of these CRMs are as follows: LGC2008, £175 per unit (5 x 5 x 10 mm ingot); LGC2010, £755 per unit (4 cuvettes); LGC2011, £259 per unit (1 cuvette); and LGC2012, £110 per unit (set of five). Price subject to change without notice. Please contact LGC.

References:

Laboratory of the Government Chemist (1995) Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC2010. UV-visible wavelength standard. Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY,

England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC2011. UV-visible absorbance standard. Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC2012. IR wavenumber standard. Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

LGC4002 - LGC4009

Elemental Microanalysis

Laboratory of the Government Chemist (UK)

Description:

These CRMs are intended for use in elemental composition analysis.

Available compounds:

LGC number	CRM	Certified elements
LGC4002	Acetanilide	C, H, N
LGC4003	Benzoic acid	O
LGC4004	4-Chlorobenzoic acid	Cl
LGC4005	Cyclohexanone-2,4-dinitrophenylhydrazone	N
LGC4006	Triphenylphosphine	P
LGC4007	Arachidic acid	C, H
LGC4008	4-Bromobenzoic acid	Br
LGC4009	2-Iodobenzoic acid	I

Order information:

These CRMs can be purchased for between £58 and 75 per unit (1-g vials). Price subject to change without notice. Please contact LGC.

References:

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4002. Acetanilide (C_8H_9NO). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4003. Benzoic acid ($C_7H_6O_2$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4004. 4-Chlorobenzoic acid ($C_7H_5ClO_2$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4005. Cyclohexanone-2,4-dinitrophenylhydrazone ($C_{12}H_{14}O_4N_4$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4006. Triphenylphosphine ($C_{18}H_{15}P$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4007. Arachidic acid ($C_{20}H_{40}O_2$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4008. 4-Bromobenzoic acid ($C_7H_5BrO_2$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

Laboratory of the Government Chemist (1995) Certificate of measurement. LGC4009. 2-Iodobenzoic acid ($C_7H_5IO_2$). Certified Reference Materials. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

RM 432 - RM 443

PCDDs and PCDFs in Isooctane

Community Bureau of Reference (Belgium)

Description:

These RMs are pure compound calibration solutions. They consist of 1.2 mL of solution in a sealed thick wall amber glass ampoule with screw cap and a septum.

RM	Compound	Noncertified
		mass fraction (mg/kg)
RM 432	2,3,7,8-TCDD	6.00
RM 433	1,2,3,7,8-PCDD	6.00
RM 434	1,2,3,4,7,8-HCDD	1.00
RM 435	1,2,3,6,7,8-HCDD	6.0
RM 436	1,2,3,7,8,9-HCDD	6.00
RM 437	2,3,7,8-TCDF	6.00
RM 438	1,2,3,7,8-PCDF	6.00
RM 439	2,3,4,7,8-PCDF	6.00
RM 440	1,2,3,4,7,8-HCDF	6.00
RM 441	1,2,3,6,7,8-HCDF	6.00
RM 442	1,2,3,7,8,9-HCDF	1.00
RM 443	2,3,4,6,7,8-HCDF	3.00

Order information:

These CRMs can only be ordered via authorized distributors. Please contact BCR for prices and availability.

Reference:

Community Bureau of Reference (BCR) (1995) Reference Materials. Addendum 1995. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 12 pp.

RM 8090

SEM Magnification Reference Material

National Institute of Standards and Technology (USA)

Description:

This RM is intended primarily for use in checking the magnification scale of a scanning electron microscope (SEM) over a wide range of magnifications, from less than 100 X to greater than 300,000 X. RM 8090 contains structures in both X and Y dimensions, ranging in nominal pitch from 0.2 μm to 3000 μm and is useful at both high and low accelerating voltages. RM 8090 is the thickness of a silicon wafer and thus can be inserted in the modern automated measurement systems. RM is an advanced issue of SRM 2090.

Order Information:

RM 8090 can be purchased for US\$166 per unit. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) RM 8090. SEM magnification reference material. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

RM 8416

Microcrystalline Cellulose

Agriculture and Agri-Food (Canada)

Description:

RM 8416 is intended for use in evaluating analytical methods and instruments used for the determination of minor and trace constituent elements in food, agricultural, and biological materials. RM 8416 was prepared and characterized by the Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada and is distributed by NIST. The source of material for this RM was Avicel microcrystalline cellulose, type PH 101, obtained from a commercial source in Canada. Lot analysis was 98.4% cellulose, with not more than 0.001% heavy metals, with nominally 50 μm particle size. The dry bulk powder was sterilized with ^{60}Co gamma radiation to 2.0 megarads. Material sieving was through nylon monofilament sieve cloths supported in high density white polyethylene holders. Pairs of sieves with openings of approximately 150 μm /20 μm were used to yield a suitable narrow middle cut constituting the RM. This fraction was blended in a polymethylmethacrylate V-configuration blender and packaged into clean 150-mL brim capacity clear glass bottles with triseal (polyethylene)-lined white polypropylene screw caps. Details of the preparation and characterization of RM 8416 can be found in Ihnat (1994a and 1994b), Ihnat *et al.* (1994), and Ihnat and Wolynetz (1994).

Best estimate concentrations ($\mu\text{g/g}$ dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
N	200	200	Cu	0.015	0.012
Al	3.7	1.2	Se	0.002	0.002
Cl	80	50	Mo	0.01	0.01
Co	0.0017	0.0007	Cd	0.0002	0.0002
Ni	0.05	0.05	Pb	0.006	0.005

Information concentrations ($\mu\text{g/g}$ dry weight):

Element	Value	Element	Value
B	0.2	Mn	0.03
F	0.005	Fe	2
Na	7	Zn	0.1
P	7	As	0.001
S	10	Sr	0.02
Ca	5	I	0.01
V	0.02	Ba	0.1
Cr	0.05	Hg	0.0002

Order information:

A unit of RM 8416 contains 35-g of powder in glass bottles and can be purchased for US\$147 per unit. Price subject to change without notice. Please contact NIST.

References:

Ihnat, M. (1994a) Characterization (certification) of Corn Bran (NIST SRM 8433), Corn Starch (NIST SRM 8432) and Microcrystalline Cellulose (NIST SRM 8416) reference materials for essential and toxic major, minor and trace element constituents. Fresenius J. Anal. Chem., 348:474-8.

Ihnat, M. (1994b) Development of a new series of agricultural/food reference materials for analytical quality control of elemental determinations. J. AOAC Internatl. 77(6):1605-27.

Ihnat, M., and M. S. Wolynetz (1994) An interlaboratory characterization (certification) campaign to establish the elemental composition of a new series of agricultural/food reference materials. Fresenius J. Anal. Chem., 348:452-8.

Ihnat, M., R. W. Dabeka, and M. S. Wolynetz (1994) Preparation and homogeneity characterization of ten agricultural/food reference materials for elemental composition. Fresenius J. Anal. Chem., 348:445-51.

National Institute of Standards and Technology (1993) RM 8416. Microcrystalline cellulose. National Institute of Standards and Technology, Gaithersburg, MD, USA.

RM 8418

Wheat Gluten

Agriculture and Agri-Food (Canada)

Description:

RM 8418 is intended for use in evaluating analytical methods and instruments used for the determination of major, minor and trace constituent elements in flour and flour products, other similar food, agricultural, and biological materials. RM 8418 was prepared and characterized by the Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada and is distributed by NIST. The source material for RM 8418 was food grade Whetpro-80 vital wheat gluten from Canadian western spring wheat flour. The dry bulk powder was sterilized with ^{60}Co gamma radiation to 2.0 megarads. Material sieving was through nylon monofilament sieve cloths supported in high density white polyethylene holders. Pairs of sieves with openings of approximately 200 μm /50 μm were used to yield a suitable narrow middle cut constituting the RM. This fraction was blended in a polymethylmethacrylate V-configuration blender and packaged into clean 150-mL brim capacity clear glass bottles with triseal (polyethylene)-lined white polypropylene screw caps. Details of the preparation and characterization of RM 8418 can be found in Ihnat (1994a and 1994b), Ihnat *et al.* (1994), and Ihnat and Wolynetz (1994).

Best estimate concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
N (%)	14.68	0.26	Co	0.010	0.006
Na (%)	0.142	0.011	Ni	0.13	0.04
Mg	510	47	Cu	5.94	0.72
Al	10.8	3.0	Zn	53.8	3.7
P (%)	0.219	0.015	Se	2.58	0.19
S (%)	0.845	0.085	Sr	1.71	0.26
Cl (%)	0.362	0.022	Mo	0.76	0.09
K	472	61	Cd	0.064	0.022
Ca	369	35	I	0.060	0.013
Cr	0.053	0.013	Ba	1.53	0.26
Mn	14.3	0.8	Hg	0.0019	0.0006
Fe	54.3	6.8	Pb	0.10	0.05

Information concentrations ($\mu\text{g/g}$ dry weight):

Element	Value
B	0.4
F	0.43
V	0.04
Ti	2
As	0.02
Br	3.6
Rb	0.4
Sb	0.01

Order Information:

A unit of RM 8418 contains 50-g of powder a glass bottle and can be purchased for US\$147 per unit. Price subject to change without notice. Please contact NIST.

References:

Ihnat, M. (1994a) Characterization (certification) of three wheat flours and a wheat gluten reference material (NIST RM 8436, 8437, 8438 and 8418) for essential and toxic major, minor and trace element constituents. Fresenius J. Anal. Chem., 348:468-73.

Ihnat, M. (1994b) Development of a new series of agricultural/food reference materials for analytical quality control of elemental determinations. J. AOAC Internatl., 77(6):1605-27.

Ihnat, M., and M. S. Wolynetz (1994) An interlaboratory characterization (certification) campaign to establish the elemental composition of a new series of agricultural/food reference materials. Fresenius J. Anal. Chem., 348:452-8.

Ihnat, M., R. W. Dabeka, and M. S. Wolynetz (1994) Preparation and homogeneity characterization of ten agricultural/food reference materials for elemental composition. Fresenius J. Anal. Chem., 348:445-51.

National Institute of Standards and Technology (1994) RM 8418. Wheat gluten. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

RM 8432

Corn Starch

Agriculture and Agri-Food (Canada)

Description:

This RM is intended for use in evaluating analytical methods and instruments used for the determination of minor and trace constituent elements in plant products and other similar food, agricultural, and biological materials containing low elemental concentrations. RM 8432 was prepared and characterized by the Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada and is distributed by NIST. The source material for RM 8432 was food grade corn starch obtained from Ontario, Canada. The dry bulk powder was sterilized with ^{60}Co gamma radiation to 2.0 megarads. Material sieving was through nylon monofilament sieve cloths supported in high density white polyethylene holders. Pairs of sieves with openings of approximately 90 μm /50 μm were used to yield a suitable narrow middle cut constituting the RM. This fraction was blended in a polymethylmethacrylate V-configuration blender and packaged into clean 150-mL brim capacity clear glass bottles with pulp/Saran-lined black polypropylene screw caps. Details of the preparation and characterization of RM 8416 can be found in Ihnat (1994a and 1994b), Ihnat *et al.* (1994), and Ihnat and Wolynetz (1994).

Best estimate concentrations ($\mu\text{g/g}$ dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
N	670	340	Ni	0.02	0.02
Na	119	7	Cu	0.06	0.04
Mg	31	5	Zn	0.22	0.05
Al	1.9	1.0	Se	0.0009	0.0009
P	178	23	Sr	0.18	0.17
Cl	45	22	Mo	0.02	0.02
K	45	17	Cd	0.0003	0.0001
Ca	56	15	Hg	0.0011	0.0007
Mn	0.10	0.05	Pb	0.007	0.005
Co	0.0012	0.0006			

Information concentrations ($\mu\text{g/g}$ dry weight):

Element	Value
F	0.02
S	200
Cr	0.02
Fe	5
W	0.001

Order information:

A unit of RM 8432 contains 50-g of powder in glass bottles and can be purchased for US\$147 per unit. Price subject to change without notice. Please contact NIST.

References:

Ihnat, M. (1994a) Characterization (certification) of Corn Bran (NIST SRM 8433), Corn Starch (NIST SRM 8432) and Microcrystalline Cellulose (NIST SRM 8416) reference materials for essential and toxic major, minor and trace element constituents. Fresenius J. Anal. Chem., 348:474-8.

Ihnat, M. (1994b) Development of a new series of agricultural/food reference materials for analytical quality control of elemental determinations. J. AOAC Internatl., 77(6):1605-27.

Ihnat, M., and M. S. Wolynetz (1994) An interlaboratory characterization (certification) campaign to establish the elemental composition of a new series of agricultural/food reference materials. Fresenius J. Anal. Chem., 348:452-8.

Ihnat, M., R. W. Dabeka, and M. S. Wolynetz (1994) Preparation and homogeneity characterization of ten agricultural/food reference materials for elemental composition. Fresenius J. Anal. Chem., 348:445-51.

National Institute of Standards and Technology (1993) RM 8432. Corn starch. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

RM 8464 - 8469

Pesticides

National Institute of Standards and Technology (USA)

Description:

These RMs are provided as primary reference compounds of measured purity are intended for use in the evaluation of procedures used on environmental samples.

Compound :

RM	Compound
8464	Aldrin
8465	Dieldrin
8466	gamma-HCH
8467	4,4'-DDE
8468	Heptachlor
8469	4,4'-DDT

Order Information:

At the time of this writing, the prices for some of these materials were not available. RM 8466 can be purchased for US\$180 per unit (100 mg) and RM 8467 for US\$215 per unit. Prices are subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1992) RM 8466. 4,4'-DDE. Report of investigation. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) RM 8467. γ -Hexachlorocyclohexane (Lindane). Report of investigation. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) RM 8469. 4,4'-DDT. Report of investigation. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 141c through 2144

Microchemical Elemental Analysis

National Institute of Standards and Technology (USA)

Description:

These materials are highly purified chemicals used in evaluating microchemical procedures for the determination of C, N, S, H, Cl, F and/or Br in organic matter. SRM 142 is used for microdeterminations of methoxyl ion (CH_3O^-).

Certified composition (nominal weight percent):

SRM	Compound	Element								
		C	H	O	N	Br	Cl	F	S	CH_3O^-
141c*	Acetanilide	71.09	6.71	-	10.36	-	-	-	-	-
142	Anisic acid	-	-	-	-	-	-	-	20.40	-
143c	Cystine	29.99	5.03	26.63	11.66	-	-	-	26.69	-
148	Nicotinic acid	58.54	4.09	-	11.38	-	-	-	-	-
2141	Urea	-	-	-	46.63	-	-	-	-	-
2142	o-Bromobenzoic acid	-	-	-	-	39.80	-	-	-	-
2143	p-Fluorobenzoic acid	-	-	-	-	-	-	13.54	-	-
2144	m-Chlorobenzoic acid	-	-	-	-	-	22.62	-	-	-

* SRM 141d is currently under preparation.

Order Information:

These SRMs range in price from US\$91 to US\$122 per unit (2-g vial). Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1969) SRM 142. Anisic acid. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1970) SRM 148. Nicotinic acid. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1970) SRM 2141. Urea. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1970) SRM 2142. o-Bromobenzoic acid. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1973) SRM 2144. m-Chlorobenzoic acid. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1976) SRM 141c. Acetanilide. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 141c through 2144 (cont.)

National Institute of Standards and Technology (1982) SRM 2143. p-Fluorobenzoic acid. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 143c. Cystine. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 185g through 2192

pH and pD Calibration Solutions

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended for use in the preparation of solutions for calibrating electrodes for pH and pD measuring systems. The pH value of the standards, pH(S), corresponds to $\log(1/a_H)$ where a_H is a conventional activity of the hydrogen ion referred to the standard state on the molal scale. The pH or pD values, as a function of temperature, are reported in the Certificates of Analysis and were derived from emf measurements of cells without liquid junction by the method of calculation described in Bates (1962). SRMs 186Ie and 186IIe, 191a and 192a, and 922 and 923 are each certified as an admixture only. SRM 186Ie and 186IIe may be used to prepare solutions with a pH of 6.863 at 25°C or a physiological buffer solution with a pH of 7.41 at 25°C. SRMs 2185, 2186I and 2186II, 2191a, and 2192a are certified for use as an admixture only and are used for preparation of known deuterium ion concentrations solutions in pD determinations. Some of the materials used for the SRMs were purchased from commercial sources and may contain impurities such as occluded water, free acid or alkali, chlorides, sulfur or heavy metals.

SRM		pH(S) at 25°C	Cost US\$	Unit size (g)
SRM 185g	Potassium hydrogen phthalate	4.005	148	60
SRM 186Ie	Potassium dihydrogen phosphate	-	128	30
SRM 186IIe	Disodium hydrogen phosphate	-	128	30
SRM 187c	Sodium tetraborate decahydrate (Borax)	9.180	124	30
SRM 188	Potassium hydrogen tartrate	3.557	129	60
SRM 189a	Potassium tetroxalate	1.681	144	65
SRM 191a	Sodium bicarbonate	10.011	142	25
SRM 192a	Sodium carbonate	10.011	142	30
SRM 2193	Calcium carbonate	12.46	156	30
SRM 2185	Potassium hydrogen phthalate	4.518	156	60
SRM 2186I	Potassium dihydrogen phosphate	7.428	131	30
SRM 2186II	Disodium hydrogen phosphate	7.428	131	30
SRM 2191a	Sodium bicarbonate	10.732	158	30
SRM 2192a	Sodium carbonate	10.732	158	30

Order information:

Prices and unit quantities are listed above. Price subject to change without notice. Please contact NIST.

References:

Bates, R. G. (1962) Revised standard values for pH measurements from 0 to 95°C. J. Res. National Bureau of Standards, 66A:179-84.

National Institute of Standards and Technology (1968) SRM 2186-I and SRM 2186-II. Potassium dihydrogen phosphate (2186-I). Disodium hydrogen phosphate (2186-II). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 185g through 2192 (cont.)

National Institute of Standards and Technology (1984) SRM 2185. Potassium hydrogen phthalate. pD standard. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 185g. Potassium hydrogen phthalate. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 187c. Sodium tetraborate decahydrate (Borax). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 2191a. Sodium bicarbonate. SRM 2192a. Sodium carbonate. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 610 - 617

Trace Elements in Glass Matrices

National Institute of Standards and Technology (USA)

Description:

These SRMs were produced and certified to facilitate the development of trace analytical methods. A glass support matrix (72% SiO₂, 12% CaO, 14% Na₂O, 2% Al₂O₃) was spiked with 500, 50, 1 and 0.02 ppm each of 61 elements to produce the 4 sets of SRMs. The material was prepared in rod form and then sliced into 3- and 1-mm thick wafers. The certification process for some of the spiked elements is underway.

Certified concentrations (µg/g):

Element	Value	Uncertainty (±)	Element	Value	Uncertainty (±)
SRM 610 and 611			SRM 614 and 615		
Mn	485	10	K	30	1
Fe	458	9	Cu	1.37	0.07
Ni	458.7	4	Rb	0.855	0.005
Rb	425.7	0.8	Sr	45.8	0.1
Sr	515.5	0.5	Ag	0.42	0.04
Pb	426	1	Pb	2.32	0.04
Th	457.2	1.2	Th	0.748	0.006
U	461.5	1.1	U	0.823	0.002
SRM 612 and 613			SRM 616 and 617		
Fe	51	2	K	29	1
Ni	38.8	0.2	Sr	41.72	0.05
Rb	31.4	0.4	Pb	1.85	0.04
Sr	78.4	0.2	Th	0.0252	0.0007
Ag	22.0	0.3	U	0.0721	0.0013
Pb	38.57	0.2			
Th	37.79	0.08			
U	37.38	0.08			

SRM 610 - 617 (cont.)

Noncertified concentrations ($\mu\text{g/g}$):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
SRM 610 and 611			SRM 614 and 615		
B	351	-	B	1.30	0.2
K	461	-	Sc	0.59	0.04
Ti	437	-	Ti	3.1	0.3
Co	390	-	Fe	13.3	1
Cu	444	4	Co	0.73	0.02
Zn	433	-	Ni	0.95	-
Ag	254	10	Ga	1.3	-
Au	25	-	Cd	0.55	-
Tl	61.8	2.5	Sb	1.06	-
SRM 612 and 613			La	0.83	0.02
B	32	-	Eu	0.99	0.04
K	64	-	Au	0.5	-
Ti	50.1	0.8	Tl	0.269	0.005
Mn	39.6	0.8	SRM 616 and 617		
Co	35.5	1.2	B	0.20	0.02
Cu	37.7	0.9	Sc	0.026	0.012
Ba	41	-	Ti	2.5	0.7
La	36	-	Fe	11	2
Ce	39	-	Cu	0.80	0.09
Nd	36	-	Ga	0.23	0.02
Sm	39	-	Rb	0.100	0.007
Eu	36	-	Sb	0.078	0.007
Gd	39	-	La	0.034	0.007
Dy	35	-	Au	0.18	0.01
Er	39	-	Tl	0.0082	0.0005
Yb	42	-			
Au	5	-			
Tl	15.7	0.3			

Order Information:

These SRMs consist of 3- and 1-mm wafers and can be purchased for between US\$156 to US\$170 per set (6 wafers). Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1992) SRM 610. Trace elements in a glass matrix (3 mm wafer). SRM 611. Trace elements in a glass matrix (1 mm wafer). Nominal trace element concentration 500 mg/kg (ppm). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 612. Trace elements in a glass matrix (3 mm wafer). SRM 613. Trace elements in a glass matrix (1 mm wafer). Nominal trace element concentration 50 mg/kg (ppm). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 614. Trace elements in a glass matrix (3 mm wafer). SRM 615. Trace elements in a glass matrix (1 mm wafer). Nominal trace element concentration 1 mg/kg (ppm). Certificate of analysis. National Institute of Standards

SRM 610 - 617 (cont.)

and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1992) SRM 616. Trace elements in a glass matrix (3 mm wafer). SRM 617. Trace elements in a glass matrix (1 mm wafer). Nominal trace element concentration 0.02 mg/kg (ppm)). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 640b

Silicon Powder $2\theta/d$ -Spacing Standard for X-Ray Diffraction

National Institute of Standards and Technology (USA)

Description:

This SRM was prepared for use as an external or internal $2\theta/d$ -spacing calibration standard for powder diffractometry. SRM 640b is a high purity silicon powder prepared by grinding electronic grade silicon rods, followed by jet milling to reduce particle size. The median particle size is about 5 μm .

Certified lattice parameter (\AA):

Spacing	Value	Uncertainty (\pm)
(a)	5.430940	0.000035

Order Information:

SRM 640b can be purchased for US\$163 per unit (7.5-gram bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1987) SRM 640b. Silicon powder $2\theta/d$ -spacing standard for x-ray diffraction. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 674a

X-Ray Powder Diffraction Intensity Set

National Institute of Standards and Technology (USA)

Description:

This SRM consists of five different phases, bottled separately. These are: α - Al_2O_3 (corundum structure), ZnO (wurtzite structure), TiO_2 (rutile structure), Cr_2O_3 (corundum structure), and CeO_2 (fluorite structure). These phases can be used as internal standards for quantitative analysis and as external standards for checking the intensity response of x-ray diffraction instruments. The five phases cover the range of linear absorption coefficients from 100 to 1000 cm^{-1} for Cu K-alpha radiation.

Certified Intensities of major lines:

hkl	2θ (°)	rel	Sigma
α - Al_2O_3 (corundum structure), $\mu_{\text{CuK}\alpha} = 126 \text{ cm}^{-1}$			
012	25.54	58.7	0.19
104	35.10	87.2	0.22
110	37.72	38.3	0.09
113	43.30	100.0	NA ^Δ
024	52.48	46.1	0.07
116	57.44	94.1	0.09
214	66.44	35.7	0.09
300	68.14	52.4	0.34
ZnO (wurtzite structure), $\mu_{\text{CuK}\alpha} = 279 \text{ cm}^{-1}$			
100	31.70	57.9	0.12
002	34.36	42.1	0.06
101	36.18	100.0	NA
102	47.48	23.5	0.02
110	56.52	35.4	0.07
103	62.80	31.6	0.05
200	66.30	4.8	0.01
112	67.88	25.6	0.06

^Δ Not available.

Certified intensities of major lines:

hkl	2 θ (°)	I _{rel}	Sigma
TiO ₂ (rutile structure), $\mu_{\text{CuK}\alpha} = 536 \text{ cm}^{-1}$			
110	27.38	100.0	NA
101	36.04	42.7	0.09
111	41.18	20.4	0.03
211	54.28	56.6	0.07
220	56.58	16.6	0.04
002	62.72	8.0	0.03
301	68.96	(17.2)	0.07
112	69.76	(5.6)	0.12

Cr ₂ O ₃ (corundum structure), $\mu_{\text{CuK}\alpha} = 912 \text{ cm}^{-1}$			
012	24.42	67.6	0.35
104	33.53	100.0	NA
110	36.12	80.8	0.68
113	41.40	30.9	0.13
024	50.14	36.9	0.19
116	54.76	92.1	0.22
214	63.38	28.6	0.13
300	65.04	37.5	0.20

CeO ₂ (fluorite structure), $\mu_{\text{CuK}\alpha} = 2203 \text{ cm}^{-1}$			
111	28.60	100.0	NA
200	33.12	27.8	0.05
220	47.52	55.2	0.19
311	56.38	43.8	0.14

Reference intensity ratios:

Phase	hkl	I/I _c	Sigma
ZnO	101	5.33	0.06
TiO ₂	110	3.32	0.04
Cr ₂ O ₃	104	2.16	0.02
CeO ₂	111	13.15	0.10

Lattice parameters (25 ± 2°C), Cu K α radiation ($\mu = 124.1 \text{ cm}^{-1}$):

Phase	Crystal	a (Å)	Sigma	c (Å)	Sigma
α -Al ₂ O ₃	Trigonal	4.759397	0.000080	12.99237	0.00022
ZnO	Hexagonal	3.249074	0.000055	5.206535	0.000101
TiO ₂	Tetragonal	4.593939	0.000062	2.958862	0.000063
Cr ₂ O ₃	Trigonal	4.959610	0.000079	13.59747	0.00025
CeO ₂	Cubic	5.411102	0.000097	NA	NA

SRM 674a (cont.)

Particle size data:

Phase	90% finer than (μm)	50% finer than (μm)
$\alpha\text{-Al}_2\text{O}_3$	1.5	0.6
ZnO	2.5	0.79
TiO ₂	0.7	0.45
Cr ₂ O ₃	2.0	0.87
CeO ₂	2.8	0.75

Order Information:

SRM 674a can be purchased for US\$344 per unit (20-gram bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1989) SRM 674a. X-ray powder diffraction intensity set. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 675

Low 2θ (Large d-Spacing) Standard for X-Ray Powder Diffraction

National Institute of Standards and Technology (USA)

Description:

This SRM was prepared for use as an external or internal low 2θ (large d-spacing) calibration standard for powder diffractometry. The material is synthetic fluorophlogopite mica and is best suited for reflection diffractometry as pressed samples have a high degree of preferred orientation in which only the 001 reflections have significant intensity. The mica was ground to pass a 75- μm sieve.

Certified d-spacing (\AA):

Spacing	Value	Uncertainty (\pm)
d(001)	9.98104	0.00007

Order Information:

SRM 675 can be purchased for US\$179 per unit (5-g bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1982) SRM 675. Low 2θ (large d-spacing) standard for x-ray powder diffraction. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 676

Alumina Internal Standard

National Institute of Standards and Technology (USA)

Description:

This SRM consists of a phase-pure alumina (corundum structure) powder intended primarily for use as an internal standard for quantitative analysis and I/I_0 determinations by x-ray powder diffraction. The powder consists of sub-micron equi-axial grains which have been de-aggregated and calcined. The certified parameters are 7 relative intensity values and lattice parameters.

Order Information:

SRM 676 can be purchased for US\$182 per unit (20-g bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) SRM 676. Alumina internal standard. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 869

Column Selectivity Test Mixture for Liquid Chromatography

National Institute of Standards and Technology (USA)

Description:

SRM 869 is an acetonitrile solution of three PAHs and is a new type of SRM intended for certifying the performance characteristics of reversed-phased liquid chromatography columns rather than proving quantitative levels of the individual constituents. Selectivity ranges for various commercial C₁₈ columns are provided in the Certificate.

PAHs in SRM 869:

Benzo[a]pyrene

1,2:3,4:5,6:7,8-Tetrabenzonaphthalene (TBN, dibenzo[g,p]chrysene)

Phenanthro[3,4-c]phenanthrene

Order Information:

SRM 869 can be purchased for US\$115 per unit (5 1.1-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1990) SRM 869. Column selectivity test mixture for liquid chromatography. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 927b

Bovine Serum Albumin (7% Solution)

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily as a reference material for total protein. The serum albumn was derived from bovine blood. The cattle received ante- and post-mortem health inspections at the abattois and were apparently free of diseases. All donor animals were sourced from the United States.

Certified concentration of peptide mass by a Biuret method (g/L):

Value	Uncertainty (\pm)
72.01	0.33

Order Information:

SRM 927b can be purchased for US\$303 per each unit (10 2.1-mL vials). Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1995) SRM 927b. Bovine serum albumin (7% solution). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 930e and 1930

Glass Filters for Spectrophotometry

National Institute of Standards and Technology (USA)

Description:

SRM 930e consists of three neutral glass filters. The glass filters have transmittances . Each filter is individually calibrated and certified for absorbance and transmittance at wavelengths in the visible spectral domain. SRM 1930 compliments 930e and consists of three individual glass filters in metal holders. SRM 1930 is intended for use in the verification and calibration of the transmittance and absorbance scales of spectrophotometers in the visible spectrum. It is complementary to SRM 930e.

Order information:

SRM 930e can be purchased for US\$1892 per each set, and SRM 1930 for US\$1265. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1994) SRM 1930. Glass filters for spectrophotometry. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 930e. Glass filters for spectrophotometry. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 931e

Liquid Filters

National Institute of Standards and Technology (USA)

Description:

These filters are absorbance standards for use in ultraviolet and visible spectrophotometry. This SRM consists of three sets of four vials, each containing a blank solution and three solutions of different concentrations of an absorbing liquid. The net absorbances are certified for each concentration at wavelengths of 302, 395, 512, and 678 nm.

Order Information:

SRM 931e can be purchased for US\$242 per unit. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 931e. Liquid absorbance standard for ultraviolet and visible spectrophotometry. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 935a - SRM 936

Potassium Dichromate and Quinine Sulfate Dihydrate

National Institute of Standards and Technology (USA)

Description:

SRM 935a consists of crystalline potassium dichromate ($K_2Cr_2O_7$) of established purity certified for use as an ultraviolet absorbance standard. Solutions made with this SRM in 0.001 N perchloric acid ($HClO_4$) are certified for their molecular emission spectrum at 23.5° C and wavelengths of 235, 257, 313, 345, and 350 nm. SRM 936 consists of powdered quinine sulfate dihydrate of known purity certified for use as an spectrofluorimetric emission standard. Solutions made with this SRM in 0.1 N perchloric acid ($HClO_4$) are certified for their molecular emission spectrum, E(g), at 25° C and a wavelength range of 375 to 675 nm.

Order information:

SRM 935a can be purchased for US\$180 per unit (15 g) and SRM 936 for US\$187 per unit (1 g). Price subject to change without notice. Please contact NIST.

Reference:

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 1491

Aromatic Hydrocarbons in Hexane/Toluene

National Institute of Standards and Technology (USA)

Description:

The chemicals used in the preparation of this SRM were obtained from commercial sources or the Community Bureau of Reference, Belgium. The solution was prepared at NIST by weighing and mixing the individual components and toluene, adding hexane and then mixing until completely dissolved and homogenized. The total mass of this solution was then measured. The calculated concentration based on the mass of each compound (adjusted for its consensus purity estimate) in the total mass of the solution is given in the Certificate of Analysis for each component. The bulk solution was then chilled to approximately -5 °C, 1.2-mL aliquots were dispensed into 2-mL amber ampoules and flame sealed. This SRM is similar to SRM 2260.

Certified concentrations (µg/mL):

Compound	Value	Uncertainty (±)	Compound	Value	Uncertainty (±)
1-Methylnaphthalene	8.3	0.3	Benzo[k]fluoranthene	5.57	0.08
1-Methylphenanthrene	7.0	0.2	Biphenyl	7.00	0.03
2,3,5-Trimethylnaphthalene	6.6	0.2	Chrysene	7.03	0.04
2,6-Dimethylnaphthalene	7.2	0.3	Dibenz[a,h]anthracene	5.18	0.12
Acenaphthene	7.28	0.2	Fluoranthene	5.91	0.04
Acenaphthylene	6.96	0.05	Fluorene	7.27	0.05
Anthracene	7.82	0.04	Indeno[1,2,3-cd]pyrene	6.29	0.05
Benz[a]anthracene	3.59	0.03	Naphthalene	6.89	0.07
Benzo[a]pyrene	6.79	0.06	Phenanthrene	7.01	0.05
Benzo[b]fluoranthene	5.25	0.04	Perylene	7.12	0.04
Benzo[e]pyrene	5.62	0.03	Pyrene	5.89	0.06
Benzo[ghi]perylene	5.29	0.09			

Noncertified concentration (µg/g):

Compound	Value
2-Methylnaphthalene	11.3

Order Information:

SRM 1491 can be purchased for US\$165 per unit (5 2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1989) SRM 1491. Aromatic hydrocarbons in hexane/toluene. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1492

Chlorinated Pesticides in Hexane

National Institute of Standards and Technology (USA)

Description:

This SRM is a solution of 15 chlorinated pesticides in hexane and is intended primarily for use in the calibration of chromatographic instrumentation. The pesticides used were obtained from the EPA Pesticides and Industrial Chemicals Repository and the Laboratory of the Government Chemist of the United Kingdom. The solution was prepared by weighing and mixing the individual pesticides and hexane.

Certified concentrations (ng/mL):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
2,4'-DDD	200	3	Dieldrin	205	3
2,4'-DDE	202	2	gamma-HCH	205	2
2,4'-DDT	205	3	Heptachlor	200	5
4,4'-DDD	197	2	Heptachlor epoxide	204	5
4,4'-DDE	204	2	Hexachlorobenzene	207	2
4,4'-DDT	202	2	Mirex	204	2
Aldrin	202	3	trans-Nonachlor	198	4
cis-Chlordane	203	2			

Order Information:

SRM 1492 can be purchased for US\$201 per unit (5 1.2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1989) SRM 1492. Chlorinated pesticides in hexane. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1493

Polychlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane

National Institute of Standards and Technology (USA)

Description:

Polychlorinated biphenyl congeners were obtained from commercial sources. The solution was prepared at NIST by weighing and mixing individual congeners and 2,2,4-trimethylpentane. The solution was dispensed into 2-mL amber ampoules. This SRM is intended primarily for calibrating methods for the determination of the chlorinated pesticides certified in this standard. It can also be used for adding known amounts of these pesticides to samples in recovery studies. Certified concentrations are available on $\mu\text{g/kg}$ and ng/mL basis. CB number is according of Ballschmiter and Zell (1980).

Certified concentrations:

Certified concentrations (ng/mL):

CB number	Compound	Value	Uncertainty (\pm)
18	2,2',5-Trichlorobiphenyl	200.6	4.7
28	2,4,4'-Trichlorobiphenyl	198.7	1.2
44	2,2',3,5'-Tetrachlorobiphenyl	199	11
52	2,2',5,5'-Tetrachlorobiphenyl	197.2	4.1
66	2,3',4,4'-Tetrachlorobiphenyl	201.4	4.8
77	3,3',4,4'-Tetrachlorobiphenyl	196.2	1.8
101	2,2',4,5,5'-Pentachlorobiphenyl	198.5	3.6
105	2,3,3',4,4'-Pentachlorobiphenyl	197	17
126	3,3',4,4',5-Pentachlorobiphenyl	198.3	2.3
128	2,2',3,3',4,4'-Hexachlorobiphenyl	200.1	1.3
138	2,2',3,4,4',5'-Hexachlorobiphenyl	198.1	1.0
153	2,2',4,4',5,5'-Hexachlorobiphenyl	198.4	3.5
170	2,2',3,3',4,4',5-Heptachlorobiphenyl	196.8	4.6
180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	199.5	3.8
187	2,2',3,4',5,5',6-Heptachlorobiphenyl	196.8	1.4
195	2,2',3,3',4,4',5,6-Octachlorobiphenyl	199.4	2.3
206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	179.0	8.5
209	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	199.8	6.5

Noncertified concentrations (ng/mL):

CB number	Compound	Value	Uncertainty (\pm)
8	2,4'-Dichlorobiphenyl	191	17
118	2,3',4,4',5-Pentachlorobiphenyl	199	20

Order information:

Price was not available at the time of writing. Please contact NIST.

SRM 1493 (cont.)

Reference:

National Institute of Standards and Technology (1995) SRM 1493. Polychlorinated biphenyl congeners in 2,2,4-trimethylpentane. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1543

GC/MS System Reference Standard

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for use in evaluating the sensitivity of gas chromatography/mass spectrometry (GC/MS) instrumentation. It consists of four solutions: two concentrations of methyl stearate in hexane and two concentrations of benzophenone in hexane.

Certified concentrations (ng/ μ L):

Compound	Value	Uncertainty (\pm)
Methyl stearate	0.99	0.02
Methyl stearate	4.98	0.08
Benzophenone	1.01	0.02
Benzophenone	5.01	0.07

Order information:

SRM 1543 can be purchased for US\$114 per unit (4 ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1984) SRM 1543. GC/MS system reference material. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1583

Chlorinated Pesticides in 2,2,4-Trimethylpentane

National Institute of Standards and Technology (USA)

Description:

Pesticides and 2,2,4-trimethylpentane were obtained from commercial sources. The pesticide solutions were prepared at NIST by weighing and mixing individual pesticides and 2,2,4-trimethylpentane. These solutions were dispensed into 2-mL amber ampoules. This SRM is intended primarily for calibrating methods for the determination of the chlorinated pesticides certified in this standard. It can also be used for adding known amounts of these pesticides to samples in recovery studies.

Certified concentrations:

Compound	$\mu\text{g/g}$		$\mu\text{g/mL}$	
	Value	Uncertainty (\pm)	Value	Uncertainty (\pm)
Aldrin	0.86	0.01	0.59	0.01
gamma-HCH	1.11	0.01	0.77	0.01
delta-HCH	0.76	0.01	0.53	0.01
4,4'-DDE	1.23	0.03	0.85	0.02
4,4'-DDT	1.90	0.10	1.31	0.07

Noncertified concentration ($\mu\text{g/mL}$):

Heptachlor epoxide 0.997

Order Information:

SRM 1583 can be purchased for US\$219 per unit (6 1-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1985) SRM 1583. Chlorinated pesticides in 2,2,4-trimethylpentane. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1584

Priority Pollutant Phenols in Methanol

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for the calibration of chromatographic instrumentation used in the determination of phenols. Due to its miscibility with water, it can also be used to fortify aqueous samples with known amounts of phenols. Since the density of methanol changes with temperature, the concentrations are certified only for the temperature range between 19 and 27°C only. The methanol solutions are sealed under nitrogen in amber glass ampoules.

Certified concentrations ($\mu\text{g/mL}$):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
2-Chlorophenol	64.4	1.4	2-Nitrophenol	25.2	0.7
4-Chloro-m-cresol	27.4	0.4	4-Nitrophenol	20.7	0.7
2,4-Dichlorophenol	35.6	1.3	Pentachlorophenol	15.4	1.1
2,4-Dimethylphenol	51.6	0.2	Phenol	29.7	0.9
4,6-Dinitro-o-cresol	20.1	0.9	2,4,6-Trichlorophenol	20.4	1.9

Noncertified concentration ($\mu\text{g/mL}$):

2,4-Dinitrophenol	22.4
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Order information:

SRM 1584 can be purchased for US\$179 per unit (5 1.2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1984) SRM 1584. Priority pollutant phenols in methanol. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1585

Chlorinated Biphenyls in 2,2,4-Trimethylpentane (Iso-octane)

National Institute of Standards and Technology (USA)

Description:

The chlorinated biphenyl compounds (PCBs) and 2,2,4-trimethylpentane were obtained from commercial sources. A solution was prepared at NIST by weighing and mixing the individual compounds and 2,2,4-trimethylpentane. This solution was dispensed into 2-mL amber ampoules which were then flame sealed.

Certified concentrations ($\mu\text{g/mL}$):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
PCB 3	29.9	0.7	PCB 77	4.56	0.03
PCB 15	6.57	0.06	PCB 101	3.61	0.01
PCB 28	2.55	0.01	PCB 138	1.63	0.01
PCB 52	5.32	0.04	PCB 153	2.11	0.01

Order information:

SRM 1585 can be purchased for US\$268 per unit (5 1.2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1986) SRM 1585. Chlorinated biphenyls in 2,2,4-trimethylpentane (isooctane). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1586

Isotopically Labeled and Unlabeled Priority Pollutants in Methanol

National Institute of Standards and Technology (USA)

Description:

SRM 1586 is composed of two solutions that were prepared at NIST by weighing and mixing ten individual compounds and the methanol solvent. The solutions were kept chilled and were stored in ampoules. The ampoules were purged with nitrogen before being sealed. All the chemicals used in the preparation of this SRM were obtained from commercial sources and were deemed the best available at the time. Information on the purity and percent of molecules labeled can be found in the certificate of analysis. This SRM is intended primarily for use in the evaluation and calibration of analytical instrumentation used for the determination of priority pollutants as classified by the US Environmental Protection Agency.

Certified concentrations ($\mu\text{g/g}$):

SRM 1586-1

Compound	Value	Uncertainty	Compound	Value	Uncertainty
Benzene	101.1	0.8	2,4-Dichlorophenol	102.5	0.6
Benzo[a]pyrene	49.2	0.2	Naphthalene	126.5	1.2
bis(2-Ethyl hexyl)= phthalate	63.9	1.7	Nitrobenzene	126.0	1.1
Carbon tetrachloride	128.5	0.5	2-Nitrophenol	103.6	3.2
Chlorobenzene	133.0	0.6	Phenol	117.0	1.3

SRM 1586-2

Compound	Value	Uncertainty
Benzene- d_6	99.0	0.5
Benzo[a]pyrene- d_{12}	44.1	2.1
bis(2-Ethyl hexyl)phthalate- d_4	60.4	0.7
Carbon tetrachloride- ^{13}C	124.4	2.1
Chlorobenzene- d_5	144.0	1.3
2,4-Dichlorophenol- d_3	82.2	1.6
Naphthalene- d_8	126.6	1.0
Nitrobenzene- d_5	134.5	1.4
2-Nitrophenol- d_4	101.9	2.3
Phenol- d_5	116.0	0.6

Order information:

SRM 1586 can be purchased for US\$278 per unit (set of 6 2 5-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1984) SRM 1586. Isotopically labeled and unlabeled priority pollutants in methanol. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1587

Nitrated Polycyclic Aromatic Hydrocarbons in Methanol

National Institute of Standards and Technology (USA)

Description:

This SRM consists of four vials each containing approximately 1 mL of a methanol solution of seven nitrated polynuclear aromatic hydrocarbons (N-PAHs). Methanol was purged with argon (Ar) and its weight determined. After known weights of the seven N-PAHs were added to the methanol, the headspace of the mixing container was filled with Ar and the solution stirred in the dark for 20 hours. Each 2-mL amber glass ampoule was purged with Ar prior to the addition of the methanol solution and then flame-sealed.

Certified concentrations ($\mu\text{g/g}$):

Compound	Value	Uncertainty (\pm)
9-Nitroanthracene	5.01	0.11
7-Nitrobenz[a]anthracene	9.27	0.23
6-Nitrochrysene	8.13	0.11
2-Nitrofluoranthene	9.24	0.06
2-Nitrofluorene	9.67	0.39
1-Nitropyrene	8.95	0.28

Information only value ($\mu\text{g/g}$):

6-Nitrobenzo[a]pyrene	6.1
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Order information:

SRM 1587 can be purchased for US\$232 per unit (4 1-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1985) SRM 1587. Nitrated polycyclic aromatic hydrocarbons in methanol. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1596

Dinitropyrene Isomers and 1-Nitropyrene in Methylene Chloride

National Institute of Standards and Technology (USA)

Description:

SRM 1596 was prepared gravimetrically from a mixture of three dinitropyrene isomers and the addition of 1-nitropyrene as an individual component. The isomers were obtained from the Midwest Research Institute and no corrections were made for purity since it was found to be at least 99% for all compounds used. The final solution was dispensed into 2-mL amber ampoules which were then flame sealed.

Certified concentrations ($\mu\text{g/mL}$):

Compound	Value	Uncertainty (\pm)
1-Nitropyrene	5.81	0.11
1,3-Dinitropyrene	2.70	0.04
1,6-Dinitropyrene	6.39	0.23
1,8-Dinitropyrene	10.48	0.20

Order information:

SRM 1596 can be purchased for US\$414 per unit (5 1.2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1986) SRM 1596. Dinitropyrene isomers and 1-nitropyrene in methylene chloride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1614

Dioxin (2,3,7,8-TCDD in Isooctane)

National Institute of Standards and Technology (USA)

Description:

This SRM consists of separate solutions of unlabeled and labeled 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) in 2,2,4-trimethylpentane (isooctane). Three ampoules contain approximately 1.2 mL each of an isooctane solution of unlabeled 2,3,7,8-TCDD, and three ampoules contain approximately 1.2 mL each of an isooctane solution of ^{13}C -labelled 2,3,7,8-TCDD. This SRM is intended primarily for evaluation of analytical methods used in the determination of 2,3,7,8-TCDD.

Certified concentrations:

Compound	ng/g		ng/mL	
	Value	Uncertainty (\pm)	Value	Uncertainty (\pm)
2,3,7,8-TCDD	98.3	3.3	67.8	2.3
2,3,7,8-TCDD- ^{13}C	95.6	1.5	65.9	1.0

Noncertified concentrations:

Solution	Compound	Value (ng/g)	Value (ng/mL)
Unlabeled	Trichlorodibenzo-p-dioxin- $^{12}\text{C}_{12}$	1.5	1.0
Labeled (^{13}C)	Trichlorodibenzo-p-dioxin- $^{13}\text{C}_{12}$	3.9	2.7

Order information:

SRM 1614 can be purchased for US\$274 per unit (6 1.2-ml ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1985) SRM 1614. Dioxin (2,3,7,8-TCDD in isooctane). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1639

Halocarbons (in Methanol) for Water Analysis

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for use with chromatographic instrumentation used for the determination of halocarbons and in recovery studies for adding known amounts of the certified compounds to a sample. The methanol solution of halocarbons was prepared at NIST, chilled and stored in 2-mL amber glass ampoules. The ampoules were purged with argon immediately before filling with the methanol solution.

Certified concentrations (ng/ μ L):

Compound	Value	Uncertainty (\pm)
Bromodichloromethane	389.9	7.1
Bromoform	86.5	1.4
Carbon tetrachloride	157.0	4.4
Chlorodibromomethane	124.6	1.1
Chloroform	6235	340
Tetrachloroethylene	40.6	0.9
Trichloroethylene	85.8	2.6

Order information:

SRM 1639 can be purchased for US\$284 per unit (4 ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1983) SRM 1639. Halocarbon (in methanol) for water analysis. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1641c

Mercury in Water

National Institute of Standards and Technology (USA)

Description:

This SRM consists of a solution of mercury in nitric acid. Gold tetrachloride (AuCl_4) has been added as a stabilizer at a concentration ten times that of Hg.

Certified concentrations (mg/L):

Value	Uncertainty (\pm)
1.47	0.04

Order information:

SRM 1641b can be purchased for US\$195 per unit (6 20-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 1641c. Mercury in water. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1643d

Trace Elements in Water

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for use in evaluating the accuracy of trace element determination in filtered and acidified fresh water and for calibrating instrumentation used in these determinations. SRM 1643d was prepared at the US Geological Survey using high-purity reagents. Only high purity reagents were used. All containers were acid-cleaned and sterilized before use. A polyethylene cylindrical tank was filled with distilled water and sufficient HNO_3 to make the solution approximately 0.5 M. Solutions containing known amounts of the analytes were added to the acidified water. The solution was mixed, then filtered, sterilized, and transferred to 250 mL polyethylene bottles.

Certified concentrations ($\mu\text{g/L}$ unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Li	16.50	0.55	Ni	58.1	2.7
B	144.8	5.2	Cu	20.5	3.8
Be	12.53	0.28	Zn	72.48	0.65
Na (mg/L)	22.07	0.64	As	56.02	0.73
Mg (mg/L)	7.989	0.035	Se	11.43	0.17
Al	127.6	3.5	Sr	294.8	3.4
K (mg/L)	2.356	0.035	Mo	112.9	1.7
Ca (mg/L)	31.04	0.50	Ag	1.270	0.057
V	35.1	1.4	Cd	6.47	0.37
Cr	18.53	0.20	Sb	54.1	1.1
Mn	37.66	0.83	Ba	506.5	8.9
Fe	91.2	3.9	Tl	7.28	0.25
Co	25.00	0.59	Pb	18.15	0.64

Noncertified concentrations ($\mu\text{g/L}$ unless noted):

Element	Value	Element	Value
Si (mg/L)	2.7	Te	1
Pb	13	Bi	13

Order information:

Price was not available at the time of writing. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) SRM 1643d. Trace elements in water. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1647c

Priority Pollutant Polynuclear Aromatic Hydrocarbons (In Acetonitrile)

National Institute of Standards and Technology (USA)

Description:

The acetonitrile (C_2H_3N) solution of 16 polycyclic aromatic hydrocarbons (PAHs) was prepared gravimetrically from individual compounds obtained from BCR (Community Bureau of Reference) and commercial sources. The solution was aliquoted into 2-mL amber glass ampoules. The ampoules were purged with argon just prior to filling. Ultraviolet absorption data between 205 and 600 nm are supplied. This SRM is intended for calibrating chromatographic instrumentation used in the determination of the PAHs certified for this SRM. It is also useful in recovery studies for adding known accurate amounts of these PAHs to a sample; and because of its miscibility with water, it can be used to fortify aqueous samples with known concentrations of PAHs. Since the density of acetonitrile changes with temperature, the concentrations are certified for the temperature range of 21 to 25°C. Certified values are available in $\mu\text{g/g}$ and $\mu\text{g/mL}$.

Certified concentrations ($\mu\text{g/mL}$):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
Acenaphthene	20.55	0.55	Chrysene	3.70	0.07
Acenaphthylene	15.43	0.30	Dibenz[a,h]anthracene	3.60	0.04
Anthracene	0.79	0.03	Fluoranthene	7.65	0.09
Benz[a]anthracene	4.08	0.11	Fluorene	4.75	0.06
Benzo[b]fluoranthene	4.19	0.04	Indeno[1,2,3-cd]pyrene	4.30	0.05
Benzo[k]fluoranthene	4.68	0.06	Naphthalene	19.96	1.07
Benzo[a]pyrene	4.92	0.12	Phenanthrene	3.47	0.04
Benzo[ghi]perylene	3.69	0.04	Pyrene	8.52	0.07

Order information:

SRM 1647c can be purchased for US\$164 per unit (5 2-mL vials). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1994) SRM 1647c. Priority pollutant polynuclear aromatic hydrocarbons. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1842 - 1843

X-Ray Stage Calibration Board

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended as a reference standards for checking x, y, and z dimension accuracy of automated r-ray inspection systems.

Order Information:

SRM 1842 can be purchased for US\$1085 and SRM 1843 for US\$875 per unit. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1993) SRM 1842. X-ray stage calibration board. (X and y dimension.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1843. X-ray stage calibration board. (Z dimension.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1872 - 1873

Glasses for Microscopic Analysis

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended primarily for the analysis of glasses, ceramics and minerals by microanalytical techniques such as quantitative electron probe, secondary ion mass spectrometry, spark source mass spectrometry, and laser probe microanalysis. These glasses provide a highly homogeneous material at microscopic spatial resolution.

Certified concentrations; noncertified concentrations are in parenthesis (nominal weight percent):

Pb-Ge Glass (SRM 1872)

Element	K-453		K-491		K-928	
	Value	Uncertainty (±)	Value	Uncertainty (±)	Value	Uncertainty (±)
O	(16.73)	-	(16.45)	-	(16.67)	-
Mg	-	-	-	-	(0.22)	-
Al	-	-	(0.10)	-	-	-
Si	-	-	(0.11)	-	-	-
P	-	-	-	-	(0.21)	-
Ti	-	-	(0.14)	-	(0.16)	-
Cr	-	-	-	-	(0.19)	-
Fe	-	-	(0.17)	-	-	-
Ni	-	-	-	-	(0.20)	-
Ge	28.43	0.34	26.10	0.34	25.93	0.34
Zr	-	-	(0.26)	-	(0.48)	-
Ba	-	-	-	-	(0.46)	-
Ce	-	-	(0.59)	-	-	-
Eu	-	-	-	-	(0.64)	-
Ta	-	-	(0.52)	-	-	-
Th	-	-	-	-	(0.12)	-
U	-	-	-	-	(0.05)	-
Pb	54.21	0.26	54.69	0.26	54.74	0.26
Total	(99.37)		(99.13)		(100.07)	

Ba-Zn-Si Glass (SRM 1873)

Element	K-458		K-489		K-963	
	Value	Uncertainty (±)	Value	Uncertainty (±)	Value	Uncertainty (±)
O	(31.86)	-	(31.70)	-	(32.00)	-
Mg	-	-	-	-	(0.34)	-
Al	-	-	(0.11)	-	-	-
Si	23.05	0.34	(22.23)	(0.34)	(21.96)	(0.34)
P	-	-	-	-	(0.33)	-
Ti	-	-	(0.27)	-	(0.32)	-
Cr	-	-	-	-	(0.31)	-
Fe	-	-	(0.35)	-	-	-
Ni	-	-	-	-	(0.33)	-
Zn	3.01	0.06	2.93	0.06	2.95	0.06
Ge	-	-	-	-	(0.47)	-
Zr	-	-	(0.40)	-	(0.61)	-
Ba	41.79	0.20	39.53	0.20	39.21	0.48
Ce	-	-	(0.80)	-	-	-
Eu	-	-	-	-	(0.95)	-
Ta	-	-	(0.95)	-	-	-
Pb	-	-	1.32	-	-	-
Th	-	-	-	-	(0.06)	-
U	-	-	-	-	(0.16)	-
Total	(99.71)	-	(100.59)	-	(100.00)	-

Order information:

These SRMs consists of 3 2x2x20 mm rods. SRM 1872 and 1873 and can be purchased for US\$339 and US\$341 per each set. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1984) SRM 1872. Lead-germanate glasses for microanalysis. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1984) SRM 1873. Barium-zinc-silicate glasses for microanalysis. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1921

Infrared Transmission Wavelength Standard

National Institute of Standards and Technology (USA)

Description:

SRM 1921 is intended for use in calibrating the wavelength scale of spectrophotometers in the infrared spectral region from 3.2 μm to 18 μm (555 cm^{-1} to 3125 cm^{-1}). It is a matte finish polystyrene film approximately 38 μm thick with a 25 mm diameter exposed area, centered 38 mm from the bottom of a cardholder which is approximately 5 cm (w) x 11 cm (h) x 2 mm (t) in size.

Order Information:

SRM 1921 can be purchased for US\$195 per unit (5 polystyrene cards) each. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) SRM 1921. Infrared transmission wavelength standard. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1978

Particle Size Distribution Standard for Gravity Sedimentation

National Institute of Standards and Technology (USA)

Description:

This SRM is a zirconium oxide powder which is intended for use in the calibration and evaluation of equipment used to measure particle size distribution in the 0.2 to 10 μm range. The powder consists of granular, irregular-shaped primary particles with a mean dimension of about 1 μm and a minimal amount of large agglomerates.

Order Information:

SRM 1978 can be purchased for US\$194 per unit (5-g bottle) each. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 1978. Particle size distribution standard for gravity sedimentation. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2031

Metal-on-Quartz Filters for Spectrophotometry

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in the verification of the transmittance and absorbance scales of conventional spectrophotometers in the ultraviolet and visible spectral domains. It consists of three individual neutral density filters in their metal holders and one empty filter holder. The exposed surface of each filter is approximately 29 x 8 mm, measuring from a point 1.5 mm above the base of the filter holder. The metal holders are provided with shutters to protect the filters when not in use. Each filter number (10, 30, or 90) corresponds to the nominal transmittance (100 x transmittance) of the filter.

Order information:

Price information was not available at the time of writing. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 2031. Metal-on-quartz filters for spectrophotometers. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2032

Potassium Iodide

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in the assessment of heterochromatic stray light radiation energy in ultraviolet spectrometers in the spectral region below 260 nm. It consists of crystalline potassium iodide (KI) of established purity. Aqueous solutions made with this material are certified for their specific absorbance under well defined conditions over a wavelength range from 240 to 275 nm. The KI solutions exhibit sharp cutoffs in transmittances below approximately 260 nm. Equations are given in the Certificate to calculate the amount of heterochromatic stray light.

Order information:

SRM 2032 can be purchased for US\$351 per unit (25-g bottle). Price subject to change without notice. Please contact NIST.

Reference:

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 2034

Holmium Oxide Solution Wavelength Standard

National Institute of Standards and Technology (USA)

Description:

SRM 2034 consists of a 4% solution of holmium oxide (Ho_2O_3) in 10% perchloric acid in water, sealed in a non-fluorescent fused silica cuvette of nominal 10 mm light path. This SRM is used to establish the accuracy of the wavelength scale of conventional spectrophotometers in the spectral range of 240-650 nm. Details concerning the materials, instrumentation, method of certification and procedures for using this SRM can be found in Weidner *et al.* (1986).

Order Information:

No price information was available at the time of writing. Please contact NIST.

References:

National Institute of Standards and Technology (1995) SRM 2034. Holmium oxide solution wavelength standard from 240 to 650 nm. Series 95. National Institute of Standards and Technology, Gaithersburg, MD.

Weidner, V. R., R. Mavrodineau, K. D. Mielenz, R. A. Velapoldi, K. L. Eckerle, and B. Adams (1986) Standard reference materials: holmium oxide solution wavelength standard from 240-650 nm, SRM 2034. NBS Spec. Pub. 260-102. PB-86-245727. 56 pp. National Institute of Standards and Technology, Gaithersburg, MD.

SRM 2069b

SEM Performance Standard

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in evaluating the performance of scanning electron microscopes (SEM). It consists of graphitized rayon fibers with very smooth and uniform surfaces, relatively free of debris. Transmission electron microscope studies of microtomed fiber cross sections show rounded edges. Two bundles of fibers, 3-5 mm long, are mounted in a specially designed SEM specimen mount. The specimen mount is constructed of aluminum 12.5 mm in diameter and has a 3 mm peg that most SEMs will accept. Additional carbon fibers are provided for mounting by the user. The procedure to be followed in determining SEM performance is given on the back of the certificate of analysis.

Order Information:

SRM 2069b can be purchased for US\$166 per unit. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 2069b. SEM performance standard. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2109

Chromium (VI) Speciation Standard Solution

National Institute of Standards and Technology (USA)

Description:

This SRM is a single element solution prepared gravimetrically to contain 1.000 mg/mL of Cr (VI) in water. The certified value is based on a gravimetric procedure, i.e. mass per volume composition of the high-purity potassium dichromate salt dissolved in deionized water. The minimum level of Cr (III) in the solution was determined by ion exchange separation of Cr (III) from Cr (VI) and measurement of the eluted Cr (III) by AAS.

Order information:

SRM 2109 can be purchased for US\$166 per unit. Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) SRM 2109. Chromium (VI) speciation standard solution. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2201 - 2203

Sodium Chloride, Potassium Chloride, Potassium Fluoride for Ion-Selective Electrodes

National Institute of Standards and Technology (USA)

Description:

SRM 2201 (NaCl), 2202 (KCl) and 2203 (KF) are primarily intended for use in the calibration of ion-selective electrodes for sodium, potassium, chloride and fluoride ions. The materials meet the American Chemical Society's specifications for reagent grade materials. They do contain, however, impurities such as chlorides, fluorosilicates and heavy metals. The materials are certified for the activity coefficients at 25°C of the sodium, potassium, chloride and fluoride ions as appropriate at various concentrations, and the related values pNa, pK, pCl and pF. Mean activity coefficients at temperatures from 15 to 45°C for any concentration up to 0.1 molal may also be calculated using the provided temperature-dependence equations.

Order Information:

SRM 2201 and 2202 can each be purchased for US\$109 and US\$107 per unit (125 g); and SRM 2203 for US\$184 per unit (125 g). Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1973) SRM 2203. Potassium fluoride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1984) SRM 2202. Potassium chloride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 2201. Sodium chloride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2260

Aromatic Hydrocarbons in Toluene

National Institute of Standards and Technology (USA)

Description:

The chemicals used in the preparation of this SRM were obtained from commercial sources or the Community Bureau of Reference, Belgium. The solution was prepared at NIST by weighing and mixing the individual components and toluene, and then mixing until completely dissolved and homogenized. The total mass of this solution was then measured. The calculated concentration based on the mass of each compound (adjusted for its consensus purity estimate) in the total mass of the solution is given in the Certificate of Analysis for each component. The bulk solution was then chilled to approximately -5 °C, 1.2-mL aliquots were dispensed into 2-mL amber ampoules and flame sealed.

Certified concentrations (µg/mL):

Compound	Value	Uncertainty (±)	Compound	Value	Uncertainty (±)
1-Methylnaphthalene	65.5	3.6	Benzo[k]fluoranthene	65.42	0.93
1-Methylphenanthrene	65.0	2.1	Biphenyl	65.84	0.58
2,3,5-Trimethylnaphthalene	58.4	3.2	Chrysene	66.2	1.9
2,6-Dimethylnaphthalene	65.6	3.2	Dibenz[a,h]anthracene	49.3	1.5
Acenaphthene	68.2	1.6	Fluoranthene	65.98	0.83
Acenaphthylene	63.20	0.59	Fluorene	65.38	0.70
Anthracene	49.75	0.52	Indeno[1,2,3-cd]pyrene	58.3	1.1
Benz[a]anthracene	57.1	1.6	Naphthalene	66.0	1.1
Benzo[a]pyrene	59.32	0.61	Phenanthrene	65.72	0.82
Benzo[b]fluoranthene	65.68	0.57	Perylene	49.69	0.36
Benzo[e]pyrene	65.69	0.95	Pyrene	65.89	0.86
Benzo[ghi]perylene	58.7	1.5			

Certified concentrations (µg/g):

Compound	Value
2-Methylnaphthalene	75.3

Order Information:

SRM 2260 can be purchased for US\$194 per unit (5 2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 2260. Aromatic hydrocarbons in toluene. (Nominal concentration 60 µg/mL.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2261

Chlorinated Pesticides in Hexane

National Institute of Standards and Technology (USA)

Description:

Pesticides used in the preparation of this SRM were donated by the U. S. EPA Pesticides & Industrial Chemicals Repository and the Laboratory of the Government Chemist, United Kingdom. The pesticide solution was prepared at NIST by weighing and mixing the individual pesticides with hexane, and mixing until completely dissolved and homogenized. The total mass of this solution was then measured. The calculated concentration based on the mass of the pesticide compound (adjusted for its consensus purity estimate) in the total mass of the solution is given in the Certificate of Analysis for each component. The bulk solution was then chilled to approximately -5 °C, 1.2-mL aliquots were dispensed into 2-mL amber ampoules and flame sealed.

Certified concentrations (µg/mL):

Compound	Value	Uncertainty (±)	Compound	Value	Uncertainty (±)
2,4'-DDD	1.973	0.017	Dieldrin	1.972	0.013
2,4'-DDE	1.976	0.017	gamma-HCH	1.972	0.010
2,4'-DDT	1.959	0.009	Heptachlor	1.977	0.015
4,4'-DDD	1.992	0.027	Heptachlor epoxide	1.977	0.017
4,4'-DDE	1.976	0.010	Hexachlorobenzene	1.968	0.009
4,4'-DDT	1.967	0.012	Mirex	1.991	0.028
Aldrin	1.983	0.026	trans-Nonachlor	1.986	0.014
cis-Chlordane	1.972	0.012			

Order Information:

SRM 22610 can be purchased for US\$205 per unit (5 2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) SRM 2261. Chlorinated pesticides in hexane. (Nominal concentration 2 µg/mL.) Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 2262

Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane (Nominal Concentration 2 µg/mL)

National Institute of Standards and Technology (USA)

Description:

This SRM is a solution of 28 chlorinated biphenyl (CB) [also known as polychlorinated biphenyl (PCB)] congeners in 2,2,4-trimethylpentane (isooctane). This SRM is intended primarily for use in the calibration of chromatographic instruments used for the determination of the certified compounds. Certified concentrations are available on mg/kg and µg/mL basis. CB number is according of Ballschmiter and Zell (1980).

Certified concentrations (µg/mL):

CB number	Compound	Value	Uncertainty (±)
1	2-Monochlorobiphenyl	2.067	0.029
8	2,4'-Dichlorobiphenyl	2.14	0.18
18	2,2',5-Trichlorobiphenyl	2.058	0.019
29	2,4,5-Trichlorobiphenyl	2.057	0.076
44	2,2',3,5'-Tetrachlorobiphenyl	2.054	0.037
52	2,2',5,5'-Tetrachlorobiphenyl	2.067	0.024
66	2,3',4,4'-Tetrachlorobiphenyl	2.051	0.039
77	3,3',4,4'-Tetrachlorobiphenyl	2.097	0.069
87	2,2',3,4,5'-Pentachlorobiphenyl	2.069	0.017
101	2,2',4,5,5'-Pentachlorobiphenyl	2.035	0.029
104	2,2',4,6,6'-Pentachlorobiphenyl	2.074	0.017
105	2,3,3',4,4'-Pentachlorobiphenyl	2.042	0.063
118	2,3',4,4',5-Pentachlorobiphenyl	2.064	0.066
126	3,3',4,4',5-Pentachlorobiphenyl	2.076	0.086
128	2,2',3,3',4,4'-Hexachlorobiphenyl	2.059	0.017
138	2,2',3,4,4',5'-Hexachlorobiphenyl	2.027	0.024
153	2,2',4,4',5,5'-Hexachlorobiphenyl	2.040	0.039
170	2,2',3,3',4,4',5-Heptachlorobiphenyl	2.045	0.034
180	2,2',3,4,4',5,5'-Heptachlorobiphenyl	2.060	0.020
187	2,2',3,4',5,5',6-Heptachlorobiphenyl	2.047	0.019
188	2,2',3,4',5,6,6'-Heptachlorobiphenyl	2.075	0.035
195	2,2',3,3',4,4',5,6-Octachlorobiphenyl	2.052	0.041
201	2,2',3,3',4,4',5,6'-Octachlorobiphenyl	2.070	0.022
206	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	2.001	0.037
209	2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2.062	0.028

Noncertified concentrations (µg/mL):

CB number	Compound	Value	Uncertainty (±)
28	2,4,4'-Trichlorobiphenyl	2.07	0.10
50	2,2',4,6-Tetrachlorobiphenyl	2.08	0.08
154	2,2',4,4',5,6'-Hexachlorobiphenyl	2.03	0.07
194	2,2',3,3',4,4',5,5'-Octachlorobiphenyl	0.22	0.02

Order Information:

No price was available for SRM 2262 at the time of this writing. Please contact NIST.

References:

Ballschmitter, K., and M. Zell (1980) Analysis of polychlorinated biphenyls (PCB) by glass capillary gas chromatography - composition of technical Aroclor - and Clophen-PCB mixtures. Fresenius Z. Anal. Chem., 302:20-31.

National Institute of Standards and Technology (1995) SRM 2262. Chlorinated biphenyl congeners in 2,2,4-trimethylpentane (Nominal concentration 2 µg/mL). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 3101 - 3172a

Spectrometric Standard Solutions

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended for use as stock solutions in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous solutions for calibration. These standards were prepared gravimetrically using well-characterized high purity elements or salts to contain 10 mg/mL of the selected metal in 10% high-purity acid. Some of the high purity elements used in the preparation of these SRMs are available as NIST SRMs and are so noted below. NIST monitors the stability of these solutions and will notify purchasers of any change.

Available single element solutions (10 mg/mL unless noted):

SRM	Element	Metal, salt or SRM	Acid Concentration
3101a	Al	Metal	10% HNO ₃
3102a	Sb	Metal	10% HNO ₃ + 2% HF
3103a	As	Metal	15% HNO ₃
3104a	Ba	BaCO ₃	1% HNO ₃
3105a	Be	Metal	10% HNO ₃
3106	Bi	Metal	10% HNO ₃
3107	B (5.00)	SRM 951	Water
3108	Cd	Metal	10% HNO ₃
3109a	Ca	SRM 915a	10% HNO ₃
3110	Ce	CeO ₂	10% HNO ₃
3111a	Cs	CsCl	1% HNO ₃
3112a	Cr	Metal	10% HNO ₃
3113	Co	Metal	10% HNO ₃
3114	Cu	Metal	10% HNO ₃
3115a	Dy	Dy ₂ O ₃	10% HNO ₃
3116	Er	Er ₂ O ₃	10% HNO ₃
3117a	Eu	Eu ₂ O ₃	16% HNO ₃
3118a	Gd	Gd ₂ O ₃	10% HNO ₃
3119a	Ga	Metal	10% HCl
3120	Ge	Metal	10% oxalic acid
3121	Au	SRM 685w	10% HCl
3122	Hf	Metal	10% HNO ₃ + 2% HF
3123a	Ho	Ho ₂ O ₃	16% HNO ₃
3124a	In	Metal	10% HNO ₃
3126a	Fe	Metal	10% HNO ₃
3127a	La	La ₂ O ₃	10% HNO ₃
3128	Pb	SRM 49e	10% HNO ₃
3129a	Li	Li ₂ CO ₃	2.03 M HNO ₃
3130a	Lu	Lu ₂ O ₃	10% HNO ₃

SRM 3101a - 3172a (cont.)

SRM	Element	Metal, salt or SRM	Acid Concentration
3131a	Mg	Metal	10% HNO ₃
3132	Mn	Metal	10% HNO ₃
3133	Hg	SRM 743	10% HNO ₃
3134	Mo	Metal	10% HCl
3135a	Nd	Nd ₂ O ₃	10% HNO ₃
3136	Ni	Metal	10% HNO ₃
3137	Nb	Metal	5% HNO ₃ + 2% HF
3138	Pd	Metal	10% HCl
3139a	P	SRM 194	0.08% HNO ₃
3140	Pt	SRM 680	10% HCl
3141a	K	SRM 999	1% HNO ₃
3142a	Pr	Pr ₆ O ₁₁	10% HNO ₃
3143	Re	Metal	10% HNO ₃
3144	Rh	(NH ₄) ₃ RhCl ₆	10% HCl
3145a	Rb	SRM 984	1% HNO ₃
3147a	Sm	Sm ₂ O ₃	2.21M HNO ₃
3148a	Sc	Sc ₂ O ₃	10% HNO ₃
3149	Se	SRM 726	10% HNO ₃
3150	Si	Na ₂ SiO ₃ ·9H ₂ O	Water
3151	Ag	Metal	10% HNO ₃
3152a	Na	SRM 2201	1% HCl
3153a	Sr	SrCO ₃	10% HNO ₃
3154	S	H ₂ SO ₄	0.10% H ₂ SO ₄
3155	Ta	Metal	5% HNO ₃ + 2% HF
3156	Te	Metal	20% HCl
3157a	Tb	Tb ₄ O ₇	16% HNO ₃
3158	Tl	Metal	10% HNO ₃
3159	Th	ThO ₂	10% HNO ₃
3160a	Tm	Tm ₂ O ₃	10% HNO ₃
3161a	Sn	SRM 741	5% HNO ₃ + 2% HF
3162a	Ti	Metal	10% HNO ₃ + 2% HF
3163	W	Metal	7% HNO ₃ + 4% HF
3164	U	NBL-CRM 129	10% HNO ₃
3165	V (5.00)	Metal	10% HNO ₃
3166a	Yb	Yb ₂ O ₃	16% HNO ₃
3167a	Y	Y ₂ O ₃	10% HNO ₃
3168a	Zn	SRM 740a	10% HCl
3169	Zr	Metal	10% HNO ₃ + 2% HF

Multielement solutions (100 mg/mL unless noted):

SRM	Element	Metal, salt or SRM	Acid Concentration
3171a	Al		5% HNO ₃
	Be (10)		
	Cd		
	Cr		
	Fe		
	Mg		
	Mn		
	Mo		
	Ni		
	K (500)		
	Na		
	V		
3172a	As (200)	Metal	5% HNO ₃
	Ba (10)	BaCO ₃	
	Ca (10)	CaCO ₃ , SRM 915	
	Co	Metal	
	Cu	Metal, SRM 393	
	Pb	Metal, SRM 49e	
	Se (500)	Metal, SRM 726	
	Ag	Metal, SRM 748	
	Sr (10)	SrCO ₃	
	Tl (99.9)	Metal	
	Zn	Metal, SRM 740	

Order information:

The single element SRMs can be purchased for US\$125 per unit (50-mL bottle) except for SRM 3148a (Sc) which is priced at US\$198 and SRM 3144 (Rb) priced at US\$158. SRM 3171a, 3172a can be purchased for US\$150. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1986) SRM 3140. Spectrometric standard solution. Platinum. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 3134. Spectrometric standard solution. Molybdenum. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3108. Spectrometric standard solution. Cadmium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3110. Spectrometric standard solution. Cerium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3155. Spectrometric standard solution. Tantalum. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3102a. Spectrometric standard solution. Antimony. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3104a. Spectrometric standard solution. Barium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3112a. Spectrometric standard solution. Chromium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3118a. Spectrometric standard solution. Gadolinium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3120. Spectrometric standard solution. Germanium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3122. Spectrometric standard solution. Hafnium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3126a. Spectrometric standard solution. Iron. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3135a. Spectrometric standard solution. Neodymium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3137. Spectrometric standard solution. Niobium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3138. Spectrometric standard solution. Palladium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3141a. Spectrometric standard solution. Potassium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3142a. Spectrometric standard solution. Praseodymium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3149. Spectrometric standard solution. Selenium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3152a. Spectrometric standard solution. Sodium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3153a. Spectrometric standard solution. Strontium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3159. Spectrometric standard solution. Thorium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3162a. Spectrometric standard solution. Titanium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3164. Spectrometric standard solution. Uranium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3168a. Spectrometric standard solution. Zinc. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3171a. Multielement mix A-1 standard solution. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3101a. Spectrometric standard solution. Aluminum. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3103a. Spectrometric standard solution. Arsenic. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3105a. Spectrometric standard solution. Beryllium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3106. Spectrometric standard solution. Bismuth. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3107. Spectrometric standard solution. Boron. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3109a. Spectrometric standard solution. Calcium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3111a. Spectrometric standard solution. Cesium. Certificate of analysis. National Institute of Standards and Technology,

Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3113. Spectrometric standard solution. Cobalt. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3114. Spectrometric standard solution. Copper. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3115a. Spectrometric standard solution. Dysprosium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3116a. Spectrometric standard solution. Erbium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3117a. Spectrometric standard solution. Europium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3119a. Spectrometric standard solution. Gallium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3121. Spectrometric standard solution. Gold. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3123a. Spectrometric standard solution. Holmium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3124a. Spectrometric standard solution. Indium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3127a. Spectrometric standard solution. Lanthanum. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3128. Spectrometric standard solution. Lead. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3129a. Spectrometric standard solution. Lithium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3130a. Spectrometric standard solution. Lutetium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3131a. Spectrometric standard

solution. Magnesium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3132. Spectrometric standard solution. Manganese. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3133. Spectrometric standard solution. Mercury. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3136. Spectrometric standard solution. Nickel. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3139a. Spectrometric standard solution. Phosphorus. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3143. Spectrometric standard solution. Rhenium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3144. Spectrometric standard solution. Rhodium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3145a. Spectrometric standard solution. Rubidium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3147a. Spectrometric standard solution. Samarium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3148a. Spectrometric standard solution. Scandium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3150. Spectrometric standard solution. Silicon. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3151. Spectrometric standard solution. Silver. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3154. Spectrometric standard solution. Sulfur. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3156. Spectrometric standard solution. Tellurium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 3101a - 3172a (cont.)

National Institute of Standards and Technology (1995) SRM 3157a. Spectrometric standard solution. Terbium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3158. Spectrometric standard solution. Thallium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3160a. Spectrometric standard solution. Thullium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3161a. Spectrometric standard solution. Tin. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3163. Spectrometric standard solution. Tungsten. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3165. Spectrometric standard solution. Vanadium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3166a. Spectrometric standard solution. Ytterbium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3167a. Spectrometric standard solution. Yttrium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3169. Spectrometric standard solution. Zirconium. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3172a. Multielement mix B standard solution. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 3181 - 3186

Anion Standard Solutions

National Institute of Standards and Technology (USA)

These SRMs are intended for use in anion ion chromatography. They consist of single component solutions prepared gravimetrically to contain 1000 µg of the anion per gram of solution. The solutions are prepared in 18 megohm water.

Concentrations (µg anion/g):

SRM	Anion	Salt	Value	Uncertainty (±)
3181	Sulfate	K ₂ SO ₄	998	3
3182	Chloride	KCl	1000	5
3183	Fluoride	NaF	995	5
3184	Bromide	KBr	1000	5
3185	Nitrate	NaNO ₃	1002	4
3186	Phosphate	KH ₂ PO ₄	1000	4

Order Information:

These SRMs can be purchased for US\$108 per unit (50 mL) respectively. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1992) SRM 3185. Anion standard solution, nitrate. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3186. Anion standard solution. Phosphate. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3181. Anion standard solution. Sulfate. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3182. Anion standard solution. Chloride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3183. Anion standard solution. Fluoride. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3184. Anion standard solution. Bromide. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 3190 - 3196

Aqueous Electrolytic Conductivity

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended for use in aqueous electrolytic conductivity measurements as calibration or control standards. As control standards, they may be used to determine the conductivity cell constant.

SRM	Component	Electrolytic conductivity ($\mu\text{S/cm}$) at 25°C
3190	HCl in water	25 ± 0.3
3191	SRM 999 (KCl) in water	100.1 ± 0.2
3192	KCl in water	500.0 ± 0.6
3193	KCl in water	1000.0 ± 1.6
3194	KCl in water	10000 ± 4
3195	KCl in water	100000 ± 20
3196	NaCl in water	20000 ± 20

Order information:

These SRMs can be purchased for US\$313 per unit (500 mL) respectively. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1993) SRM 3190. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3195. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 3196. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 3193. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3191. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 3192. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 3190 - 3196 (cont.)

National Institute of Standards and Technology (1995) SRM 3194. Aqueous electrolytic conductivity. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 4226B through 4949B

Alpha-Particle, Beta-Particle, Gamma-Ray, and Electron Capture Solutions

National Institute of Standards and Technology (USA)

Description:

Certain radioactivity SRMs have short half-lives and are available only at certain announced times. Others of intermediate half-lives are issued periodically and may be out of stock. The amount of radionuclide in these SRMs is stated in terms of activity or decays per second. Becquerel (Bq) units are related to curies (Ci) by the formula

$$1 \text{ Ci} = 3.7 \times 10^{10} \text{ Bq.}$$

Radioactivity level (Bq/g):

SRM	Radionuclide	Approx. activity (Bq/g)	Date of calibration	Total uncertainty (±)
4226B *	⁶³ Ni	1 x 10 ⁶	12/84	1.1
4233C *	¹³⁷ Cs	7 x 10 ⁵	11/89	0.94
4251C *	¹³³ Ba	4 x 10 ⁵	9/93	-
4276C *	¹²⁵ Sb	2 x 10 ⁴	9/88	-
	¹⁵⁴ Eu	1 x 10 ⁴		
	¹⁵⁵ Eu	7 x 10 ³		
4288A *	⁹⁹ Tc	4 x 10 ⁴	11/82	1.6
4320	²⁴⁴ Cm	57	4/89	0.9
4321B	²³⁸ U (natural)	263	11/86	0.4
4322B *	²⁴¹ Am	39	11/86	1.0
4323A *	²³⁸ Pu	33	11/86	0.5
4324A *	²³² U	83	2/84	1.5
4328 *	²²⁹ Th	884	5/84	1.5
4329 *	²⁴³ Cm	69	6/84	1.4
4332C *	²⁴³ Am	0.21	7/90	0.02
4334D *	²⁴² Pu	25.58	12/89	1.2
4338 *	²⁴⁰ Pu	18	4/80	1.0
4361B	³ H	1.12	8/87	1.0
4370 *	¹⁵² Eu	9 x 10 ⁴	2/87	1.1
4915E *	⁶⁰ Co	3 x 10 ⁵	2/84	0.8
4919-G *	⁹⁰ Sr	4 x 10 ³	1/90	1.2
4926D	³ H	3 x 10 ³	4/89	0.8
4927D	³ H	7 x 10 ⁵	1/89	0.8
4929-D	⁵⁵ Fe	1 x 10 ⁴	8/85	2.6
4943 *	³⁶ Cl	1 x 10 ⁴	12/84	0.8
4947C	³ H	3 x 10 ⁵	3/87	1.2
4949C	¹²⁹ I	7 x 10 ³	1/82	1.9

* License certification is required by NIST.

SRM 4226B through 4949C (cont.)

Order Information:

These SRMs can be purchased for the prices and quantities listed below. Price subject to change without notice. Please contact NIST.

SRM	Unit	Cost (US\$)	SRM	Unit	Cost (US\$)
4233C	5 g	772	4338	5 g	677
4251C	5 g	620	4361-B	490 g	518
4276C	5 mL	723	4370C	5 mL	670
4288A	5 mL	587	4915E	5 g	614
4320	5 mL	611	4919G	5 g	602
4322B	5 mL	670	4926D	18 mL	746
4323	5 mL	687	4927E	3 mL	666
4324A	5 mL	-	4929D	5 mL	476
4328	2 mL	458	4943	3 mL	373
4329	5.1 g	378	4947C	4 g	501
4332D	5 mL	639	4949C	1.1 g	697
4334D	4 mL	584			

References:

National Institute of Standards and Technology (1980) SRM 4338. Alpha particle emission rate solution standard. Plutonium-240. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1982) SRM 4288A. Radioactivity standard. Technetium-99. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1982) SRM 4949C. Radioactivity standard. Iodine-129. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1984) SRM 4226B. Radioactivity standard. Nickel-63. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1984) SRM 4915E. Radioactivity standard. Cobalt-60. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1984) SRM 4943. Radioactivity standard. Chlorine-36. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1985) SRM 4328. Radioactivity standard. Thorium-229. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1985) SRM 4329. Radioactivity standard. Curium-243. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1986) SRM 4323A. Alpha particle solution standard. Plutonium-238. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 4226B through 4949B (cont.)

National Institute of Standards and Technology (1986) SRM 4324A. Radioactivity standard. Uranium-232. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1986) SRM 4929D. Radioactivity standard. X-Ray emission rate standard. Iron-55. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1987) SRM 4361-B. Radioactivity standard. Hydrogen-3. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1987) SRM 4370C. Radioactivity solution standard. Europium-152. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1987) SRM 4947C. Tritiated toluene radioactivity standard for liquid scintillating counting. Hydrogen-3. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1988) SRM 4276C. Radioactivity standard. Mixed radionuclide solution standard for the efficient calibration of germanium spectrometry systems. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1988) SRM 4339A. Radioactivity standard. Radium-228. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1989) SRM 4233B. Radioactivity standard. Cesium-137. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1989) SRM 4926D. Radioactivity standard. Hydrogen-3. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1989) SRM 4927D. Radioactivity standard. Hydrogen-3. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 4332D. Radioactivity standard. Americium-243. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1990) SRM 4334D. Alpha particle solution standard. Plutonium-242. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 4322B. Alpha particle solution standard. Americium-241. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 4919-G. Radioactivity standard. Strontium-90. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 4226B through 4949B (cont.)

National Institute of Standards and Technology (1992) SRM 4321B. Alpha particle solution standard. Natural uranium. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1994) SRM 4251C. Radioactivity standard. Barium-133. Certificate. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 4400N through 4427A

Radiopharmaceuticals

Source:

National Institute of Standards and Technology (USA)

Description:

License certification is required by NIST before shipment. No other information available.

Radioactivity level (Bq/g):

SRM	Radionuclide	Approx. activity (MBq/g)	Half life (d)
4400N	⁵¹ Cr	4	27.7
4401T	¹³¹ I	5	8.0
4402C	¹¹³ Sn/ ¹¹³ In	1	115
4403B	⁸⁵ Sr	1	65
4404Q	²⁰¹ Tl	4	3
4405B	¹⁹⁸ Au	4	2.7
4406M	³² P	2	14.3
4407S	¹²⁵ I	1	60
4408D	⁶⁰ Co	2	272
4409D	⁷⁵ Se	1	119.8
4410HT	^{99m} Tc	1000	0.3
4411B	⁵⁹ Fe	1	44
4412S	⁹⁹ Mo, ^{99m} Tc	1000	0.3
4414C	¹²³ I	60	0.6
4415R	¹³³ Xe	500 (total)	5.2
4416O	⁶⁷ Ga	4	3.3
4417N	¹¹¹ In	5	2.8
4418L	²⁰³ Hg	1	47
4419C	¹⁶⁹ Yb	2	32
4420B	²⁰³ Pb	3	2.2
4421L	¹⁹⁵ Au	1	183
4424	³⁵ S	1	87.4
4425A	¹⁵³ Sm	4	1.9
4426A	⁸⁹ Sr	1	50
4427A	⁹⁰ Y	1	2.7

Order information:

No price information available at the time of writing Please contact NIST.

Reference:

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

V - 9

Cotton Cellulose

International Atomic Energy Agency (Austria)

Description:

No information available.

Recommended values (mg/kg dry weight unless noted):

Element	Value	Confidence interval	Element	Value	Confidence interval
Na	56	49 - 64	Cu	0.59	0.47 - 0.94
Mg	53	46 - 67	Sr	0.65	0.54 - 0.96
Cl	600	490 - 640	Mo (µg/kg)	34	30 - 45
Ca	240	220 - 260	Ba	9	6 - 12
Mn	0.15	0.12 - 0.21	Hg	0.06	0.04 - 0.08
Cr	0.11	0.08 - 0.14	Pb	0.25	0.22 - 0.33
Ni	0.09	0.07 - 0.18			

Order Information:

V-9 can be purchased for US\$110 per unit (25 g). Price subject to change. The price includes handling, postage (surface mail in Europe, airmail elsewhere), and insurance. Please contact IAEA.

Reference:

International Atomic Energy Agency (1994) AQCS (Analytical Quality Control Services) Intercomparison runs reference materials 1994 - 1995. Catalog. International Atomic Energy Agency, Laboratory Seibersdorf, P.O. Box 100, A-1400 Vienna, Austria. 100 pp.

VS-N

Glass Standard

Association Nationale de la Recherche Technique (France)

Description:

This CRM is a synthetic silico-aluminous glass of phonolitic composition.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value
Al_2O_3 (%)	13.44

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
B	300	Cr	700	Mo	700
Na_2O (%)	5.95	MnO (%)	0.1	Cd	900
MgO (%)	4.51	Co	700	Sn	800
SiO_2 (%)	55.57	Ni	800	Sb	800
K_2O (%)	8.12	Cu	800	Cs	900
CaO (%)	4.53	Zn	800	Ba	1000
Sc	300	Ga	400	Yb	900
TiO_2 (%)	1.08	Pb	800	Pb	1000
V	600	Sr	700	Bi	1000
		Zr	700		

Order Information:

VS-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. VS-N is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

O - L S



O I S



CRM 349

PCBs in Cod Liver Oil

Community Bureau of Reference (Belgium)

Description:

This material consists of cod liver oil with endogeneous chlorobiphenyls in a sealed argon filled ampoule. The oil was stabilized by the addition of 0.2 mg/g butyl hydroxy toluene.

Certified concentrations ($\mu\text{g/kg}$):

PCB congener	Value	Uncertainty (\pm)
PCB 28	68	7
PCB 52	149	20
PCB 101	370	17
PCB 118	454	31
PCB 153	938	40
PCB 180	280	22

Noncertified concentrations ($\mu\text{g/kg}$):

Compound	Value	Compound	Value
4,4'-DDD	175	Mirex	22
4,4'-DDE	234	PCB 44	75
4,4'-DDT	59	PCB 128	104
alpha-Chlordane	20.5	PCB 138 + 163	765
Dieldrin	153	PCB 194	38
gamma-HCH	73		

Order Information:

CRM 349 can be purchased for ECU150 per unit (2 g). Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

References:

Community Bureau of Reference (BCR) (1987) BCR CRM 349, chlorobiphenyls in cod liver oil. Certificate of analysis. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium.

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 350

Chlorobiphenyls in Mackerel Oil

Community Bureau of Reference (Belgium)

Description:

This material consists of mackerel oil with endogeneous chlorobiphenyls in a sealed argon filled ampoule. The oil was stabilized by the addition of 0.2 mg/g butyl hydroxy toluene. Information on additional PCBs and chlorinated pesticides is available in the report.

Certified concentrations ($\mu\text{g/kg}$):

Congener	Value	Uncertainty (\pm)
PCB 28	68	7
PCB 52	149	20
PCB 101	370	17
PCB 118	454	31
PCB 153	938	40
PCB 180	280	22

Noncertified concentrations ($\mu\text{g/kg}$):

Compound	Value	Compound	Value
4,4'-DDD	175	Mirex	22
4,4'-DDE	234	PCB 44	75
4,4'-DDT	59	PCB 128	104
alpha-Chlordane	20.5	PCB 138 + 163	765
Dieldrin	153	PCB 194	38
gamma-HCH	73		

Order information:

CRM 350 can be purchased for ECU150 per unit (2 g). Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

References:

Community Bureau of Reference (BCR) (1987) BCR CRM 350, chlorobiphenyls in mackerel oil. Certificate of analysis. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium.

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

SRM 1580

Organics in Shale Oil

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for evaluating the reliability of analytical methods for the determination of trace level organic compounds in oil matrices such as shale oil, petroleum crude oils and others. The oil was obtained from shale from the Mahogany Zone of the Colorado Green River Formation. After separation from water and sludge, the oil was centrifuged, filtered and bottled.

Certified concentrations ($\mu\text{g/g}$):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
2,6-Dimethylphenol	175	30	Pyrene	104	18
Benzo[a]pyrene	21	6	Perylene	3.4	2.2
Benzo[e]pyrene	18	8	Phenol	407	50
Benzo[f]quinoline	16	4	o-Cresol	385	50
Fluoranthene	54	10			

Noncertified concentrations ($\mu\text{g/g}$):

Compound	Value	Compound	Value
2,4-Dimethylphenol	380	m-Cresol	330
2,5-Dimethylphenol	320	p-Cresol	270
2,4,6-Trimethylphenol	120	Phenanthridine	45
2,5,6-Trimethylphenol	360		

Order information:

SRM 1580 can be purchased for US\$291 per unit (5 2-mL). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1980) SRM 1580. Organics in shale oil. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1581

Polychlorinated Biphenyls in Oil

National Institute of Standards and Technology (USA)

Description:

This SRM is intended primarily for calibrating instrumentation and validating methodology used in the determination of polychlorinated biphenyl mixtures (PCBs) in motor and transformer oils. These PCBs are present at Aroclor 1242 and 1260.

Certified concentrations ($\mu\text{g/g}$):

Matrix	Aroclor type	Value	Uncertainty (\pm)
Motor oil	1242	100	1
Motor oil	1260	100	2
Transformer oil	1242	100	1
Transformer oil	1260	100	3

Order information:

SRM 1581 can be purchased for US\$236 per unit (4 ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1990) SRM 1581. Polychlorinated biphenyls in oils. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1582

Petroleum Crude Oil

National Institute of Standards and Technology (USA)

Description:

Petroleum crude oil from the US Environmental Protection Agency's repository at the Oak Ridge National Laboratory, Oak Ridge, TN, USA, was homogenized and transferred to amber glass ampoules.

Certified concentrations ($\mu\text{g/g}$):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
Benz[a]anthracene	3.0	0.3	Fluoranthene	2.5	0.3
Benzo[a]pyrene	1.1	0.3	Phenanthrene	101	5
Dibenzothiophene	33	2	Perylene	31	3

Noncertified concentrations ($\mu\text{g/g}$):

Compound	Value	Compound	Value
Benzo[e]pyrene	3.5	Indeno[1,2,3-cd]pyrene	0.17
Benzo[ghi]perylene	1.7	Phenol	0.3
Carbazole	3.4	Pyrene	7
o-Cresol	0.5		

Order Information:

SRM 1582 can be purchased for US\$308 per unit (5 2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1984) SRM 1582. Petroleum crude oil. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1588

Organics in Cod Liver Oil

National Institute of Standards and Technology (USA)

Description:

The cod liver oil was donated to NIST by the University of Ulm, Germany. All the compounds were naturally present in the oil.

Certified concentrations (ng/g unless noted):

Compound	Value	Uncertainty (\pm)	Compound	Value	Uncertainty (\pm)
Hexachlorobenzene	148	21	4,4'-DDT	529	45
alpha-HCH	86	19	PCB 101	129	5
trans-Chlordane	50	13	PCB 138	261	29
cis-Chlordane	158	8	PCB 153	276	40
trans-Nonachlor	209	11	PCB 170	45	5
Dieldrin	150	12	PCB 180	107	4
4,4'-DDD	277	15	alpha-Tocopherol		
4,4'-DDE	641	62	(μ g/g)	112	5
2,4'-DDT	156	5			

Order information:

SRM 1588 can be purchased for US\$262 per unit (5 2-mL ampoules). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1989) SRM 1588. Organics in cod liver oil. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1616a and SRM 1917a

Sulfur in Kerosine

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in the determination of total sulfur in fuel oils or materials of similar matrix. It consists of 100 mL of a regular grade kerosine suitable for use in flue-connected burner appliances and for use in wick-fed illuminating lamps as described in ASTM D 3699-92 Specification for Kerosine.

Certified concentration (%):

	Element	Value	Uncertainty (\pm)
SRM 1616a	S	0.01462	0.00018
SRM 1617a	S	0.17307	0.00034

Order information:

No price information is available. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) SRM 1616a. Sulfur in kerosine. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 1617a. Sulfur in kerosine. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1618

Vanadium and Nickel in Residual Fuel Oil

National Institute of Standards and Technology (USA)

Description:

SRM 1618 consists of commercial No. 6 residual fuel oil as defined by the American Society for Testing and Materials.

Certified concentrations ($\mu\text{g/g}$):

Element	Value	Uncertainty (\pm)
V	423.1	3.4
Ni	75.2	0.4

Order Information:

SRM 1618 can be purchased for US\$174 per unit (100 mL). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1985) SRM 1618. Vanadium and nickel in residual fuel oil. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1634c

Trace Elements in Fuel Oil

National Institute of Standards and Technology (USA)

Description:

SRM 1634c is a commercial "No. 6" residual fuel oil as defined by the American Society for Testing and Materials (ASTM). This SRM is intended for use in the evaluation of methods used in the analysis of fuel oils and other materials with similar matrices. The certified values are based on at least 1 g sample which is the minimum amount that should be used for analysis. Supplemental information on the physical properties of this SRM can be found on the certificate of analysis.

Certified mass fractions (w_B in mg/kg):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
V	28.19	0.40	As	0.1426	0.0064
Co	0.1510	0.0051	Se	0.1020	0.0038
Ni	7.54	0.21			

Noncertified mass fractions (w_B in mg/kg):

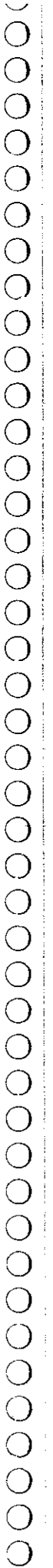
Element	Value	Element	Value
Na	37	Cl	45
S (%)	2	Ba	1.8

Order Information:

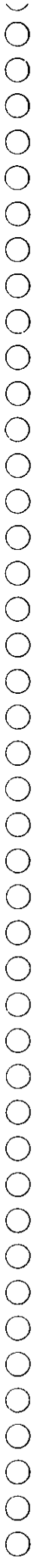
No price information was available as of this writing. Please contact NIST.

Reference:

National Institute of Standards and Technology (1995) SRM 1634c. Trace elements in fuel oil. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

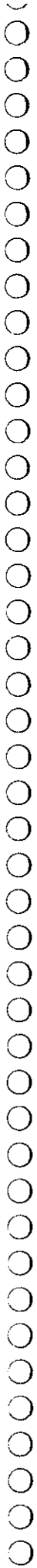


PHYSICAL PROPERTIES



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CRM 066 through 132

Particle Size Distribution

Community Bureau of Reference (Belgium)

Description:

For each reference material, the distribution is expressed as the curve of the cumulative mass of particles undersize versus particle size. For sieves, for example, this is the mass fraction of particles which passes through a particular sieve. In the case of particles less than 90µm diameter, the particle size is expressed as the equivalent Stokes diameter determined from the settling rate of particles in a viscous fluid. For larger particles, the equivalent volume diameter determined by sieving was preferred.

Certified property:

Standard	Material	Property	Size range (µm)	
CRM 066	Quartz powder	Stokes diameter	0.35 -	3.50
CRM 067	Quartz powder	Stokes diameter	2.4 -	32.0
CRM 068	Quartz sand	Volume diameter	160 -	630
CRM 069	Quartz powder	Stokes diameter	14 -	90
CRM 070	Quartz powder	Stokes diameter	1.2 -	20
CRM 130	Quartz powder	Volume diameter	50 -	220
CRM 131	Quartz powder	Volume diameter	480 -	1800
CRM 132	Quartz gravel	Volume diameter	1400 -	5000

Order information:

CRM 066, 067, 069 and 070 are available in 10-g bottles, CRM 068, 130, 131 and 132 are available in 100-, 200-, 450- and 700-g bottles respectively. All these CRMs can be purchased for ECU150 per unit. Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 165 - 167

Latex Spheres of Certified Size

Community Bureau of Reference (Belgium)

Description:

These standards are suspensions of latex spheres in aqueous solutions of stabilizers. Each standard has a very narrow size distribution of spheres, approximately 99% of the spheres are within $\pm 2\%$ of the certified diameter.

Certified diameter (μm):

Standard	Diameter	Uncertainty (\pm)
CRM 165	2.223	0.013
CRM 166	4.821	0.019
CRM 167	9.475	0.018

Order Information:

CRM 165 through CRM 167 can be purchased for ECU100 per unit (1 vial) respectively. Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

CRM 169 - 175

Certified Surface Area

Community Bureau of Reference (Belgium)

Description:

These standards are mineral particulate material with certified surface area determined using the Nitrogen BET Method.

Surface area (m²/g):

Standard	Material	Specific surface area	Uncertainty (±)	Unit size
CRM 169	Alpha alumina	0.104	0.012	60
CRM 170	Alpha alumina	1.05	0.05	60
CRM 171	Alumina	2.95	0.13	50
CRM 172	Quartz	2.56	0.10	10
CRM 173	Rutile titania	8.23	0.21	46
CRM 175	Tungsten	0.181	0.013	200

Order information:

CRM 169 through CRM 175 can be purchased for ECU100 per unit. Price includes handling and normal postage within the European Union except when special handling is required. Price subject to change without notice. Please contact BCR.

Reference:

Community Bureau of Reference (BCR) (1994) Reference Materials. Community Bureau of Reference, Commission of the European Communities, Directorate General for Science, Research and Development, 200 rue de la Loi, B-1049 Brussels, Belgium. 86 pp.

M11-01 - M11-08

Surface Area

Laboratory of the Government Chemist (UK)

Description:

These CRMs are certified for surface area.

Available materials:

Material	Specific surface area (m ² /g)	LGC number	Unit size (g)
α -Alumina	0.0686	M11-07	50
α -Alumina	0.229	M11-06	50
α -Alumina	0.692	M11-08	50
α -Alumina	2.09	M11-05	50
Graphitised carbon black	11.1	M11-01	10
Graphitised carbon black	71.3	M11-02	10
Non-porous silica	152.5	M11-03	10
Meso-porous silica	260.4	M11-04	10

Order Information:

These samples are for purchase for £95 per unit. Price subject to change without notice. Please contact LGC.

Reference:

Laboratory of the Government Chemist (1991) Certified Reference Materials. Issue No. 2. Office of Reference Materials, Laboratory of the Government Chemist, Queen's Road, Teddington, Middlesex TW11 0LY, England.

SRM 473, 475 - 476

Optical Microscope Linewidth Measurement Standards

National Institute of Standards and Technology (USA)

Description:

These SRMs are for use in calibrating optical microscopes used to measure the widths of opaque lines and clear spaces on integrated circuit photomasks. They can also be used to calibrate line spacings and line-to-space ratios. The accuracy of a measured linewidth or line spacing is ± 0.5 μm or better. They are not for use with partially transmitting materials, in reflected light with opaque materials, or in a scanning electron microscope. These SRMs consist of patterns of clear and opaque lines with nominal dimensions ranging from 0.9 to 10.8 μm and line spacing patterns ranging from 2 to 36 μm . SRM 473 and SRM 475 are made with anti-reflective chromium on a borosilicate glass substrate. SRM 476 is made with bright chromium.

Order information:

SRM 473, 475, and 476 can be purchased for US\$6130, 6361, and 4722 respectively. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1990) Certificate, SRM 476, Optical microscope linewidth measurement standard. National Institute of Standards and Technology, Gaithersburg, MD.

National Institute of Standards and Technology (1992) Certificate, SRM 473, Optical microscope linewidth measurement standard. National Institute of Standards and Technology, Gaithersburg, MD.

National Institute of Standards and Technology (1992) Certificate, SRM 475, Optical microscope linewidth measurement standard. National Institute of Standards and Technology, Gaithersburg, MD.

SRM 484f

Scanning Electron Microscope Magnification Standard

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in calibrating the scanning electron microscope magnification scale within the range of 1000X to 20,000X. Each SRM bears an identification number and has been individually measured. SRM 484f consists of thin gold layers separated by layers of nickel of nominal thicknesses of 0.5, 0.5, 1, 3, and 5 μm mounted such that the layers are viewed in cross-section. The gold layers appear as thin gold lines in a nickel substrate. The SRM is mounted in copper-filled epoxy within a cylinder of 304 stainless steel. The certified region of each SRM is located relative to a the Knoop indentation. A diagram of this SRM is included in the certificate of analysis.

Certified distances (μm):

Line pair	Nominal spacing	Uncertainty (\pm)
0 -> 1	0.5	0.021
1 -> 2	0.5	0.020
2 -> 3	1	0.026
3 -> 4	3	0.035
4 -> 5	5	0.052
(0 -> 5)	(10)	(0.100)

The 0 -> 5 line pair value is for information purposes only.

Order information:

No price information was available as of this writing. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) SRM 484f. Scanning electron microscope magnification standard. Certificate of Analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 659

Particle Size Distribution Standard for Sedigraph Calibration

National Institute of Standards and Technology (USA)

Description:

The SRM is a silicon nitride powder intended for use in the calibration and evaluation of equipment used to measure particle size distribution in the 0.2 to 10 μm range. It consists of 2.5 g of powder under argon in a glass vial sealed in a mylar pouch. The particle properties used for selection criteria of a particular silicon nitride powder were size, shape and degree of primary aggregation of the particles. The selected powder has equiaxed primary particles with a mean dimension of approximately 1 μm and a minimal amount of large agglomerates.

Certified size distribution:

Cumulative weight percentile	Value (μm)	Uncertainty
10	0.48	0.10
25	0.81	0.10
50	1.43	0.10
75	2.08	0.11
90	2.80	0.13

Order information:

SRM 659 can be purchased for US\$207 per unit (5 vials). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) Certificate, SRM 659. Particle size distribution standard for sedigraph calibration. Certificate of Analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1003b through 1019a

Glass Spheres and Beads

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended for use in calibrating equipment and in evaluating methods for measuring particle size.

Diameter (μm):

SRM	Diameter	Sieve No.	Cost (US\$)	Wt./unit (g)
1003b	6-60	-	150	25
1004a	40-104	-	146	70
1017b	100-400	140-45	272	-
1018b	225-780	60-25	-	-
1019a	760-2160	20-10	-	200

Order information:

Cost and unit size are listed above. Not all information available at the time of writing. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1984) SRM 1019a. Glass spheres for calibrating test sieves. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1003b. Calibrated glass beads. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1004a. Calibrated glass beads. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1995) SRM 1017b. Glass spheres for calibrating test sieves. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 1690 through 1965

Polystyrene Spheres

National Institute of Standards and Technology (USA)

Description:

These SRMs are intended for use as primary particle size reference standards for the calibration of particle size measuring instruments including optical and electron microscopes, and flow-through counters. They are suspensions of polystyrene spheres in water at a weight concentration of 0.25-5% with 50 µg/g sodium azide (NaN_3) added as a biocide. SRM 1965 is a microscope slide with two different groupings of SRM 1960 spheres permanently deposited on the surface and sealed in an air chamber. The groupings are a hexagonal array and unordered clusters. SRM 1690 was manufactured aboard the NASA orbiter CHALLENGER during the STS-6 mission in 1983. It is the first space-manufactured material made available for sale.

Diameter (µm):

	Diameter	Uncertainty (±)		Diameter	Uncertainty (±)
SRM 1690	0.895	0.008	SRM 1961	29.64	0.06
SRM 1691	0.269	0.007	SRM 1963	0.1007	0.0020
SRM 1692	2.982	0.016	SRM 1965	9.94	0.04
SRM 1960	9.89	0.04			

Order Information:

These SRMs can be purchased for between US\$375 to 785 per unit (5-mL vials), and SRM 1965 can be purchased for US\$120. Price subject to change without notice. Please contact NIST.

References:

National Institute of Standards and Technology (1985) SRM 1960. Nominal 10-µm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1993) SRM 1963. Nominal 0.1-µm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1987) SRM 1961. Nominal 30-µm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1987) SRM 1965. Microsphere slide (10-µm polystyrene spheres). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1982) SRM 1690. Nominal One-µm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 1690 through 1965 (cont.)

National Institute of Standards and Technology (1984) SRM 1691. Nominal 0.3 μm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

National Institute of Standards and Technology (1991) SRM 1692. Nominal 3- μm diameter polystyrene spheres. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

SRM 2135b

Depth Profiling

National Institute of Standards and Technology (USA)

Description:

This SRM is intended for use in calibrating equipment used to measure sputtered depth and erosion rates in surface analysis. It consists of nine alternating metal thin-film layers - five layers of pure chromium and four of pure nickel - on a substrate of pure polished silicon. It is certified for total chromium and total nickel thickness, for individual layer uniformity, for Ni/Cr bi-layer uniformity, and for individual layer thickness.

Order Information:

No price information was available as of this writing. Please contact NIST.

Reference:

Trahey, N. M. (ed.) (1995) NIST Standard Reference Materials Catalog 1995-96. NIST Spec. Pub. 260. National Institute of Standards and Technology, Gaithersburg, MD, USA. 167 pp.

ROCKS



**R
O
C
K
S**



AC-E

Granite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

AC-E is Ailsa Craig granite from southwest Scotland. The material contains significant amounts of light and heavy rare earths elements.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.22	Fe ₂ O ₃ (%)	1.34	Ce	154
H ₂ O ⁻ (%)	0.15	Co	0.2	Pr	22.2
Li	93	Ni	1.5	Nd	92
Be	12	Cu	4	Sm	24.2
B	21	Zn	224	Eu	2
F (%)	0.21	Ga	39	Gd	26
Na ₂ O (%)	6.54	As	2.3	Tb	4.8
MgO (%)	0.03	Rb	152	Dy	29
Al ₂ O ₃ (%)	14.70	Sr	3	Ho	6.5
SiO ₂ (%)	70.35	Y	184	Er	17.7
P ₂ O ₅ (%)	0.014	Zr	780	Tm	2.6
K ₂ O (%)	4.49	ZrO ₂ (%)	0.108	Yb	17.4
CaO (%)	0.34	Nb	110	Lu	2.45
Sc	0.11	Mo	2.5	Hf	27.9
TiO ₂ (%)	0.11	Cd	0.6	Th	18.5
V	3	Sn	13	Ta	8.4
Cr	3.4	Sb	0.4	W	1.5
MnO (%)	0.058	Cs	3	Pb	39
FeO (%)	1.07	Ba	55	U	4.6
		La	59	LOI (%)	0.37

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
CO ₂ (%)	0.07
S	70
Cl	180
Br	0.5
Ag	0.1
Tl	0.9
Bi	0.4

Order information:

AC-E is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. AC-E is

AC-E (cont.)

Govindaraju at Geostandards. Membership dues subject to change without notice. AC-E is packaged in 30-g units.

References:

Govindaraju, K. (1987) 1987 Compilation report on Ailsa Craig granite AC-E with the participation of 128 GIT-IWG laboratories. Geostand. Newsletter, 11(2):203-55.

Potts, J. P., and J. R. Holbrook (1987) Ailsa Craig - the history of a reference material. Geostand. Newsletter, 11(2):257-60.

AGV-1

Andesite

US Geological Survey (USA)

Description:

AGV-1 is an andesite from the east wall of Guano Valley, Lake County, Oregon, USA. (Flanagan, 1967). Values for elemental concentrations have been calculated by Abbey (1983) and Gladney *et al.* (1983) using the results of various analysts. Those calculated by Gladney *et al.* (1983) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Li	12	2	Ag (ng/g)	104	30
Be	2.0	0.4	Cd (ng/g)	61	8
B	7	4	In (ng/g)	41	6
O (%)	47.23	0.35	Sn	4.2	1.1
F	420	50	Sb	4.4	0.4
Na (%)	3.15	0.09	I (ng/g)	260	30
Mg (%)	0.922	0.058	Te (ng/g)	2.2	0.3
Al (%)	9.07	0.18	Cs	1.26	0.12
Si (%)	27.67	0.27	Ba	1221	16
P	2100	120	La	38	3
Cl	120	26	Ce	66	6
K (%)	2.41	0.80	Pr	6.5	0.9
Ca (%)	3.53	0.10	Nd	34	5
Sc	12.1	0.9	Sm	5.9	0.5
Ti	6340	300	Eu	1.66	0.11
V	123	12	Gd	5.2	0.6
Cr	12	3	Tb	0.71	0.10
Mn	740	60	Dy	3.8	0.4
Fe (%)	4.73	0.13	Ho	0.73	0.08
Co	15.1	1.2	Er	1.61	0.22
Ni	17	4	Tm	320	50
Cu	60	6	Yb	1.67	0.17
Zn	88	2	Lu (ng/g)	280	30
Ga	20	3	Hf	5.1	0.4
Ge	1.25	0.13	Ta	0.92	0.12
As	0.84	0.27	W	0.53	0.09
Br (ng/g)	340	170	Re (ng/g)	0.38	-
Rb	67	1	Os (ng/g)	<0.02	-
Sr	662	9	Au (ng/g)	0.62	0.11
Y	21	6	Hg (ng/g)	20	9
Zr	225	18	Tl	0.7	0.5
Nb	15	3	Pb	36	5
Mo	3	1	Bi (ng/g)	54	4
Ru (ng/g)	<4000	-	Th	6.50	0.37
Rh (ng/g)	<5	-	U	1.89	0.25

Major and minor oxide concentrations (%):

Component	Mean	Uncertainty (\pm)	Component	Mean	Uncertainty (\pm)
H ₂ O ⁺	0.80	0.18	FeO	2.06	0.11
H ₂ O ⁻	1.01	0.21	Fe ₂ O ₃	4.47	0.22

Order information:

AGV-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Flanagan, F. J. (1967) US Geological Survey silicate rock standards. Geochim. Cosmochim. A., 31:289-308.

Gladney, E. S., C. E. Burns, and I. Roelandts (1983) 1982 Compilation of elemental concentrations in eleven United States Geological Survey rock standards. Geostands. Newsletter, 7(1):3-226.

AK

Aragonite

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 45% aragonite, 54% calcite, with accessory levels of minerals (quartz, fluorite, dolomite, potassium feldspar, and others) at 1%. The granulometric composition is: larger than 0.090 mm, 2.6%; 0.071 to 0.090 mm, 2.1%; 0.040 to 0.071 mm, 3.8%; and smaller than 0.040 mm, 91.5%. The material was prepared in 1981. Minimum sample amount recommended is 0.1 g.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
H ₂ O ⁺	3235	1650	Mn	25.7	3.3
Li	3.9	2.68	Fe ₂ O ₃ (%)	0.130	0.017
Be	34	17.25	Co	1	0.39
CO ₂ (%)	43.0	0.4	Cu	4.5	2.38
F (%)	0.20	0.02	Zn	20.6	7.0
Na ₂ O (%)	0.047	0.007	As	11	5.5
MgO (%)	0.11	0.009	Pb	14	3.2
Al ₂ O ₃ (%)	0.11	0.03	SrO (%)	0.28	0.03
SiO ₂ (%)	0.64	0.06	Zr	40	5.75
P ₂ O ₅ (%)	0.029	0.004	Sb	0.1	0.088
S (%)	0.046	0.011	Cs	0.46	0.4
K ₂ O (%)	0.037	0.006	Ba	31	15
CaO (%)	54.9	0.4	Sm	0.23	0.2
Sc	0.16	0.1	Pb	30	8.6
Ti	23	12	U	1.67	1.3
Cr	1.8	1.0	LOI (%)	43.27	

Order Information:

AK can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

Reference:

Institute of Mineral Raw Materials (1986?) Aragonite AK. Certificate. ST SEV 5365-85. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breitländer, Hamm, Germany.)

AL-I

Albite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The material used for AL-I comes from Pinzele, Italy, and consists of large albite lenses in green schist-facies metamorphic terrains. Mineralogically, the rock consists of albite (more than 96%), chlorite, and epidote. Quartz-banded albite is also present. The material was cleaned, broken, crushed and packaged. Details of the collection, preparation and calculation of recommended and proposed values can be found in Govindaraju (1995).

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.29	Cr	2	La	9.5
H ₂ O ⁻ (%)	0.06	MnO (%)	0.004	Ce	21
Li	1	FeO (%)	0.04	Nd	10.4
Be	2.7	Fe ₂ O ₃ (%)	0.03	Sm	2.8
F	45	Co	0.2	Eu	0.19
Na ₂ O (%)	10.59	Ni	2	Gd	1.9
MgO (%)	0.035	Cu	3	Tb	0.3
Al ₂ O ₃ (%)	18.59	Zn	6	Dy	1.5
SiO ₂ (%)	69.34	Ga	20	Hb	0.28
P ₂ O ₅ (%)	0.038	As	0.8	Er	0.6
S	85	Pb	5.8	Tm	0.1
Cl	110	Sr	80	Yb	0.7
K ₂ O (%)	0.14	Y	6.8	Lu	0.13
CaO (%)	0.384	Zr	40	Hf	2.6
Sc	1.75	Nb	1.6	Th	9.5
TiO ₂ (%)	0.012	Sb	0.2	Ta	1.9
V	2	Cs	0.34	Pb	4.5
		Ba	85	U	5.8

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Ga	1.4	In	0.01	W	0.2
Mo	0.1	Sn	0.4	Tl	0.04
Cd	0.03	Pr	2.8	Bi	0.03

Order information:

AL-I is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. AL-I is packaged in 30-g units.

AL-I (cont.)

Reference:

Govindaraju, K. (1995) Update (1984-1995) on two GIT-IWG geochemical reference samples: albite from Italy, AL-I and iron formation sample from Greenland, IF-G. Geostand. Newsletter, 19(1):55-96.

AN-G

Anorthosite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The material for this CRM was collected from the stratified basic complex of Fiskenaasset, Western Greenland.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.61	V	70	Ce	4.7
H ₂ O ⁻ (%)	0.11	Cr	50	Pr	0.6
Li	12.5	MnO (%)	0.04	Nd	2.4
Be	0.3	FeO (%)	2.24	Sm	0.7
CO ₂ (%)	0.13	Fe ₂ O ₃ (%)	0.87	Eu	0.37
F	120	Co	25	Gd	0.9
F (%)	0.012	Ni	35	Tb	0.2
Na ₂ O (%)	1.63	Cu	19	Dy	1.2
MgO (%)	1.80	Zn	20	Ho	0.28
Al ₂ O ₃ (%)	29.80	Ga	18	Er	0.75
SiO ₂ (%)	46.30	As	0.2	Tm	0.14
P ₂ O ₅ (%)	0.01	Rb	1	Yb	0.8
Cl	300	Sr	76	Lu	0.12
K ₂ O (%)	0.13	Y	9	Hf	0.38
CaO (%)	15.90	Zr	11	Ta	0.18
Sc	10	Cs	0.05	W	105
TiO ₂ (%)	0.22	Ba	34	Pb	2
		La	2.2		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
S	140	Cd	0.08	Hg	0.04
Se	0.06	Sn	1.4	Tl	0.02
Nb	0.7	Sb	0.1	U	0.12
Mo	0.2	Au	0.0018		

Order information:

AN-G is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. AN-G is packaged in 30-g units.

AN-G (cont.)

Reference:

Govindaraju, K., and I. Roelandts (1993) Second report (1993) on the first three GIT-IWG rock reference samples: anorthosite from Greenland, AN-G; basalte d'Essey-la-Côte, BE-N; granite de Beauvoir, MA-N. Geostand. Newsletter, 17(2):227-94.

BCS-CRM 309

Sillimanite

Bureau of Analysed Samples Ltd. (UK)

Description:

No information available.

Certified concentrations (percent dry weight):

Component	Value	Component	Value
Na ₂ O	0.34	K ₂ O	0.46
MgO	0.17	CaO	0.22
Al ₂ O ₃	61.1	TiO ₂	1.92
SiO ₂	34.1	Fe ₂ O ₃	1.51

Noncertified concentration (percent dry weight):

Component	Value
Li ₂ O	0.01
MnO	0.03
SrO	0.003
BaO	0.006
LOI	0.1

Order Information:

BCS-CRM 309 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

Reference:

Bureau of Analyzed Samples Ltd. (1995) Certified reference materials. Catalog. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 319

Sillimanite

Bureau of Analysed Samples Ltd. (UK)

Description:

No information available.

Certified concentrations (percent dry weight):

Component	Value	Component	Value
Na ₂ O	0.009	TiO ₂	0.03
Al ₂ O ₃	0.97	MnO	0.14
SiO ₂	1.55	Fe ₂ O ₃	4.63
CaO	2.28		

Noncertified concentration (percent dry weight):

Component	Value
Li ₂ O	0.02
B ₂ O ₃	0.10
MgO	90.6
K ₂ O	< 0.01
Cr ₂ O ₃	0.02

Order Information:

BCS-CRM 309 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

Reference:

Bureau of Analyzed Samples Ltd. (1995) Certified reference materials. Catalog. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 348

Ball Clay

Bureau of Analysed Samples Ltd. (UK)

Description:

No information available.

Certified concentrations (percent dry weight):

Component	Value	Component	Value
Na ₂ O	0.344	CaO	0.173
MgO	0.305	TiO ₂	1.08
Al ₂ O ₃	31.59	Cr ₂ O ₃	0.016
SiO ₂	51.13	Fe ₂ O ₃	1.04
P ₂ O ₅	0.071	LOI	11.75
K ₂ O	2.23		

Noncertified concentration (percent dry weight):

Component	Value
ZrO ₂	0.03
BaO	0.04

Order Information:

BCS-CRM 348 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

Reference:

Bureau of Analyzed Samples Ltd. (1995) Certified reference materials. Catalog. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 375

Soda Felspar

Bureau of Analysed Samples Ltd. (UK)

Description:

The material was crushed to pass through a 125 μm sieve (120 mesh) and passed through a magnetic separator.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na_2O (%)	10.4	Fe_2O_3 (%)	0.12
Al_2O_3 (%)	19.8	Ni	5
SiO_2 (%)	67.1	Cu	2
K_2O (%)	0.79	Zn	13
CaO (%)	0.89	Sr	65
TiO_2 (%)	0.38	Rb	47
Cr	24	Pb	9
Mn	20		

Noncertified concentration (percent dry weight):

Component	Value
MgO	0.05
LOI	0.39

Order Information:

BCS-CRM 375 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

References:

Bureau of Analyzed Samples Ltd. (1972) BCS-CRM No. 375. Soda felspar. Certificate of analyses. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

Bureau of Analyzed Samples Ltd. (1989) BCS-CRM No. 368 Dolomite, BCS-CRM No. 375 Soda Feldspar, BCS-CRM No. 376 Potash Feldspar, BCS-CRM No. 389 High Purity Magnesite, BCS-CRM No. 395 Bauxite. Supplementary information regarding trace element content. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 376

Potash Felspar

Bureau of Analysed Samples Ltd. (UK)

Description:

The material was ground to pass through a 150 μm sieve (100 mesh) and passed through a magnetic separator.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na ₂ O (%)	2.83	Mn	18
Al ₂ O ₃ (%)	17.7	Fe ₂ O ₃ (%)	0.10
SiO ₂ (%)	67.1	Ni	< 5
K ₂ O (%)	11.2	Cu	5
CaO (%)	0.54	Zn	5
TiO ₂ (%)	< 0.02	Pb	369
Cr	< 4	Sr	55
		Pb	62

Noncertified concentration (percent dry weight):

Component	Value
MgO	0.03
LOI	0.35

Order Information:

BCS-CRM 376 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

References:

Bureau of Analyzed Samples Ltd. (1972) BCS-CRM No. 376. Potash felspar. Certificate of analyses. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

Bureau of Analyzed Samples Ltd. (1989) BCS-CRM No. 368 Dolomite, BCS-CRM No. 375 Soda Feldspar, BCS-CRM No. 376 Potash Feldspar, BCS-CRM No. 389 High Purity Magnesite, BCS-CRM No. 395 Bauxite. Supplementary information regarding trace element content. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 389

High-purity Magnesite

Bureau of Analysed Samples Ltd. (UK)

Description:

The material for this CRM was graded to pass through a 150 μm sieve (100 mesh) and passed through a magnetic separator.

Certified concentrations (percent dry weight unless noted):

Component	Value	Component	Value
B ₂ O ₃	0.029	Fe ₂ O ₃	0.29
Na ₂ O	0.11	Cr ($\mu\text{g/g}$)	1765
Al ₂ O ₃	0.23	Cr ₂ O ₃	0.28
SiO ₂	0.89	Ni ($\mu\text{g/g}$)	12
S	0.007	Cu ($\mu\text{g/g}$)	3
CaO	1.66	Zn ($\mu\text{g/g}$)	5
TiO ₂	0.015	Sr ($\mu\text{g/g}$)	10
Mn ($\mu\text{g/g}$)	48	Pb ($\mu\text{g/g}$)	< 7
MnO	0.008		

Noncertified concentrations (percent dry weight):

Component	Value
Li ₂ O	< 0.02
MgO	96.7
K ₂ O	< 0.01

Order Information:

BCS-CRM 389 can be purchased for £54 per unit (100 g). Price subject to change without notice. Please contact BAS.

References:

Bureau of Analyzed Samples Ltd. (1975) BCS-CRM No. 389. High-purity magnesite. Certificate of analyses. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

Bureau of Analyzed Samples Ltd. (1989) BCS-CRM No. 368 Dolomite, BCS-CRM No. 375 Soda Feldspar, BCS-CRM No. 376 Potash Feldspar, BCS-CRM No. 389 High Purity Magnesite, BCS-CRM No. 395 Bauxite. Supplementary information regarding trace element content. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 393

Limestone

Bureau of Analysed Samples Ltd. (UK)

Description:

Derbyshire limestone was used for this reference material. It was ground to pass through a 75 μm sieve (200 mesh) and passed through a magnetic separator.

Certified concentrations (percent dry weight):

Component	Value	Component	Value
MgO	0.15	TiO ₂	0.009
Al ₂ O ₃	0.12	MnO	0.010
SiO ₂	0.70	Fe ₂ O ₃	0.045
S	0.007	SrO	0.019
K ₂ O	0.02	BaO	0.006
CaO	55.4	LOI	43.4

Noncertified concentrations (percent dry weight):

Component	Value
Na ₂ O	< 0.03
P ₂ O ₅	0.01

Order Information:

BCS-CRM 393 can be purchased for £54 per unit (100 g). Price subject to change without notice. Please contact BAS.

Reference:

Bureau of Analyzed Samples Ltd. (1984) BCS-CRM No. 393. Limestone. Certificate of analyses.
Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BCS-CRM 395

Bauxite

Bureau of Analysed Samples Ltd. (UK)

Description:

The material was ground to pass through a 150 μm sieve (100 mesh) and passed through a magnetic separator.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
MgO (%)	0.02	Fe ₂ O ₃ (%)	16.3
Al ₂ O ₃ (%)	52.4	Ni	34
SiO ₂ (%)	1.24	Cu	21
CaO (%)	0.05	Zn	43
TiO ₂ (%)	1.93	Sr	23
Cr	453	Pb	28
Mn	42		

Order Information:

BCS-CRM 395 can be purchased for £39 per unit (100 g). Price subject to change without notice. Please contact BAS.

References:

Bureau of Analyzed Samples Ltd. (1989) BCS-CRM No. 395. Bauxite. Certificate of analyses. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

Bureau of Analyzed Samples Ltd. (1989) BCS-CRM No. 368 Dolomite, BCS-CRM No. 375 Soda Feldspar, BCS-CRM No. 376 Potash Feldspar, BCS-CRM No. 389 High Purity Magnesite, BCS-CRM No. 395 Bauxite. Supplementary information regarding trace element content. Bureau of Analyzed Samples Ltd., Newham Hall, Newby, Middlesbrough, Cleveland, England.

BE-N

Basalt

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The material for this CRM was collected at an old volcano near Essey-la-Côte, near Nancy, Meurthe et Moselle, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	2.24	MnO (%)	0.20	Pr	17.5
H ₂ O ⁻ (%)	0.50	FeO (%)	6.74	Nd	67
Li	13	Fe ₂ O ₃ (%)	5.34	Sm	12.2
Be	1.9	Co	60	Eu	3.6
CO ₂ (%)	0.74	Ni	267	Gd	9.7
F	1000	Cu	72	Tb	1.3
Na ₂ O (%)	3.18	Zn	120	Dy	6.4
MgO (%)	13.15	Ga	17	Hb	1.1
Al ₂ O ₃ (%)	10.07	As	1.8	Er	2.5
SiO ₂ (%)	38.20	Pb	47	Tm	0.34
P ₂ O ₅ (%)	1.05	Sr	1370	Yb	1.8
K ₂ O (%)	1.39	Y	30	Lu	0.24
CaO (%)	13.87	Zr	260	Hf	5.6
Sc	22	Nb	105	Ta	5.7
TiO ₂ (%)	2.61	Sn	2	W	29
V	235	Cs	0.8	Pb	4
Cr	360	Ba	1025	Th	10.4
		La	82	U	2.4
		Ce	152		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
S	300	Cd	0.12	Hg	0.04
Cl	200	Sb	0.26	Tl	0.04
Mo	2.4				

Order information:

BE-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. BE-N is packaged in 30-g units.

Reference:

Govindaraju, K., and I. Roelandts (1993) Second report (1993) on the first three GIT-IWG rock reference samples: anorthosite from Greenland, AN-G; basalte d'Essey-la-Côte, BE-N; granite de Beauvoir, MA-N. Geostand. Newsletter, 17(2):227-94.

BHVO-1

Basalt

US Geological Survey (USA)

Description:

A basaltic lava from Kilauea caldera, Kilauea volcano, Hawaii, USA, was collected from the surface layer of the pahoehoe lava that flowed from Halemaumau in the fall of 1919 (19° 25'N, 155° 17.5' W). A complete mineralogical description of this material can be found in Flanagan *et al.* (1976). Values for elemental concentrations have been calculated by Gladney and Goode (1981), Abbey (1982, 1983) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations (µg/g dry weight unless noted):

Component	Value	Uncertainty (±)	Component	Value	Uncertainty (±)
Li	4.6	1.5	Nb	19	2
Be	1.1	0.3	Mo	1.02	0.10
B	2.5	0.6	Ru	<0.46	-
C	98	51	Rh (ng/g)	0.2	-
N	22.6	-	Pd (ng/g)	3.0	0.4
F	385	31	Ag (ng/g)	55	7
Na (%)	1.68	0.05	Cd (ng/g)	69	11
Mg (%)	4.36	0.13	In (ng/g)	180	-
Al (%)	7.30	0.11	Sn	2.1	0.5
Si (%)	23.32	0.25	Sb	0.159	0.036
P	1190	110	Te (ng/g)	6.4	1.6
S	102	7	Cs	0.13	0.06
Cl	92	8	Ba	139	14
K (%)	0.43	0.029	La	15.8	1.3
Ca (%)	8.15	0.12	Ce	39	4
Sc	31.8	1.3	Pr	5.7	0.4
Ti	16220	380	Nd	25.2	2.0
V	317	12	Sm	6.2	0.3
Cr	289	22	Eu	2.06	0.08
Mn	1300	62	Gd	6.4	0.5
Fe (%)	8.55	0.15	Tb	0.96	0.08
Co	45	2	Dy	5.2	0.3
Ni	121	2	Ho	0.99	0.08
Cu	136	6	Er	2.4	0.2
Zn	105	5	Tm (ng/g)	330	40
Ga	21	2	Yb	2.02	0.20
Ge	1.64	-	Lu (ng/g)	291	26
As	0.40	0.22	Hf	4.38	0.22
Se (ng/g)	74	44	Ta	1.23	0.13
Br	0.71	-	W	0.27	0.06
Rb	11	2	Re	<10	-
Sr	403	25	Os	<22	-
Y	27.6	1.7	Ir (ng/g)	4.4	-
Zr	179	21	Pt (ng/g)	2.2	-

BHVO-1 (cont.)

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Au (ng/g)	1.6	0.5	Bi (ng/g)	18	4
Hg (ng/g)	5.6	-	Th	1.08	0.15
Tl (ng/g)	58	12	U	0.42	0.06
Pb	2.6	0.9			

Major and minor oxide concentrations (%):

Component	Value	Uncertainty (\pm)			
H ₂ O ⁺	0.16	0.06	K ₂ O	0.520	0.035
H ₂ O ⁻	0.05	0.01	CaO	11.40	0.17
CO ₂	0.036	0.019	TiO ₂	2.71	0.06
Na ₂ O	2.26	0.07	MnO	0.168	0.008
MgO	7.23	0.22	FeO	8.58	0.09
Al ₂ O ₃	13.80	0.21	Fe ₂ O ₃	2.82	0.24
SiO ₂	49.94	0.54	Cl	0.009	0.001
P ₂ O ₅	0.273	0.025	F	0.038	0.003
			S	0.010	0.001
Component	Value	Uncertainty (\pm)			

Order Information:

BHVO-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Flanagan, F. J., T. L. Wright, S. R. Taylor, C. S. Ansell, R. C. Christian, and J. I. Dinnin (1976) Basalt, BHVO-1, from Kilauea crater, Hawaii. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, p. 33-9. US Government Printing Office, Washington, DC, USA.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

BIR-1

Icelandic Basalt

US Geological Survey (USA)

Description:

This material is basalt from one of the interglacial lava flows known as Reykjavik dolerites. The rock is a coarse-grained olivine tholeiite. Original concentration values for various elements were initially provided by Flanagan (1984). Values for elemental concentrations have been calculated by Abbey (1983), Gladney *et al.* (1983), Flanagan (1986) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	3.4	0.4	Rh (ng/g)	0.35	-
Be	0.58	0.07	Ag (ng/g)	36	-
B	0.33	0.16	Cd (ng/g)	114	38
C	66	24	Sn	0.69	-
F	44	13	Sb	0.58	0.16
Na (%)	1.30	0.08	Te (ng/g)	7	-
Mg (%)	5.84	0.17	Cs	0.45	0.06
Al (%)	8.12	0.27	Ba	7.7	2.2
Si (%)	22.31	0.24	La	0.88	0.33
P	200	120	Ce	2.5	1.1
Cl	26	6	Pr	0.5	0.4
K	220	80	Nd	2.5	0.7
Ca (%)	9.47	0.21	Sm	1.08	0.09
Sc	44	4	Eu	0.54	0.04
Ti	5720	200	Gd	1.9	0.4
V	313	23	Tb (ng/g)	410	50
Cr	382	38	Dy	2.4	0.3
Mn	1320	80	Ho (ng/g)	500	80
Fe (%)	7.87	0.16	Er	1.8	0.3
Co	51.4	3.4	Tm (ng/g)	270	70
Ni	166	16	Yb	1.70	0.19
Cu	126	5	Lu (ng/g)	260	40
Zn	71	9	Hf	0.58	0.06
Ga	16	2	Ta (ng/g)	62	36
Ge	1.45	-	W (ng/g)	0.22	-
As	0.44	0.48	Ir (ng/g)	0.15	-
Se (ng/g)	18	-	Pt (ng/g)	2.8	-
Br	<2	-	Au (ng/g)	1.56	-
Pb	1.0	0.9	Hg (ng/g)	7.3	-
Sr	108	14	Tl (ng/g)	10	-
Y	16	2	Pb	3.2	0.8
Zr	22	7	Bi (ng/g)	20	-
Nb	2.0	0.5	Th	0.89	0.70
Mo	0.5	0.8	U (ng/g)	25	-
Pd (ng/g)	5.6	0.6			

Major and minor oxide concentrations (%):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
H ₂ O ⁺	0.010	0.03	K ₂ O	0.027	0.010
H ₂ O ⁻	0.07	0.02	CaO	13.24	0.29
Na ₂ O	1.75	0.11	TiO ₂	0.96	0.03
MgO	9.68	0.28	MnO	0.171	0.010
Al ₂ O ₃	15.35	0.51	FeO	8.38	0.11
SiO ₂	47.77	0.51	Fe ₂ O ₃	2.08	0.08
P ₂ O ₅	0.046	0.028	CO ₂	0.02	0.01

Order Information:

BIR-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Flanagan, F. J. (1984) Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. U.S. Geol. Survey Prof. Bull. 1623:1-12. U.S. Geological Survey, Reston, VA, USA.

Flanagan, F. J. (1986) Additions and corrections for USGS Bulletin 1623, Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. Open file report 86-220. U.S. Geological Survey, Reston, VA, USA.

Gladney, E. S., C. E. Burns, and I. Roelandts (1983) 1982 Compilation of elemental concentrations in eleven United States Geological Survey rock standards. Geostands. Newsletter, 7(1):3-226.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BIR-1, DNC-1 and W-2. Geostand. Newsletter, 12(1):63-118.

BR

Basalt

Centre de Recherches Pétrographiques et Géochimiques (France)

Description:

The material for BR was collected at Essey-la-Côte, near Nancy, Meurthe et Moselle, France, at an old volcanic site. A replacement material collected at the same location is currently under preparation.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	2.30	MnO (%)	0.20	Pr	17
H ₂ O ⁻ (%)	0.50	FeO (%)	6.57	Nd	65
Li	13	Fe ₂ O ₃ (%)	5.58	Sm	12.2
Be	1.5	Co	52	Eu	3.7
CO ₂ (%)	0.86	Ni	260	Gd	9.5
F	1000	Cu	72	Dy	6.4
Na ₂ O (%)	3.05	Zn	160	Ho	1.1
MgO (%)	13.28	Ga	19	Er	2.5
Al ₂ O ₃ (%)	10.20	Rb	47	Tm	0.3
SiO ₂ (%)	38.20	Sr	1320	Yb	1.8
P ₂ O ₅ (%)	1.04	Y	30	Lu	0.25
K ₂ O (%)	1.40	Zr	260	Hf	5.6
CaO (%)	13.80	Nb	98	Ta	6.2
Sc	25	Mo	2.4	W	1.3
TiO ₂ (%)	2.60	Cs	0.8	Pb	5
V	235	Ba	1050	Th	11
Cr	380	La	82	U	2.5
		Ce	151		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
B	8	Ge	1.2	Sb	0.2
S	390	Cd (ng/g)	150	Tb	1.25
Cl	350	In	0.08	Tl (ng/g)	50
As	2	Sn	2	LOI (%)	3

Order Information:

BR is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France). Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. BR is packaged in 10-g units.

BR (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Govindaraju, K. (1995) 1995 working values with confidence limits for twenty-six CRPG, ANRT and IWG-GIT geostandards. Geostands. Newsletter, 19(Special issue):1-32.

Govindaraju, K., and I. Roelandts (1988) Compilation report (1966-1987) on trace elements in five CRPG geochemical reference samples: basalt BR; granites, GA and GH; micas, biotite Mica-Fe and phlogopite Mica-Mg. Geostands. Newsletter, 12(1):119-201.

BX-N

Bauxite

Association Nationale de la Recherche Technique (France)

Description:

The material for this CRM was collected at the Mine de Marou, Var, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	11.48	FeO (%)	0.26	Ce	520
H ₂ O ⁻ (%)	0.44	Fe ₂ O ₃ (%)	22.88	Pr	54
Be	5.5	Co	30	Nd	163
CO ₂ (%)	0.44	Ni	180	Sm	22
Na ₂ O (%)	0.04	Cu	18	Eu	4.4
MgO (%)	0.11	Zn	80	Gd	20
Al ₂ O ₃ (%)	54.21	Ga	67	Tb	3
SiO ₂ (%)	7.40	As	115	Dy	18.5
P ₂ O ₅ (%)	0.13	Sr	110	Hb	4.1
K ₂ O (%)	0.05	Y	114	Er	11
CaO (%)	0.17	Zr	550	Tm	1.7
Sc	60	Nb	52	Yb	11.6
TiO ₂ (%)	2.37	Mo	8.3	Lu	1.8
Cr	280	Sn	13.4	Ta	4.6
MnO (%)	0.05	Ba	30	Pb	135
		La	355	Th	50

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Li	39	In	0.3	Bi	1.7
F	900	Sb	8	U	8.8
V	350	Cs	0.4	LOI (%)	12.17
Ge	1.1	Hf	15.2		
Rb	3.6	W	9		

Order information:

BX-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. BX-N is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostandards Newsletter, 18(Special issue):1-158.

CRM 811

Felspar-Quartz Siltstone

All-Union Research Institute of Metrology of Certified Reference Materials (Russia)

Description:

The approximate composition of this material is 56% quartz, 3% feldspar, 40% Fe-Si mica, and 1% various ores. The material was prepared in 1988.

Certified composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Abs. error	Component	Mean	Abs. error
H ₂ O ⁺ (%)	4.0	0.4	Ni	59	3
Li	60	10	Cu	41	5
Be	3.0	0.3	Zn	120	10
B	80	10	Ga	22	1
CO ₂ (%)	0.20	0.02	Ge	1.7	0.7
F (%)	0.06	0.01	Pb	120	10
P ₂ O ₅ (%)	0.19	0.01	Sr	170	20
Na ₂ O (%)	2.31	0.05	Y	32	80
MgO (%)	2.22	0.03	Zr	210	20
Al ₂ O ₃ (%)	18.20	0.08	Nb	14	4
SiO ₂ (%)	60.67	0.15	Mo	2.0	0.7
S (%)	0.087	0.005	Sn	3.2	0.6
K ₂ O (%)	3.43	0.05	Cs	6.3	0.8
CaO (%)	0.51	0.03	Ba	900	100
Sc	19	1	Ce	70	20
V	160	10	Yb	3.4	0.6
TiO ₂ (%)	0.94	0.02	Ta	13	0.6
Cr	96	5	Pb	20	3
MnO (%)	0.042	0.002	Ra	3 x 10 ⁻⁶	2 x 10 ⁻⁶
FeO (%)	4.8	0.1	Th	11	1
Fe ₂ O ₃ (%)	7.20	0.06	U	2.5	0.3
Co	21	1	LOI (%)	4.6	0.1

Order information:

CRM 811 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

Reference:

All-Union Research Institute of Metrology of Certified Reference Materials (1988?) Feldspar-quartz siltstone CRM 811. Certificate. All-Union Research Institute of Metrology of Certified Reference Materials, Sverdlovsk, GSP-824, Russia. (Available from Breiitländer, Hamm, Germany.)

DNC-1

Dolerite

US Geological Survey (USA)

Description:

DNC-1 is a Triassic-Jurassic olivine-normative dolerite known locally as Braggtown dolerite. Five hundred pounds of this material was collected from the Braggtown Quarry, near Chapel Hill, NC, USA, and processed (Flanagan, 1984). The complete petrology of the material can be found in Ragland *et al.* (1968). Values for elemental concentrations have been calculated by Abbey (1983), Gladney *et al.* (1983), Flanagan (1986) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	5.1	0.5	Rh (ng/g)	0.35	-
Be	1.0	0.4	Pd (ng/g)	16	4
B	0.90	0.28	Ag (ng/g)	27	-
C	125	67	Cd (ng/g)	182	108
F	66	10	Sb	0.96	0.15
Na (%)	1.39	0.07	Te (ng/g)	21	-
Mg (%)	6.06	0.20	Cs	0.34	0.14
Al (%)	9.68	0.26	Ba	114	16
Si (%)	21.97	0.30	La	3.8	0.4
P	370	90	Ce	10.6	2.4
S	392	-	Pr	1.3	0.6
Cl	37	8	Nd	4.9	0.2
K	1900	130	Sm	1.38	0.15
Ca (%)	8.06	0.16	Eu	0.59	0.03
Sc	31.0	1.4	Gd	2.0	0.4
Ti	2880	100	Tb (ng/g)	410	30
V	148	9	Dy	2.7	0.4
Cr	285	32	Ho (ng/g)	620	140
Mn	1150	70	Er	2.0	0.2
Fe (%)	6.94	0.10	Tm (ng/g)	330	50
Co	54.7	3.7	Yb	2.01	0.10
Ni	247	18	Lu (ng/g)	320	40
Cu	96	9	Hf	1.01	0.07
Zn	66	5	Ta (ng/g)	98	13
Se (ng/g)	200	-	W (ng/g)	190	-
Ga	15	2	Ir (ng/g)	0.52	-
Ge	1.26	-	Pt (ng/g)	36	-
As	0.2	-	Au (ng/g)	1.99	-
Rb	4.5	2.2	Hg (ng/g)	6.2	-
Sr	145	6	Tl (ng/g)	26	-
Y	18	3	Pb	6.3	1.0
Zr	41	7	Bi (ng/g)	20	-
Nb	3.0	0.7	Th	0.20	0.09
Mo	0.7	-	U (ng/g)	100	-

Major and minor oxide concentrations (%):

Component	Mean	Uncertainty (\pm)	Component	Mean	Uncertainty (\pm)
H ₂ O ⁺	0.68	0.07	P ₂ O ₅	0.085	0.021
H ₂ O ⁻	0.33	0.07	K ₂ O	0.229	0.016
CO ₂	0.046	0.02	CaO	11.27	0.22
Na ₂ O	1.87	0.09	TiO ₂	0.48	0.02
MgO	10.05	0.33	MnO	0.149	0.009
Al ₂ O ₃	18.30	0.49	FeO	7.39	0.14
SiO ₂	47.04	0.64	Fe ₂ O ₃	1.76	0.14

Order information:

DNC-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Flanagan, F. J. (1984) Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. U.S. Geol. Survey Prof. Bull. 1623:1-12. U.S. Geological Survey, Reston, VA, USA.

Flanagan, F. J. (1986) Additions and corrections for USGS Bulletin 1623, Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. Open file report 86-220. U.S. Geological Survey, Reston, VA, USA.

Gladney, E. S., C. E. Burns, and I. Roelandts (1983) 1982 Compilation of elemental concentrations in eleven United States Geological Survey rock standards. Geostands. Newsletter, 7(1):3-226.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BIR-1, DNC-1 and W-2. Geostand. Newsletter, 12(1):63-118.

Ragland, P. C., J. J. W. Rogers, and P. S. Justus (1968) Origin and differentiation of Triassic dolerite magmas, North Carolina, USA. Contributions to Mineralogy and Petrology, 20(1):57-80.

DR-N

Diorite

Association Nationale de la Recherche Technique (France)

Description:

The material for this CRM was collected from Neuntelstein, Massif du Champ du Feu, Vosges, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	2.22	MnO (%)	0.22	Ce	46
H ₂ O ⁻ (%)	0.25	FeO (%)	5.40	Pr	5.7
Li	40	Fe ₂ O ₃ (%)	3.70	Nd	23.5
Be	1.8	Co	35	Sm	5.4
CO ₂ (%)	0.10	Ni	15	Eu	1.45
F	500	Cu	50	Gd	4.7
Na ₂ O (%)	2.99	Zn	145	Tb	0.77
MgO (%)	4.40	Ga	22	Dy	4.6
Al ₂ O ₃ (%)	17.52	As	3	Ho	1
SiO ₂ (%)	52.85	Pb	73	Er	2.5
P ₂ O ₅ (%)	0.25	Sr	400	Tm	0.39
Cl	400	Y	26	Yb	2.5
K ₂ O (%)	1.70	Zr	125	Lu	0.4
CaO (%)	7.05	Nb	7	Hf	3.5
Sc	28	Sb	0.4	Ta	0.6
TiO ₂ (%)	1.09	Cs	6.3	Pb	55
V	220	Ba	385	Th	5
Cr	40	La	21.5	U	1.5

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
B	14	Cd	0.9	Tl	0.7
S	350	In	0.08	Bi	0.5
Ge	1.9	Sn	2	LOI (%)	2.26
Mo	0.9	W	130		

Order information:

DR-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. DR-N is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

DT-N

Disthene (Kyanite)

Association Nationale de la Recherche Technique (France)

Description:

The material for this CRM was collected in Nanga, Eboko, Cameroon.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	0.90	MnO (%)	0.008	Sm	8.4
H ₂ O (%)	0.15	FeO (%)	0.10	Eu	1.45
CO ₂ (%)	0.62	Fe ₂ O ₃ (%)	0.55	Gd	5.5
Na ₂ O (%)	0.04	Cu	7	Tb	0.6
MgO (%)	0.04	Zn	28	Dy	2.4
Al ₂ O ₃ (%)	59.20	Y	6.6	Ho	0.33
SiO ₂ (%)	36.45	Zr	370	Er	0.75
P ₂ O ₅ (%)	0.09	Cs	0.13	Tm	0.1
K ₂ O (%)	0.12	Ba	130	Yb	0.7
CaO (%)	0.04	La	90	Lu	0.14
TiO ₂ (%)	1.40	Ce	134	Pb	25
Cr	260	Pr	15.5	Th	12
		Nd	52		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Li	26	Ge	4.9	Sb	0.25
Be	0.3	As	0.2	Hf	10
F	40	Rb	6	Ta	2.7
Cl	30	Sr	30	W	120
Sc	2.1	Nb	34	Bi	0.06
V	150	Mo	0.5	U	2.3
Co	15	Cd	0.1	LOI (%)	1.43
Ni	14	In	0.01		
Ga	30	Sn	2.2		

Order information:

DT-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. DN-R is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special Issue):1-158.

DVG-1

Greisenred Granite

State University of Iskutsk (Russia)

Description:

This material was prepared in 1988 and is also known as CRM No. 4322-88.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li (%)	0.33	0.02	Ga	40	5
Be	8	2	Ge	2.7	0.9
B	40	10	As (%)	0.06	0.01
F (%)	2.5	0.1	Rb (%)	0.15	0.01
Na ₂ O (%)	3.81	0.06	Sr	140	10
MgO (%)	0.07	0.01	Y	120	40
Al ₂ O ₃ (%)	15.3	0.1	Zr	70	10
SiO ₂ (%)	70.8	0.1	Nb	50	10
P ₂ O ₅ (%)	0.055	0.009	Mo	260	20
S (%)	0.14	0.01	Ag	0.4	0.2
K ₂ O (%)	3.32	0.06	Cd	5	2
CaO (%)	0.76	0.05	Sn	33	5
Sc	3	1	Sb	30	20
TiO ₂ (%)	0.012	0.003	Cs	40	10
V	2.5	0.9	Be	70	20
Cr	45	5	La	30	10
MnO (%)	0.080	0.003	Ce	50	30
Fe ₂ O ₃ (%)	2.00	0.03	Yb	20	5
FeO (%)	1.65	0.05	W	70	40
Co	1.5	0.7	Pb	90	8
Ni	7	2	Bi	46	6
Cu	40	4	Th	38	5
Zn (%)	0.20	0.01	U	17	5
			LOI (%)	1.7	0.1

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁻ (%)	0.1	Tb	3
H ₂ O ⁺ (%)	0.5	Dy	10
CO ₂ (%)	0.05	Ho	3
In	3	Er	9
Nd	30	Hf	6
Gd	20		

DVG-1 (cont.)

Mineral composition:

Mineral	Percent
Accessory mineral	1
Micas	10
Plagioclase	35
Potassium feldspar	20
Quartz	30
Topaz	4

Granulometric composition:

Fraction size (μm)	Percent
<10	60
10 - 20	23
20 - 30	10
30 - 40	4
40 - 50	2
50-60	1

Order information:

DVG-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1988?) Greisenired CRM No. 4322-88 (DVG-1). Certificate. State University, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

FER-1 to FER-4

Iron-Formation Samples

Canada Centre for Mineral and Energy Technology (Canada)

Description:

FER-1 was obtained from a bed of magnetite-quartz iron-formation at Austin Brook near Bathurst, New Brunswick, Canada. These minerals comprise 55% and 30%, respectively, of the volume of the sample. The hematite content is about 3%. FER-2 is from an iron-formation bed occurring in greywacke at the north pit of the Griffith Mine at Bruce Lake, Ontario. Magnetite makes up about 25% of the sample by volume. Amphibole and quartz are the major gangue constituents. FER-3 and FER-4 are from the Sherman Mine property at Temagami, Ontario. FER-3 is from the west pit in the north limb of the Tetapaga incline containing metavolcanic and pyroclastic rocks. Quartz is the most abundant mineral present. Hematite occurs as dusty inclusions in the quartz, but as micro-laminae in jasper layers. FER-4 was taken in the south pit from a cherty magnetite ironformation containing chloritic tuff. The mineral assemblage of FER-4 is similar to that of FER-3, but the proportions of the minerals differ. FER-1, FER-2, FER-3, and FER-4 were prepared at CANMET and were characterized by the Geological Survey of Canada. They are available only as a set of four.

Recommended values (percent dry weight):

Constituent	FER-1	FER-2	FER-3	FER-4
H ₂ O ⁺	0.41	0.98	0.2	0.72
Li	(5)	22		7
Be	(1.5)	(3)		(1)
B		(61)		(2)
CO ₂	1.39	0.07	1.2	4.86
F	(0.06)	(0.04)	(0.01)	(0.02)
Na ₂ O	0.03	0.51	0.03	0.05
MgO	0.3	2.1	1.02	1.41
Al ₂ O ₃	0.52	5.16	0.09	1.7
SiO ₂	16.95	49.21	53.61	50.07
P ₂ O ₅	2.39	0.27	0.07	0.13
S	0.26	0.17	0.03	0.11
Cl		(100)		(100)
K ₂ O	0.02	1.33	0.03	0.29
CaO	3.29	2.17	0.84	2.23
Sc	(0.8)	(6)		(1.5)
TiO ₂	0.03	0.18	0.01	0.07
V	(100)	(37)	(8)	(11)
Cr	7	47	(6)	9
MnO	0.22	0.12	0.08	0.19
FeO	(23.34)	15.24	(13.63)	15.54
Fe ₂ O ₃	(49.88)	22.5	(29.4)	22.7
Co	12	7	(2)	(2)

Values in parenthesis are provisionally recommended.

Recommended values (percent dry weight) (cont.):

Constituent	FER-1	FER-2	FER-3	FER-4
Ni	8	21	10	(6)
Cu	100	45	(6)	13
Zn	3500	43	36	27
Ge	3	(6)	(4)	(5)
As	(6)	(2)	(1)	(3.6)
Pb		(66)		(16)
Sr	90	58	31	62
Y		(15)	(6)	(8)
Zr	(13)	39	2	18
Mo		(3)		
Cd		(3)		
Sn		(1)		
Sb	(5)	(0.7)	(1)	(3)
Cs		(5)		(0.8)
Cs		(5)		(0.8)
Ba	1000	(240)	(11)	(43)
La	12	(14)	(2)	(8)
Sm	(1.7)	(2.6)	(0.6)	(2.2)
Yb	1	(1.3)	(0.2)	(0.5)
Lu	(0.2)			
Hg		(0.02)		
Pb	5200	(11)	(9)	(8)
Bi	(6)			
Th		(3)		

Values in parenthesis are provisionally recommended.

Order information:

These CRMs can be purchased for Canadian \$415 per set (4 100-g bottles. Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

Geological Survey of Canada () FER-1, FER-2, FER-3, and FER-4: four Canadian iron-formation samples prepared for use as reference aterials. Paper 83-19. Geological Survey of Canada, Canada.

FK-N

Feldspath

Association Nationale de la Recherche Technique (France)

Description:

The material for FK-N was collected at Madras (now Tamil Nadu), India.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	0.32	MnO (%)	0.005	Nd	0.3
H ₂ O ⁻ (%)	0.14	FeO (%)	0.06	Sm	0.05
Li	8.5	Fe ₂ O ₃ (%)	0.02	Eu	0.45
Na ₂ O (%)	2.58	Co	14	Gd	0.06
MgO (%)	0.01	Cu	2	Tb	0.01
Al ₂ O ₃ (%)	18.61	Pb	860	Dy	0.06
SiO ₂ (%)	65.02	Sr	39	Ho	0.012
P ₂ O ₅ (%)	0.024	Y	0.5	Er	0.04
K ₂ O (%)	12.81	Cs	7	Tm	0.006
CaO (%)	0.11	Ba	200	Yb	0.04
TiO ₂ (%)	0.02	La	0.95	Lu	0.006
Cr	5	Ce	1	Pb	240
		Pr	0.09		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Be	1	Ga	23	Sb	0.45
CO ₂ (%)	0.09	Ge	2.5	Hf	0.04
F	30	As	0.3	Ta	0.25
S	60	Zr	0.7	W	120
Cl	20	Nb	0.3	Bi	0.1
Sc	0.05	Mo	0.25	U	0.15
V	0.5	Cd	0.018	LOI (%)	0.6
Ni	1.5	In	0.02		
Zn	10	Sn	0.3		

Order information:

FK-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. FK-N is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

FM

Fluorite

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 90% magnesite with trace levels of dolomite, leuchtenbergite, clinocllore, quartz, rutile, graphite, pyrite, zircon, and limonite. The granulometric composition is: larger than 0.1 mm, 0.07%; 0.09 to 0.1 mm, 1.00%; 0.075 to 0.09 mm, 2.14%; and smaller than 0.075 mm, 96.79%. The material was prepared in 1970.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
F (%)	34.09	0.56	Fe_2O_3 (%)	0.498	0.024
Na_2O (%)	0.027	0.007	Cu	55.8	11
Al_2O_3 (%)	0.276	0.074	Sr	527	98
SiO_2 (%)	22.59	0.40	Sb	2.3	0.4
S (%)	0.92	0.06	La	14	2.3
Ca (%)	35.91	0.40	Ce	28	2
Sc	0.63	0.05	Sm	6.1	1.4
TiO_2 (%)	0.018	0.003	Eu	1.23	0.16
Mn	63.6	13.6	Bi	74	8

Non-attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Component	Mean	Component	Mean
H_2O^+ (%)	0.2	Zn	24	Tb	1.7
CO_2 (%)	0.09	Pb	7	Yb	3.85
MgO (%)	0.025	Y	144	Lu	0.4
P_2O_5 (%)	0.023	Zr	31.5	Hf	2.4
K_2O (%)	0.095	Mo	44.5	Ta	0.105
V	5	Ag	11	W	10.2
Cr	279	Cs	0.83	Pb	65
Co	2.5	Nd	17.7	U	2.5
Ni	33	Gd	5.2		

Order information:

FM can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

Reference:

Institute of Mineral Raw Materials (1981?) Fluorite FM. Certificate. ST SEV 2979-81. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breitländer, Hamm, Germany.)

Granite

US Geological Survey (USA)

Description:

This material is composed of Westerly granite collected from the Sullivan Quarry, Bradford, Long Island, USA (Flanagan 1967). Values for elemental concentrations calculated by Abbey (1983), Gladney *et al.* (1983) and others using the results of various analysts. Those calculated by Gladney *et al.* (1983) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	36	5	Ag (ng/g)	45	6
Be	2.4	0.5	Cd (ng/g)	25	11
B	2.2	0.2	In	30	2
C	230	50	Sn	1.6	0.5
N	41	13	Sb	0.078	0.032
O (%)	48.12	0.21	Te (ng/g)	3.9	1.4
F	1260	90	I (ng/g)	310	-
Na (%)	3.02	0.09	Cs	1.33	0.14
Mg (%)	0.460	0.040	Ba	1880	20
Al (%)	8.15	0.12	La	86	5
Si (%)	32.24	0.28	Ce	159	11
P	600	40	Pr	19	2
Cl	69	25	Nd	53	8
K (%)	3.73	0.12	Sm	7.2	0.6
Ca (%)	1.41	0.07	Eu	1.41	0.12
Sc	3.5	0.4	Gd	4.1	0.8
Ti (%)	0.295	0.022	Tb	0.48	0.07
V	36	5	Dy	2.5	0.5
Cr	9	2	Ho	0.37	0.02
Mn	260	40	Er	1.2	0.3
Fe (%)	1.87	0.07	Tm (ng/g)	170	70
Co	4.6	0.4	Yb	0.78	0.14
Ni	4.9	2.3	Lu (ng/g)	113	24
Cu	11	3	Ta	0.88	0.12
Zn	85	7	W	0.15	0.06
Ga	22	2	Re (ng/g)	<7	-
Ge	1.14	0.15	Os (ng/g)	<100	-
As	0.27	0.12	Pt (ng/g)	5.9	-
Br (ng/g)	230	150	Au (ng/g)	1.0	0.2
Rb	170	3	Hg (ng/g)	49	13
Sr	478	3	Tl	1.02	0.08
Y	11.4	2.3	Pb	31	4
Zr	300	30	Bi (ng/g)	41	10
Nb	13	4	Ra (PCI/g)	0.71	-
Mo	1.0	0.6	Th	24.6	1.5
Ru	<4	-	U	2.04	0.17
Rh (ng/g)	<5	-			

Major and minor oxide concentrations (%):

Component	Mean	Uncertainty (\pm)	Component	Mean	Uncertainty (\pm)
H ₂ O ⁺	0.51	0.09	FeO	1.45	0.08
H ₂ O ⁻	0.10	0.04	Fe ₂ O ₃	1.07	0.12

Order information:

G-2 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Flanagan, F. J. (1967) U.S. Geological Survey silicate rock standards. Geochim. Cosmochim. Acta, 31:289-308.

Gladney, E. S., C. E. Burns, and I. Roelandts (1983) 1982 Compilation of elemental concentrations in eleven United States Geological Survey rock standards. Geostands. Newsletter, 7(1):3-226.

GA

Granite

Centre de Recherches Pétrographiques et Géochimiques (France)

Description:

The material for GA was collected at Andlau, Bas-Rhin, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	0.87	FeO (%)	1.32	Pr	8.3
H ₂ O ⁻ (%)	0.09	Fe ₂ O ₃ (%)	1.36	Nd	27
Li	90	Co	5	Sm	5
Be	3.6	Ni	7	Eu	1.08
B	26	Cu	16	Gd	3.8
CO ₂ (%)	0.11	Zn	80	Tb	0.6
F	500	Ga	16	Dy	3.3
Na ₂ O (%)	3.55	As	1.7	Hb	0.7
MgO (%)	0.95	Rb	175	Er	1.9
Al ₂ O ₃ (%)	14.50	Sr	310	Tm	0.3
SiO ₂ (%)	69.90	Y	21	Yb	2
P ₂ O ₅ (%)	0.12	Zr	150	Lu	0.3
K ₂ O (%)	4.03	Nb	12	Hf	4
CaO (%)	2.45	Mo	0.5	Ta	1.3
Sc	7	Sn	2.7	W	1.5
TiO ₂ (%)	0.38	Sb	0.2	Pb	30
V	38	Cs	6	Th	17
Cr	12	Ba	840	U	5
MnO (%)	0.09	La	40		
		Ce	76		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
S	80	Cd (ng/g)	130	Tl (ng/g)	8
Cl	250	In	0.03	LOI (%)	1
Ga	1.7				

Order information:

GA is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. GA is packaged in 10-g units.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Govindaraju, K. (1995) 1995 working values with confidence limits for twenty-six CRPG, ANRT and IWG-GIT geostandards. Geostands. Newsletter, 19(Special issue):1-32.

Govindaraju, K., and I. Roelandts (1988) Compilation report (1966-1987) on trace elements in five CRPG geochemical reference samples: basalt BR; granites, GA and GH; micas, biotite Mica-Fe and phlogopite Mica-Mg. Geostands. Newsletter, 12(1):119-201.

GH

Granite

Centre de Recherches Pétrographiques et Géochimiques (France)

Description:

The material for GH was collected at the Massif du Taurirt Tan Afella, Hoggar, Algeria.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	0.46	FeO (%)	0.84	Nd	29
H ₂ O ⁻ (%)	0.14	Fe ₂ O ₃ (%)	0.41	Sm	9
Li	45	Co	0.3	Eu	0.12
Be	5.5	Ni	3	Gd	9.5
CO ₂ (%)	0.30	Cu	3	Tb	1.9
F	3500	Zn	55	Dy	12
Na ₂ O (%)	3.85	Ga	23	Hb	2.9
MgO (%)	0.03	As	0.4	Er	8
Al ₂ O ₃ (%)	12.50	Rb	390	Tm	1.3
SiO ₂ (%)	75.80	Y	75	Yb	8
P ₂ O ₅ (%)	0.01	Zr	150	Lu	1.1
K ₂ O (%)	4.76	Nb	85	Hf	6.6
CaO (%)	0.69	Mo	2	Ta	4.8
Sc	0.8	Sn	10	W	1.6
TiO ₂ (%)	0.08	Cs	2.5	Tl	1.8
V	5	Ba	20	Pb	45
Cr	3	La	25	Th	87
MnO (%)	0.05	Ce	60	U	18
		Pr	7.8		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
S	70	Ge	2	In	0.04
Cl	100	Cd	0.1	LOI (%)	0.7

Order information:

GH is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. GH is packaged in 10-g units.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostandards. Newsletter, 18(Special issue):1-158.

GH (cont.)

Govindaraju, K. (1995) 1995 working values with confidence limits for twenty-six CRPG, ANRT and IWG-GIT geostandards. Geostands. Newsletter, 19(Special issue):1-32.

Govindaraju, K., and I. Roelandts (1988) Compilation report (1966-1987) on trace elements in five CRPG geochemical reference samples: basalt BR; granites, GA and GH; micas, biotite Mica-Fe and phlogopite Mica-Mg. Geostands. Newsletter, 12(1):119-201.

GBW 07101 - GBW 07102

Ultrabasic Rocks

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	GBW 07101	GBW 07102	Component	GBW 07101	GBW 07102
H ₂ O ⁺ (%)	14.17	12.69	Sr	2.3	33.2
Li	1.3	2.3	Y	(0.14)	(0.14)
B	5.9	10.2	Ru	0.01	0.009
CO ₂ (%)	0.58	1.66	Rh	0.0006	0.0012
F	21.4	35.3	Ag	0.031	0.023
Na ₂ O (%)	0.008	0.028	Pd	0.005	0.002
MgO (%)	41.03	38.34	Cd	(0.024)	(0.034)
Al ₂ O ₃ (%)	0.67	0.21	Sb	(0.12)	(0.050)
SiO ₂ (%)	34.34	37.75	Ba	6.4	10.5
P ₂ O ₅ (%)	0.004	0.003	La	0.20	0.21
S	0.051	0.008	Ce	0.34	0.40
Cl	0.57	0.022	Pr	(0.045)	(0.047)
K ₂ O (%)	0.010	0.009	Nd	0.16	0.10
CaO (%)	0.10	1.8	Sm	0.025	0.028
Sc	4.9	4.8	Eu	0.0043	0.0061
TiO ₂ (%)	0.008	0.004	Gd	0.024	0.031
V ₂ O ₅ (%)	0.007	0.003	Tb	0.0029	0.003
Cr ₂ O ₃ (%)	1.57	0.42	Dy	0.020	0.021
MnO (%)	0.068	0.097	Ho	0.0049	0.0043
FeO (%)	2.42	1.97	Er	(0.014)	(0.012)
Fe ₂ O ₃ (%)	(4.21)	(4.85)	Tm	0.0030	(0.0028)
CoO (%)	0.012	0.013	Yb	0.020	0.012
NiO (%)	0.32	0.30	Lu	0.004	0.0022
Cu	5.5	5.3	Os	0.006	0.006
Zn	45.4	43.6	Ir	0.003	0.003
Ga	1.2	0.38	Pt	0.004	0.006
Ge	0.66	0.63	Au	0.0014	0.0004
As	0.82	(0.43)	Hg	0.046	(0.015)
Br	(24.7)	(1.4)	Pb	2.8	3.2

Values in parenthesis are for information only.

Order information:

These CRMs can be purchased for US\$240 per unit (60 g). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GBW 07103 - GBW 07114

Rocks

National Research Center for Certified Reference Materials (China)

Description:

No information available.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	GBW 07103	GBW 07104	GBW 07105	GBW 07106	GBW 07107	GBW 07108
H ₂ O ⁺ (%)	(0.61)	(1.54)	(2.88)	(0.99)	(5.6)	(2.20)
Be	12.4	1.1	2.5	0.97	3.0	0.8
B	24	4.7	3.5	34	154	16
CO ₂ (%)	(0.15)	(3.46)	(0.17)	(0.18)	(0.077)	(32.44)
F (%)	0.235	0.0280	0.0700	0.0183	0.129	0.0406
Na ₂ O (%)	3.13	3.86	3.38	0.061	0.35	(0.081
MgO (%)	0.42	1.72	7.77	0.082	2.01	5.19
Al ₂ O ₃ (%)	13.40	16.17	13.83	3.52	18.82	5.03
SiO ₂ (%)	72.83	60.62	44.64	90.36	59.23	15.60
Cl	127	(42)	114	(42)	(40)	(80)
K ₂ O (%)	5.01	1.89	2.32	0.65	4.16	0.78
CaO (%)	1.55	5.20	8.81	0.30	0.60	35.67
V	24	94.5	167	33.4	87	36
Cr	(5.0)	32.4	134	20	99	32
FeO (%)	(1.03)	(2.43)	(7.60)	(0.62)	(1.38)	(1.64)
Fe ₂ O ₃ (%)	2.14	4.90	13.40	3.22	7.60	2.52
Co	3.4	13.2	46.5	6.4	21	9.0
Cu	3.2	55.4	48.6	19	42	23.4
Zn	28	71	150	20	55	52
Ga	19	18.1	24.8	5.3	25.6	7.1
Ge	2.0	0.93	0.98	1.16	3.1	0.67
As	2.1	2.1	(0.79)	9.1	1.4	4.7
Y	62	9.3	22	21.5	26	9.1
Zr	167	99	277	214	96	62
Ag	0.033	0.071	0.040	0.062	0.047	0.043
Cd	(0.032)	0.061	0.067	0.060	(0.033)	0.069
Cs	38.4	2.3	(1.2)	1.8	14	3.2
Ba	343	1020	527	143	450	120
Ce	108	40	105	48	109	25.4
Eu	0.85	1.02	3.2	1.02	1.7	0.51
Gd	9.3	2.7	8.5	4.5	6.7	1.9
Dy	10.2	1.85	5.6	4.1	5.1	1.6
Ho	2.05	0.34	0.88	0.75	0.98	0.33
Er	6.5	0.85	2.0	2.0	2.7	(1.1)
Tm	1.06	(0.15)	0.28	0.32	0.43	0.17

Values in parenthesis are for information only.

Component	GBW 07103	GBW 07104	GBW 07105	GBW 07106	GBW 07107	GBW 07108
Yb	7.4	0.89	1.5	1.92	2.6	0.90
Hf	6.3	2.9	6.5	6.6	2.9	1.8
W	8.4	(0.47)	(0.44)	1.16	0.79	0.67
Au (ng/g)	(0.55)	(0.95)	(0.66)	(1.8)	(1.0)	(0.94)
Hg (ng/g)	(4.3)	12	(6.4)	(8.4)	9.7	1.6
Bi	0.53	0.081	(0.045)	0.18	0.23	0.16
U	18.8	0.90	1.4	2.1	1.5	1.9
TOC (%)	-	-	-	(0.04)	(0.15)	(0.12)
LOI (%)	(0.69)	(4.44)	(2.24)	(1.10)	(5.95)	(34.14)

Component	GBW 07109	GBW 07110	GBW 07111	GBW 07112	GBW 07113	GBW 07114
H ₂ O ⁺ (%)	2.38	1.79	0.88	1.09	1.18	0.34
Li	32.9	17.5	16.2	1.94	12.7	2.30
Be	17.2	3.64	2.11	(0.98)	4.09	(0.22)
B	31.8	10.8	3.92	1.84	3.5	20.5
CO ₂ (%)	0.26	1.03	0.15	0.12	0.52	46.77
F	0.048	0.112	0.084	0.006	0.13	0.014
Na ₂ O (%)	7.16	3.06	4.05	2.11	2.57	0.030
MgO (%)	0.65	0.84	2.81	5.25	0.16	21.8
Al ₂ O ₃ (%)	17.72	16.1	16.56	14.14	12.96	0.10
SiO ₂ (%)	54.48	63.06	59.68	35.69	72.78	0.62
P ₂ O ₅ (%)	0.018	0.36	0.34	0.028	0.045	0.006
S	0.011	0.023	0.011	0.37	0.009	0.011
Cl	0.059	0.016	0.023	0.006	(0.002)	0.012
K	7.48	5.17	3.5	0.15	5.43	0.038
CaO (%)	1.39	2.47	4.72	9.86	0.59	30.02
Sc	2.22	7.52	10.3	22.5	5.15	0.098
TiO ₂ (%)	0.48	0.80	0.77	7.69	0.30	0.015
V	179	64.3	104	768	3.8	2.10
Cr	3.6	7.7	37.6	14.5	7.3	2.6
MnO (%)	0.12	0.089	0.094	0.193	0.14	0.010
FeO (%)	1.23	0.19	3.08	13.36	1.86	0.15
Fe ₂ O ₃ (%)	6.04	4.51	2.64	9.90	1.14	0.04
Co	4.59	7.9	15.6	93.0	2.40	3.88
Ni	1.75	12.6	24.4	69	64.5	241
Cu	11.8	9.1	8.8	28.3	10.9	30.2
Zn	112	164	85.4	118	86.3	11.7
Ga	35.8	19.8	20.8	23.7	20.5	(0.21)
Ge	0.95	1.11	1.00	1.06	1.17	0.15
As	6.27	5.96	0.4	(0.21)	0.7	0.23
Se	0.05	0.03	0.03	0.26	0.040	0.08
Br	1.21	(0.55)	(0.34)	(0.32)	(0.25)	0.84
Rb	130	183	70.1	(4.79)	213	(1.42)
Sr	(0.116)	318	1198	612	43.0	27.0
Y	24.7	28.0	15.5	4.9	42.5	(1.40)

Values in parenthesis are for information only.

Component	GBW 07109	GBW 07110	GBW 07111	GBW 07112	GBW 07113	GBW 07114
Zr	(1540)	335	224	29	403	3.0
Nb	66.9	20.8	10.6	9.3	34.3	(2.77)
Mo	0.26	0.95	0.47	(0.094)	2.46	(0.24)
Ag	(0.033)	0.17	0.066	0.05	0.08	0.04
Cd	0.07	0.61	0.08	0.09	0.14	0.07
In	0.15	0.11	0.08	0.12	0.09	(0.066)
Sn	6.50	3.12	1.44	0.89	3.35	0.53
Sb	0.15	1.34	0.06	(0.04)	0.38	(0.04)
Te	0.012	(0.007)	0.011	0.010	(0.009)	(0.012)
I	0.14	0.07	(0.078)	0.08	(0.093)	0.23
Cs	2.05	7.16	0.97	(0.17)	3.34	0.07
Ba	251	1053	(1900)	86.2	506	44.3
La	149	62.5	60.5	1.71	82.7	1.34
Ce	242	117	112	4.2	163	3.58
Pr	22.5	13.2	13.2	0.84	18.4	(0.44)
Nd	65.1	47.2	48.1	4.10	64.5	1.39
Sm	9.7	8.63	7.74	1.22	11.7	0.25
Eu	2.35	1.96	1.91	0.74	1.18	0.05
Gd	7.0	6.54	5.09	1.31	9.47	0.18
Tb	1.02	0.99	0.68	0.20	1.51	0.05
Dy	4.70	5.32	3.20	1.11	8.19	0.19
Hb	0.96	1.10	0.60	0.20	1.64	0.04
Er	2.48	2.93	1.57	0.47	4.31	0.09
Tm	0.46	0.50	0.26	0.09	0.73	(0.040)
Yb	2.56	3.15	1.56	0.36	4.51	0.09
Lu	0.43	0.49	0.24	0.06	0.67	0.019
Hf	34.0	7.5	5.2	0.65	10.8	(0.10)
Ta	1.96	1.42	0.62	(0.56)	2.41	(0.18)
W	1.24	1.62	0.19	(0.10)	1.10	0.11
Hg	0.005	0.014	0.035	(0.005)	0.005	(0.004)
Tl	0.76	1.02	0.39	0.07	0.83	(0.070)
Pb	196	97.7	19.8	(5.16)	33.3	(4.44)
Bi	0.37	0.09	0.05	0.04	0.06	0.03
Th	79.3	16.7	10.9	(0.28)	27.1	0.11
U	14.6	3.04	1.40	(0.086)	4.83	0.16
TOC (%)	(0.093)	(0.29)	(0.057)	(0.039)	(0.15)	(12.88)

Values in parenthesis are for information only.

Order Information:

These CRMs can be purchased for US\$240 per unit (60 g). Price subject to change without notice. Please contact NRCCRM.

Reference:

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

Polymetallic Nodule

National Research Center for Certified Reference Materials (China)

Description:

The material for this CRM was collected from the central part of the Pacific during the HY4-871 cruise of the R/V Haiyang of the Ministry of Geology and Mineral Resources. The sediment was air dried, crumbled to less than 5 mm pieces, mixed, oven dried at 60°C, ground to less than 0.08 mm particles, mixed, and packaged.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	11.1	0.7	Sr (%)	0.12	0.01
B	215	26	Y	159	10
Na ₂ O (%)	2.12	0.06	Zr	659	25
MgO (%)	2.00	0.03	Mo	371	15
Al ₂ O ₃ (%)	3.53	0.07	Sb	28.1	1.1
SiO ₂ (%)	13.30	0.08	Ba (%)	0.14	0.01
P ₂ O ₅ (%)	0.73	0.02	La	239	12
S (%)	0.18	0.02	Ce	998	52
Cl (%)	0.85	0.03	Pr	55.1	2.6
K ₂ O (%)	0.68	0.02	Nd	238	6
CaO (%)	2.81	0.06	Sm	51.9	2.4
Sc	13.4	1.2	Eu	12.7	0.9
TiO ₂ (%)	1.71	0.03	Gd	56.2	3.0
V	588	11	Tb	8.6	0.8
Cr	10.0	0.9	Dy	48.9	2.3
Mn (%)	20.92	0.06	Hb	9.9	0.6
Fe (%)	18.71	0.07	Er	26.4	1.6
Co (%)	0.35	0.01	Yb	24.3	1.4
Ni (%)	0.36	0.01	Lu	3.5	0.4
Cu (%)	0.28	0.01	W	61.0	3.6
Zn	563	11	Tl	133	12
Ga	5.5	0.7	Pb	948	20
As	179	22	Tm	3.6	0.4
Rb	8.3	1.6	Th	32.5	2.9
			U	9.3	1.2

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
F (%)	289
Org. C (%)	0.07
Nb	64.9

Order information:

GBW 07249 can be purchased for US\$240 per unit (60 g). Price subject to change without notice. Please contact NRCCRM.

Reference:

Institute of Marine Geology (1990) Certificate of certified reference material. Polymetallic nodule. Institute of Marine Geology, Ministry of Geology and Mineral Resources, Qingdao, China.

National Research Center for CRMs (1995) Certified reference materials catalog. State Bureau of Technical Supervision, National Research Center for Certified Reference Materials, Office of Certified Reference Materials, Hepingjie, Chaoyangqu, Beijing, China. 147 pp.

GL-O

Glauconite

Association Nationale de la Recherche Technique (France) (France)

Description:

The material for this CRM was collected near the beach of Cauville, Normandy, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	5.58	SiO ₂ (%)	50.90	FeO (%)	2.19
H ₂ O ⁻ (%)	2.52	P ₂ O ₅ (%)	0.37	Fe ₂ O ₃ (%)	17.17
Na ₂ O (%)	0.04	K ₂ O (%)	7.95	Pb	238
MgO (%)	4.46	CaO (%)	0.96	Sr	19.3
Al ₂ O ₃ (%)	7.55	MnO (%)	0.008	Lu	0.09

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Li	70	Nb	3.7	Tb	0.6
Be	5	Mo	0.03	Dy	2.7
Sc	8	In	0.05	Hb	0.5
TiO ₂ (%)	0.07	Sn	2	Er	1
V	65	Sb	0.3	Tm	0.12
Cr	140	Te	3.4	Yb	65
Co	14	Cs	3.3	Hf	1.1
Ni	36	Ba	6	Ta	0.22
Cu	3.5	La	20	W	4.4
Zn	38	Ce	54	Pb	3
Ga	13	Pr	6.5	Bi	0.1
Ge	4.5	Nd	27	U	0.8
As	10.5	Sm	5.5	LOI (%)	8.5
Y	13.2	Eu	1.2		
Zr	36	Gd	4.5		

Order information:

GL-O is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. GL-O is packaged in 20-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostandards. Newsletter, 18(Special issue):1-158.

GPOS301

Dolomitized Limestone

Research Institute of Applied Physics (Russia)

Description:

The material for this CRM was collected in Yahun, USSR. It is also known as SI-1 and CRM 813.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.4	0.2	Ba	30	10
Be	1.3	0.3	Pb	8	2
B	5	3	Ra	2×10^{-6}	1×10^{-6}
CO ₂ (%)	45.6	0.3	Th	1.0	0.4
F	0.02	0.01	U	1.5	0.2
Na ₂ O (%)	0.07	0.02	LOI (%)	45.6	0.3
MgO (%)	20.75	0.22	Mineral composition (%):		
Al ₂ O ₃ (%)	0.43	0.05	Quartz	3	
SiO ₂ (%)	2.69	0.06	Microcline	<1	
P ₂ O ₅ (%)	0.011	0.003	Albite	<1	
S (%)	0.02	0.01	Dolomite	95	
K ₂ O (%)	0.35	0.02	Calcite	1	
CaO (%)	29.48	0.17	Others	1	
TiO ₂ (%)	0.025	0.004	Fraction size (μm):		
V	25	6	<10	64.5	
Cr	6	2	10 - 20	14.0	
MnO (%)	0.050	0.003	20 - 30	8.5	
Fe ₂ O ₃ (%)	0.47	0.002	30 - 40	3.5	
Co	3.0	0.5	40 - 50	4.0	
Ni	5	2	50 - 60	2.5	
Cu	8	3	60 - 70	1.5	
Sn	30	10	70 - 80	1.5	
Pb	5	1			
Sr	90	10			
Zr	30	9			

Order information:

This CRM can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostand. Newsletter, 18(Special issue):1-158.

Research Institute of Applied Physics (1989?). Dolomitized limestone CRM No. 813 (GPOS301). Certificate. Research Institute of Applied Physics, State University of Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

GS-N

Glauconite

Association Nationale de la Recherche Technique (France)

Description:

The material for this CRM was collected in Senones, Vosges, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	1.02	FeO (%)	1.65	Ce	135
H ₂ O ⁻ (%)	0.28	Fe ₂ O ₃ (%)	1.92	Pr	14.5
Li	55	Co	65	Nd	49
Be	5.4	Ni	34	Sm	7.5
F	1050	Cu	20	Eu	1.7
Na ₂ O (%)	3.77	Zn	48	Gd	5.2
MgO (%)	2.30	Ga	22	Tb	0.6
Al ₂ O ₃ (%)	14.67	Pb	185	Dy	3.1
SiO ₂ (%)	65.80	Sr	570	Ho	0.6
P ₂ O ₅ (%)	0.28	Y	16	Er	1.5
K ₂ O (%)	4.63	Zr	235	Tm	0.22
CaO (%)	2.50	Nb	21	Yb	1.4
Sc	7.3	Te	41	Lu	0.22
TiO ₂ (%)	0.68	Cs	5.4	Hf	6.2
V	65	Ba	1400	Ta	2.6
Cr	55	La	75	Pb	53
MnO (%)	0.056	Ce	135	Th	41
		Pr	14.5	U	7.5

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
CO ₂ (%)	0.18	Mo	1.2	W	450
S	140	Cd	0.04	Bi	0.18
Cl	450	In	0.02	LOI (%)	1.33
Ge	1.3	Sn	3		
As	1.6	Sb	0.7		

Order information:

GS-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. GS-N is packaged in 20-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

GSR-1

Biotite Granite

National Research Center for CRMs (China)

Description:

The material used for this CRM is a grey, medium-grained biotite collected at Chenzhou, Hunan, China. There is W, Sn and Mo mineralization in the contact zone between the granite and carbonate rocks.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	131	3	Nb	40	1.4
Be	12.4	0.7	Mo	3.5	0.1
B	24	2	Sn	12.5	1
F	2350	80	Sb	0.21	0.03
Na ₂ O (%)	3.13	0.03	Te	0.021	0.003
MgO (%)	0.42	0.016	Cs	38.4	0.8
Al ₂ O ₃ (%)	13.40	0.04	Ba	343	13
SiO ₂ (%)	72.83	0.06	La	54	2
P	405	9	Ce	108	4
Cl	127	11	Pr	12.7	0.5
K ₂ O (%)	5.01	0.03	Nd	47	2
CaO (%)	1.55	0.02	Sm	9.7	0.5
Sc	6.1	0.2	Eu	0.85	0.04
Ti	1720	30	Gd	9.3	0.4
V	24	1	Tb	1.65	0.06
Mn	463	7	Dy	10.2	0.2
Fe ₂ O ₃ (%)	2.14	0.02	Ho	2.05	0.11
Co	3.4	0.2	Er	6.5	0.2
Ni	2.3	0.3	Yb	7.4	0.2
Cu	3.2	0.4	Lu	1.15	0.06
Zn	28	1	Hf	6.3	0.5
Ga	19	1	Ta	7.2	0.4
Ge	2.0	0.2	W	8.4	0.2
As	2.1	0.16	Tl	1.93	0.26
Rb	466	10	Pb	31	1.3
Sr	106	3	Bi	0.53	0.08
Y	62	2	Tm	1.06	0.06
Zr	167	5	Th	54	1.3
			U	18.8	1

GSR-1 (cont.)

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
S	380
Cr	5.0
Se	0.059
Cd	0.032
In	0.02
Au (ng/g)	0.55
Hg (ng/g)	4.3

Order information:

No price information is available. Please contact NRCCRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

GSR-2

Hornblende Andesite

National Research Center for CRMs (China)

Description:

The material used for this CRM is hornblende andesite collected in the vicinity of the Meishan iron mine, Nanjiang, China. The material has thin carbonation.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	18.3	0.5	Nb	6.8	0.7
Be	1.1	0.07	Mo	0.54	0.05
B	4.7	0.5	Ag	0.071	0.006
F	280	15	Cd	0.061	0.008
Na ₂ O (%)	3.86	0.04	Sn	0.79	0.11
MgO (%)	1.72	0.03	Sb	0.12	0.02
Al ₂ O ₃ (%)	16.17	0.06	Te	0.017	0.003
SiO ₂ (%)	60.62	0.08	Cs	2.3	0.4
P	1030	12	Ba	1020	21
K ₂ O (%)	1.89	0.02	La	21.8	1
CaO (%)	5.52	0.04	Ce	40	2
Sc	9.5	0.4	Pr	4.9	0.2
Ti	3090	40	Nd	19	1
V	94.5	1.6	Sm	3.4	0.1
Cr	32.4	1.3	Eu	1.02	0.03
Mn	604	7	Gd	2.7	0.2
Fe ₂ O ₃ (%)	4.90	0.03	Tb	0.41	0.03
Co	13.2	0.4	Dy	1.85	0.12
Ni	17	0.5	Ho	0.34	0.014
Cu	55.4	1.1	Er	0.85	0.08
Zn	71	2	Yb	0.89	0.07
Ga	18.1	0.9	Lu	0.12	0.02
Ge	0.93	0.01	Hf	2.9	0.3
As	2.1	0.2	Hg (ng/g)	12	2
Rb	37.6	1.7	Pb	11.3	0.9
Sr	790	16	Bi	0.081	0.010
Y	9.3	0.5	Th	2.6	0.15
Zr	99	5	U	0.90	0.13

GSR-2 (cont.)

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
S	190
Cl	42
Se	0.063
In	0.033
Ta	0.46
W	0.47
Au (ng/g)	0.95
Tm	0.15
Tl	0.16

Order information:

No price information is available. Please contact NRCCRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

GSR-3

Olivine Basalt

National Research Center for CRMs (China)

Description:

The material used for this CRM was collected at Zhangjiakou, Hebei, China. The principal components are plagioclase, olivine, magnetite and augite.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	9.5	0.5	Zr	277	10
Ba	2.5	0.2	Nb	68	4
B	3.5	0.7	Mo	2.6	0.1
F	700	26	Ag	0.040	0.005
Na ₂ O (%)	3.38	0.02	Cd	0.067	0.010
MgO (%)	7.77	0.08	Sn	2.0	0.3
Al ₂ O ₃ (%)	13.83	0.07	Sb	0.083	0.021
SiO ₂ (%)	44.64	0.06	Ba	527	12
P	4130	60	La	56	2
S	100	10	Ce	105	5
Cl	114	15	Pr	13.2	0.8
K ₂ O (%)	2.32	0.03	Nd	54	2
CaO (%)	8.81	0.05	Sm	10.2	0.3
Sc	15.2	0.7	Eu	3.2	0.15
Ti	14200	200	Gd	8.5	0.4
V	167	5	Tb	1.2	0.1
Cr	134	4	Dy	5.6	0.15
Mn	1310	24	Ho	0.88	0.02
Fe ₂ O ₃ (%)	13.40	0.09	Er	2.0	0.14
Co	46.5	1.3	Yb	1.5	0.2
Ni	140	3	Lu	0.19	0.03
Cu	48.6	1.1	Pb	7.2	1.2
Zn	150	4	Tm	0.28	0.02
Ga	24.8	0.6	Hf	6.5	0.4
Ge	0.98	0.14	Ta	4.3	0.4
Rb	37	2	Th	6.0	0.5
Sr	1100	30	U	1.4	0.2
Y	22	1			

GSR-3 (cont.)

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
As	0.79
Se	0.086
In	0.063
Te	0.022
Cs	1.2
W	0.44
Au (ng/g)	0.66
Hg (ng/g)	6.4
Tl	0.12
Bi	0.045

Order Information:

No price information is available. Please contact NRCCRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

GSR-4

Sandstone

National Research Center for CRMs (China)

Description:

The material used for this CRM is a light and dark sandstone sample collected at Tongling, Anhui, China. In addition to quartz, the material contains a small amount of muscovite.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	11.1	0.3	Mo	0.76	0.08
Be	0.97	0.06	Ag	0.062	0.004
B	34	4	Cd	0.060	0.011
F	183	12	Sn	1.1	0.1
Na ₂ O (%)	0.061	0.007	Sb	0.60	0.06
MgO (%)	0.082	0.011	Te	0.038	0.007
Al ₂ O ₃ (%)	3.52	0.05	Pb	29	1.3
SiO ₂ (%)	90.36	0.10	Cs	1.8	0.2
P	970	21	Ba	143	7
S	860	20	La	21	1
K ₂ O (%)	0.65	0.014	Ce	48	2
CaO (%)	0.30	0.02	Pr	5.4	0.4
Sc	4.2	0.2	Nd	21	1
Ti	1580	40	Sm	4.7	0.16
V	33.4	1.2	Eu	1.02	0.06
Cr	20	1	Gd	4.5	0.2
Mn	155	3	Tb	0.79	0.06
Fe ₂ O ₃ (%)	3.22	0.03	Dy	4.1	0.2
Co	6.4	0.2	Ho	0.75	0.08
Ni	16.6	0.4	Er	2.0	0.2
Cu	19	0.6	Tm	0.32	0.02
Zn	20	1	Yb	1.92	0.08
Ga	5.3	0.5	Lu	0.30	0.02
Ge	1.16	0.17	Hf	6.6	0.4
As	9.1	0.7	W	1.16	0.12
Pb	29	1.3	Tl	0.36	0.04
Sr	58	2	Pb	7.6	0.4
Y	21.5	1.1	Bi	0.18	0.02
Zr	214	5	Th	7.0	0.2
Nb	5.9	0.5	U	2.1	0.2

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
Cl	42
Se	0.098
In	0.026
Ta	0.42
Au (ng/g)	1.8
Hg (ng/g)	8.4

Order information:

No price information is available. Please contact NRCCRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

GSR-5

Shale

National Research Center for CRMs (China)

Description:

The material used for this CRM was collected at Jixian, Tianjin, China. The shale contains some muscovite and dolomite.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	44	1	Ag	0.047	0.005
Be	3.0	0.16	In	0.082	0.016
B	154	8	Sn	2.0	0.2
F	1290	40	Sb	0.17	0.04
Na ₂ O (%)	0.35	0.01	Cs	14	1
MgO (%)	2.01	0.03	Ba	450	16
Al ₂ O ₃ (%)	18.82	0.08	La	62	2
SiO ₂ (%)	59.23	0.10	Ce	109	5
P	690	18	Pr	13.6	1.1
S	60	20	Nd	48	2
K ₂ O (%)	4.16	0.05	Sm	8.4	0.3
CaO (%)	0.60	0.02	Eu	1.7	0.1
Sc	18.5	0.7	Gd	6.7	0.3
Ti	3950	60	Tb	1.02	0.05
V	87	2	Dy	5.1	0.3
Cr	99	2	Ho	0.98	0.03
Mn	173	5	Er	2.7	0.2
Fe ₂ O ₃ (%)	7.60	0.04	Yb	2.6	0.14
Co	21	0.5	Lu	0.41	0.03
Ni	36.8	1	Hf	2.9	0.2
Cu	42	1	Ta	1.0	0.2
Zn	55	2	W	0.79	0.08
Ga	25.6	1.6	Hg (ng/g)	9.7	1.4
Ge	3.1	0.27	Tl	0.71	0.06
As	1.4	0.2	Pb	8.7	0.9
Pb	205	5	Bi	0.23	0.02
Sr	90	4	Tm	0.43	0.02
Y	26	1	Th	12.8	0.6
Zr	96	5	U	1.5	0.14
Nb	14.3	0.9			
Mo	0.35	0.05			

GSR-4 (cont.)

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
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Cl	40
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Se	0.084
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Cd	0.033
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Te	0.022
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Au (ng/g)	1.0
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Order Information:

No price information is available. Please contact NRC CRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

GSR-6

Carbonate Rock

National Research Center for CRMs (China)

Description:

The material used for this CRM was collected at Tongling, Anhui, China. The major component is limestone with a small amount of dolomite.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Li	20.5	1.4	Y	9.1	0.9
Be	0.8	0.1	Zr	62	8
B	16	2	Nb	6.6	1.1
F	406	19	Mo	0.38	0.03
MgO (%)	5.19	0.06	Cd	0.069	0.014
Al ₂ O ₃ (%)	5.03	0.05	Sb	0.43	0.06
SiO ₂ (%)	15.60	0.04	Cs	3.2	0.4
P	226	17	Ba	120	6
S	370	90	La	14.6	1.9
K ₂ O (%)	0.78	0.02	Ce	25.4	1.8
CaO (%)	35.67	0.14	Pr	3.4	0.2
Sc	6.0	0.8	Nd	12.0	0.7
Ti	1960	40	Sm	2.4	0.1
V	36	3	Eu	0.51	0.03
Cr	32	2	Gd	1.9	0.13
Mn	434	12	Tb	0.35	0.03
Fe ₂ O ₃ (%)	2.52	0.03	Dy	1.6	0.1
Co	9.0	0.5	Ho	0.33	0.03
Ni	17.8	0.8	Yb	0.90	0.07
Cu	23.4	0.8	Lu	0.14	0.02
Zn	52	2	Hf	1.8	0.2
Ga	7.1	0.5	W	0.67	0.11
Ge	0.67	0.12	Hg (ng/g)	16	1
As	4.7	0.4	Pb	18.3	1.4
Se	0.099	0.015	Bi	0.16	0.02
Pb	32	2	Tm	0.17	0.02
Sr	913	28	Th	4.1	0.3
			U	1.9	0.17

GSR-6 (cont.)

Noncertified concentrations ($\mu\text{g/g}$ dry weight):

Component	Value
Cl	80
In	0.042
Sn	0.98
Te	0.023
Er	1.1
Ta	0.46
Au (ng/g)	0.94
Tl	0.36

Order information:

No price information is available. Please contact NRCCRM.

Reference:

Institute of Geophysical and Geochemical Exploration (1986) Certificate of geochemical standard reference materials. Institute of Geophysical and Geochemical Exploration, Langfang, Hebei, China.

IF-G

Iron Formation Sample

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

IF-G was collected from a large iron ore deposit in the Isua supracrustal belt, West Greenland. The iron ore deposit is oxide facies iron formation, chemically precipitated on the ocean floor in a volcanic environment dominated by basaltic rocks. The IF-G is typically banded, with magnetite-rich layers alternating with quartz-rich layers. The layers range from a fraction of a centimeter to several tens of centimeters. The principal components are quartz and magnetite. Minor amounts of actinolite were observed. Scarce euhedral grains of pyrite are irregularly distributed through the iron formation. The material for the iron formation originated from submarine exhalations and/or submarine leaching of basaltic rocks. After deposition, the area was metamorphosed under amphibolite facies conditions, as a result of which the original chert layers recrystallized to quartz layers, and the grain size of the magnetite increased. Details of the collection, preparation and calculation of recommended and proposed values can be found in Govindaraju (1995).

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	0.41	Cr	4	Ce	4
H ₂ O ⁻ (%)	0.06	MnO (%)	0.042	Nd	1.8
Li	1	FeO (%)	16.78	Sm	0.4
Be	4.7	Fe ₂ O ₃ (%)	55.85	Eu	0.39
Na ₂ O (%)	0.032	Co	29	Gd	0.74
MgO (%)	1.89	Ni	22.5	Tb	0.11
Al ₂ O ₃ (%)	0.15	Cu	10	Dy	0.8
SiO ₂ (%)	41.20	Zn	20	Ho	0.2
P ₂ O ₅ (%)	0.063	As	1.5	Er	0.63
K ₂ O (%)	0.012	Y	9	Tm	0.09
CaO (%)	1.55	Sb	0.63	Yb	0.6
Sc	0.3	Ba	1.5	Lu	0.09
TiO ₂ (%)	0.014	La	2.8	Ta	0.2

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
F	50	Ga	0.7	Sn	0.3
S	700	Ge	24	Tl	0.02
Cl	25	Mo	0.7	U	0.02
V	2	In	0.02		

IF-G (cont.)

Order Information:

IF-G is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. IF-G is packaged in 30-g units.

Reference:

Govindaraju, K. (1995) Update (1984-1995) on two GIT-IWG geochemical reference samples: albite from Italy, AL-I and iron formation sample from Greenland, IF-G. Geostand. Newsletter, 19(1):55-96.

IPT 28

Clay (Pára)

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 28 was provided by Celite S/A Indústria e Comércio. The material was dried at 140°C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value
Na ₂ O	0.02
MgO	0.04
Al ₂ O ₃	37.6
SiO ₂	45.1
P ₂ O ₅	0.15
K ₂ O	0.03
CaO	0.09
TiO ₂	2.04
Fe ₂ O ₃	0.83

Order Information:

IPT 28 can be purchased for US\$190 per unit (50 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1979) Amostra padrão 28. Argila Pará. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 32

Plastic Clay (Saracuruna)

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 32 was provided by Klabin Cerâmica S/A. The material was dried at 140° C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value
Na ₂ O	0.16
MgO	0.39
Al ₂ O ₃	28.5
SiO ₂	51.8
P ₂ O ₅	0.13
K ₂ O	0.80
CaO	0.17
TiO ₂	1.49
Fe ₂ O ₃	3.46

Order Information:

IPT 32 can be purchased for US\$190 per unit (50 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1980) Amostra padrão 32. Argila plastica Saracuruna. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 35

Calcitic Limestone

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 35 was provided by S/A Indústrias Votorantim. The material was dried at 110° C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value
Na ₂ O	0.004
MgO	0.70
Al ₂ O ₃	0.24
SiO ₂	1.98
P ₂ O ₅	0.008
K ₂ O	0.10
CaO	53.8
TiO ₂	0.013
MnO	0.012
Fe ₂ O ₃	0.14
SrO	0.04

Order Information:

IPT 35 can be purchased for US\$170 per unit (80 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1980) Amostra padrão 35. Calcário calcítico. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 42

Clay (São Simão)

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 42 was provided by Celite S/A Indústria e Comércio. The material was dried at 140° C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (±)
Na ₂ O	0.02	0.005
MgO	0.19	0.02
Al ₂ O ₃	32.2	0.1
SiO ₂	51.9	0.1
P ₂ O ₅	0.07	0.01
K ₂ O	0.47	0.80
CaO	0.05	0.01
TiO ₂	0.96	0.04
Fe ₂ O ₃	1.09	0.05

Order Information:

IPT 42 can be purchased for US\$190 per unit (50 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1981) Amostra padrão 42. Argila São Simão. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 44

Limestone

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 44 was provided by Indústrias Votorantim. The material was dried at 110° C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (±)
Na ₂ O	0.002	0.001
MgO	2.93	0.07
Al ₂ O ₃	0.33	0.02
SiO ₂	2.69	0.03
P ₂ O ₅	0.013	0.001
K ₂ O	0.12	0.01
CaO	50.5	0.1
TiO ₂	0.019	0.001
MnO	0.015	0.001
Fe ₂ O ₃	0.30	0.02
SrO	0.04	0.005

Order Information:

IPT 44 can be purchased for US\$170 per unit (80 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1981) Amostra padrão 44. Calcário. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 48

Dolomitic Limestone

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

Material for IPT 48 was provided by Indústria Mineradora Pagliato Ltda. The material was dried at 110° C, ground and passed through a 0.074 mm sieve.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (±)
Na ₂ O	0.013	0.003
MgO	21.2	0.1
Al ₂ O ₃	0.17	0.02
SiO ₂	0.45	0.02
P ₂ O ₅	0.022	0.002
K ₂ O	0.026	0.003
CaO	31.0	0.1
TiO ₂	0.006	0.001
MnO	0.014	0.002
Fe ₂ O ₃	0.17	0.01
SrO	0.009	0.001

Order Information:

IPT 48 can be purchased for US\$170 per unit (80 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1982) Amostra padrão 48. Calcário dolomítico. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo Brazil.

IPT 53

Potash Feldspar

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

No information available.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (\pm)
Na ₂ O	2.5	0.1
MgO	0.05	0.004
Al ₂ O ₃	18.3	0.1
SiO ₂	65.8	0.1
P ₂ O ₅	0.072	0.002
K ₂ O	12.1	0.1
CaO	0.27	0.03
TiO ₂	0.013	0.003
Fe ₂ O ₃	0.13	0.01

Order Information:

IPT 53 can be purchased for US\$190 per unit (80 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1984) Amostra padrão IPT 53. Feldspato potássico. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo Brazil.

IPT-61 - IPT-62

Glass Sands

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

No information available.

Certified concentrations (percent dry weight):

Oxide	IPT-61	IPT-62
	Value	Value
Al ₂ O ₃	0.054	0.11
SiO ₂	99.79	99.62
TiO ₂	0.026	0.036
Fe ₂ O ₃	0.014	0.072
ZrO ₂	0.010	0.010

Noncertified concentrations (percent dry weight):

Oxide	IPT 61	IPT 62
	Value	Value
Na ₂ O	0.002	0.002
MgO	0.003	0.004
K ₂ O	0.007	0.007
CaO	0.004	0.004

Order Information:

IPT-61 and IPT-62 can be purchased for US\$190 per unit (100 g) each. Price subject to change without notice. Please contact IPT.

References:

Instituto de Pesquisas Tecnológicas (1985) Amostra padrão 61. Areia quartzosa (0.01% Fe₂O₃) Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

Instituto de Pesquisas Tecnológicas (1985) Amostra padrão 62. Areia quartzosa (0.07% Fe₂O₃). Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo, Brazil.

IPT 72

Soda Feldspar

Instituto de Pesquisas Tecnológicas (Brazil)

Description:

No information available.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (\pm)
Na ₂ O	10.0	0.1
MgO	0.022	0.002
Al ₂ O ₃	20.26	0.03
SiO ₂	66.2	0.1
P ₂ O ₅	1.03	0.04
K ₂ O	1.47	0.06
CaO	0.18	0.01
TiO ₂	0.005	0.001
Fe ₂ O ₃	0.09	0.01
LOI	0.66	0.02

Order Information:

IPT 72 can be purchased for US\$190 per unit (80 g). Price subject to change without notice. Please contact IPT.

Reference:

Instituto de Pesquisas Tecnológicas (1988) Amostra padrão IPT 72. Feldspato sódico. Certificate of analysis. Instituto de Pesquisas Tecnológicas, São Paulo Brazil.

JA-2

Andesite

Geological Survey of Japan (Japan)

Description:

The material for JA-2 is a Goshikidai sanukitoid andesite collected from Sakaide, Kagawa Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	27.3	Fe (%)	4.34	Pr	3.84
Be	2.05	FeO (%)	3.69	Nd	13.9
B	20.7	Fe ₂ O ₃ (%)	2.16	Sm	3.11
C	141*	Co	29.5	Eu	0.93
F	223*	Ni	130	Gd	3.06
Na (%)	2.31	Ni ₂ O (%)	3.11	Tb	0.44
Mg (%)	4.58	Cu	29.7	Dy	2.80
MgO (%)	7.60	Zn	64.7	Ho	0.50
Al (%)	8.16	Ga	16.9	Er	1.48
Al ₂ O ₃ (%)	15.41	Ge	1.05*	Tm	0.28
Si (%)	26.37	As	0.858	Yb	1.62
SiO ₂ (%)	56.42	Rb	72.9	Lu	0.27
P (%)	0.064	Sr	248	Hf	2.86
P ₂ O ₅ (%)	0.146	Y	18.3	Ta	0.80
S	8*	Zr	116	W	0.99*
K (%)	1.50	Nb	9.47	Re (ng/g)	0.063*
K ₂ O (%)	1.81	Mo	0.60	Ir (ng/g)	0.013*
Ca (%)	4.50	Ag	0.043*	Pt (ng/g)	1.3*
CaO (%)	6.29	Cd	0.078*	Au (ng/g)	0.26
Sc	19.6	Sn	1.68	Hg (ng/g)	1.8*
Ti (%)	0.40	Sb	0.14*	Tl	0.32
TiO ₂ (%)	0.66	I	0.005*	Pb	19.2
V	126	Cs	4.63	Bi	0.07*
Cr	436	Ba	321	Th	5.03
Mn (%)	0.084	La	15.8	U	2.21
MnO (%)	0.108	Ce	32.7		
		Pd (ng/g)	0.5*		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JA-3

Andesite

Geological Survey of Japan (Japan)

Description:

The material for JA-3 is an andesite collected from the 1783 eruption of the Asama volcano, Tsumagoi-mura, Gunma Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Be	0.80	Fe (%)	4.62	Nd	12.3
B	24.8	FeO (%)	4.83	Sm	3.05
C	61 *	Fe ₂ O ₃ (%)	1.15	Eu	0.82
F	286 *	Co	21.1	Gd	2.96
Na (%)	2.37	Ni	32.2	Tb	0.52
Mg (%)	2.24	Ni ₂ O (%)	3.19	Dy	3.01
MgO (%)	3.72	Cu	43.4	Ho	0.51
Al (%)	8.23	Zn	67.7	Er	1.57
Al ₂ O ₃ (%)	15.56	Ga	16.3	Tm	0.28 *
Si (%)	29.11	As	4.68 *	Yb	2.16
SiO ₂ (%)	62.27	Pb	36.7	Lu	0.32
P (%)	0.051	Sr	287	Hf	3.42
P ₂ O ₅ (%)	0.116	Y	21.2	Ta	0.27
S	214 *	Zr	118	W	8.07 *
K (%)	1.17	Nb	3.41	Re (ng/g)	0.65 *
K ₂ O (%)	1.41	Mo	1.89	Ir (ng/g)	0.014 *
Ca (%)	4.46	Ag	0.084	Pt (ng/g)	1.7 *
CaO (%)	6.24	Cd	0.089 *	Au (ng/g)	0.95 *
Sc	22.0	Sn	0.95 *	Hg (ng/g)	1.9 *
Ti (%)	0.42	Sb	0.32 *	Tl	0.23 *
TiO ₂ (%)	0.70	Cs	2.08	Pb	7.70
V	169	Ba	323	Bi	0.05 *
Cr	66.2	La	9.33	Th	3.25
Mn (%)	0.081	Ce	22.8	U	1.18
MnO (%)	0.104	Pd (ng/g)	1.0 *		
		Pr	2.40		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JA-3 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JB-2

Basalt

Geological Survey of Japan (Japan)

Description:

The material for JB-2 is a flood basalt (tholeiitic basalt) from the eruption of 1950-1951 of the O-shima volcano, Oshima, Tokyo, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	7.78	Fe (%)	9.97	Ce	6.76
Be	0.26*	FeO (%)	9.98	Pd (ng/g)	6.3*
B	30.2	Fe ₂ O ₃ (%)	3.33	Pr	1.01
C	218*	Co	38.0	Nd	6.63
F	98.5	Ni	16.6	Sm	2.31
Na (%)	1.51	Ni ₂ O (%)	2.04	Eu	0.86
Mg (%)	2.79	Cu	225	Gd	3.28
MgO (%)	4.62	Zn	108	Tb	0.60
Al (%)	7.75	Ga	17.0	Dy	3.73
Al ₂ O ₃ (%)	14.64	Ge	1.35	Ho	0.75
Si (%)	24.89	As	2.87	Er	2.60
SiO ₂ (%)	53.25	Se	0.19*	Tm	0.41
P (%)	0.044	Br		Yb	2.62
P ₂ O ₅ (%)	0.101	Rb	7.37	Lu	0.40
S	17.9	Sr	178	Hf	1.49
Cl	281	Y	24.9	Ta	0.13
K (%)	0.35	Zr	51.2	W	0.26*
K ₂ O (%)	0.42	Nb	1.58*	Re (ng/g)	0.38*
Ca (%)	7.02	Mo	1.08	Pt (ng/g)	4.0*
CaO (%)	9.82	Ag	0.072*	Au (ng/g)	5.64
Sc	53.5	Cd	0.14	Hg (ng/g)	4.78
Ti (%)	0.71	In	0.094*	Tl	0.042*
TiO ₂ (%)	1.19	Sn	0.95	Pb	5.36
V	575	Sb	0.25	Bi	0.033*
Cr	28.1	I	0.049*	Th	0.35
Mn (%)	0.169	Cs	0.85	U	0.18
MnO (%)	0.218	Ba	222		
		La	2.35		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JB-2 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JB-3

Basalt

Geological Survey of Japan (Japan)

Description:

The material for JB-3 is a high alumina basalt from the 864 eruption of Fuji volcano, Narusawa-mura, Yamanashi Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	7.21	Fe (%)	8.27	Pd (ng/g)	3.2*
Be	0.81	FeO (%)	7.85	Pr	3.11
B	18.0	Fe ₂ O ₃ (%)	3.20	Nd	15.6
C	120*	Co	34.3	Sm	4.27
F	253	Ni	36.2	Eu	1.32
Na (%)	2.03	Ni ₂ O (%)	2.73	Gd	4.67
Mg (%)	3.13	Cu	194	Tb	0.73
MgO (%)	5.19	Zn	100	Dy	4.54
Al (%)	9.10	Ga	19.8	Hb	0.80
Al ₂ O ₃ (%)	17.20	Ge	1.12	Er	2.49
Si (%)	23.82	As	1.84	Tm	0.42
SiO ₂ (%)	50.96	Se	0.069*	Yb	2.55
P (%)	0.128	Rb	15.1	Lu	0.39
P ₂ O ₅ (%)	0.294	Sr	403	Hf	2.67
S	9.86	Y	26.9	Ta	0.15
Cl	259*	Zr	97.8	W	1.06*
K (%)	0.65	Nb	2.47	Re (ng/g)	0.24*
K ₂ O (%)	0.78	Mo	1.09	Ir (ng/g)	0.037*
Ca (%)	7.00	Ag	0.075	Pt (ng/g)	4.3*
CaO (%)	9.79	Cd	0.081	Au (ng/g)	1.99
Sc	33.8	In	0.069*	Hg (ng/g)	2.4*
Ti (%)	0.86	Sn	0.94	Tl	0.048
TiO ₂ (%)	1.44	Sb	0.12	Pb	5.58
V	372	I	0.028*	Bi	0.023*
Cr	58.1	Cs	0.94	Th	1.27
Mn (%)	0.137	Ba	245	U	0.48
MnO (%)	0.177	La	8.81		
		Ce	21.5		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JB-3 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JDo-1

Dolomite

Geological Survey of Japan (Japan)

Description:

The material for JDo-1 is Kuzuu dolomite (Permian) collected in Kuzuu-machi, Tochigi Prefecture, Japan.

Recommended ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	<0.05	P ₂ O ₅ (%)	0.034	Ni	2.9
H ₂ O ⁻ (%)	0.17	S	86	Cu	1.4
Li	0.4	K ₂ O (%)	0.002	Zn	34.4
Be	<0.1	CaO (%)	34.12	As	0.11
C	12.76%	TiO ₂ (%)	<0.002	Sr	119
CO ₂ (%)	46.87	V	<5	Pb	<0.2
Na ₂ O (%)	0.009	Cr	7	Cs	<0.2
MgO (%)	18.40	MnO (%)	0.006	Tl	0.003
Al ₂ O ₃ (%)	0.013	Fe ₂ O ₃ (%)	0.020	Pb	1
SiO ₂ (%)	0.20	Co	<0.3	LOI (%)	46.58

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., A. Ando, T. Okai, Y. Kanai, M. Taniguchi, F. Takizawa, and S. Itoh (1990) Elemental concentrations in nine new GSJ rock reference samples "Sedimentary rock series". Geostands. Newsletter, 14(1):1-5.

JF-1

Feldspar

Geological Survey of Japan (Japan)

Description:

The material for JF-1 is Ohira feldspar, a mixture of orthoclase and albite separated from granite by mechanical grinding and sieving, collected at Nagiso-machi, Nagano Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	9.81	Mn (%)	0.001	Ce	4.19
Be	1.3*	MnO (%)	0.001	Pd (ng/g)	<0.2*
B	1.8*	Fe (%)	0.06	Pr	0.48
C	<20*	FeO (%)	<0.04*	Nd	1.46
F	7.8*	Fe ₂ O ₃ (%)	0.06	Sm	0.41
Na (%)	2.50	Co	0.12	Eu	0.87
Mg (%)	0.004	Ni	1.36*	Gd	0.93
MgO (%)	0.006	Ni ₂ O (%)	3.37	Tb	0.076
Al (%)	9.57	Cu	0.82	Dy	0.39
Al ₂ O ₃ (%)	18.08	Zn	4.41	Ho	0.11
Si (%)	31.17	Ga	17.4	Er	0.31
SiO ₂ (%)	66.69	As	0.92*	Tm	0.04*
P (%)	0.004	Rb	266	Yb	0.35
P ₂ O ₅ (%)	0.01	Sr	172	Lu	0.053
S	<5*	Y	2.84	Hf	1.18
K (%)	8.29	Zr	38.6	Ta	0.079
K ₂ O (%)	9.99	Nb	0.74	W	0.8*
Ca (%)	0.66	Mo	0.30*	Pt (ng/g)	<0.5*
CaO (%)	0.93	Ag	0.017*	Au (ng/g)	0.11*
Sc	0.23	Cd	0.003*	Hg (ng/g)	1.6*
Ti (%)	0.003	Sn	0.3*	Tl	1.18
TiO ₂ (%)	0.005	Sb	0.055*	Pb	33.4
V	5.43	Cs	2.09	Th	1.17
Cr	5.48	Ba	1750	U	0.33
		La	2.80		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. *Geochem. J.*, 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". *Geochem. J.*, 29(1):91-5.

JF-2

Feldspar

Geological Survey of Japan (Japan)

Description:

The material for JF-2 is Kurosaka feldspar, orthoclase occurring in a pegmatite, collected in Kurosaka, Ibaraki Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	2.19	Fe (%)	0.04	Pd (ng/g)	<0.2*
Be	0.77*	FeO (%)	<0.03*	Pr	0.088*
B	1.6*	Fe ₂ O ₃ (%)	0.06	Nd	0.33*
C	38*	Co	0.68	Sm	0.11
F	16*	Ni	1.38*	Eu	0.59
Na (%)	1.77	Ni ₂ O (%)	2.39	Gd	0.072*
MgO (%)	0.004*	Cu	0.78	Tb	0.009*
Al (%)	9.80	Zn	1.40	Dy	0.036*
Al ₂ O ₃ (%)	18.52	Ga	17.9	Hb	0.021*8
Si (%)	30.52	As	0.28*	Er	0.034*
SiO ₂ (%)	65.30	Pb	218	Tm	0.05
P ₂ O ₅ (%)	0.003*	Sr	200	Yb	0.045*
S	2.8*	Y	2.67	Lu	0.020
K (%)	10.74	Zr	6.73	Hf	0.19
K ₂ O (%)	12.94	Nb	0.70	Ta	0.045*
Ca (%)	0.06	Mo	0.21*	W	4.3*
CaO (%)	0.09	Ag	0.019*	Pt (ng/g)	<0.5*
Sc	0.089	Cd	0.003*	Au (ng/g)	0.12*
Ti (%)	0.003	Sn	0.13*	Hg (ng/g)	1.7*
TiO ₂ (%)	0.005	Sb	0.04*	Tl	1.10
V	4.86	Cs	1.06	Pb	48.7
Cr	2.47*	Ba	298	Th	0.31
Mn (%)	0.001	La	0.63	U	0.078*
MnO (%)	0.001	Ce	0.84		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. *Geochem. J.*, 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". *Geochem. J.*, 29(1):91-5.

JG-1a

Granodiorite

Geological Survey of Japan (Japan)

Description:

This material is Sori granodiorite collected at Azuma-mura, Gunma Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	79.5	MnO (%)	0.057	Pd (ng/g)	<0.2*
Be	3.16	Fe (%)	1.40	Pr	5.63
B	3.95	FeO (%)	1.36	Nd	20.4
C	295*	Fe ₂ O ₃ (%)	0.51	Sm	4.53
F	439	Co	5.90	Eu	0.70
Na (%)	2.51	Ni	6.91	Gd	4.08
Mg (%)	0.42	Ni ₂ O (%)	3.39	Tb	0.81
MgO (%)	0.69	Cu	1.67	Dy	4.44
Al (%)	7.57	Zn	36.5	Ho	0.82
Al ₂ O ₃ (%)	14.30	Ga	16.5	Er	2.57
Si (%)	33.80	Ge	1.5*	Tm	0.38
SiO ₂ (%)	72.30	As	0.43*	Yb	2.70
P (%)	0.036	Rb	178	Lu	0.44
P ₂ O ₅ (%)	0.083	Sr	187	Hf	3.59
S	11*	Y	32.1	Ta	1.90
Cl	65*	Zr	118	W	12.4
K (%)	3.29	Nb	11.4	Re (ng/g)	0.015*
K ₂ O (%)	3.96	Mo	0.45	Pt (ng/g)	<0.5*
Ca (%)	1.52	Ag	0.023*	Au (ng/g)	0.21
CaO (%)	2.13	Cd	0.026*	Hg (ng/g)	4.1*
Sc	6.21	In	0.025*	Tl	0.98
Ti (%)	0.15	Sn	4.47	Pb	26.4
TiO ₂ (%)	0.25	Sb	0.048*	Bi	0.43*
V	22.7	Cs	10.6	Th	12.8
Cr	17.6	Ba	470	U	4.69
Mn (%)	0.044	La	21.3		
		Ce	45.0		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JG-1a (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JG-2

Granite

Geological Survey of Japan (Japan)

Description:

Naegi granite, Cretaceous, Hirukawa-mura, Gifu Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	42.2	Fe (%)	0.68	Pr	6.20
Be	3.26	FeO (%)	0.57	Nd	26.4
B	1.78*	Fe ₂ O ₃ (%)	0.33	Sm	7.78
C	35*	Co	3.62	Eu	0.10
F	972*	Ni	4.35*	Gd	8.01
Na (%)	2.63	Ni ₂ O (%)	3.54	Tb	1.62
Mg (%)	0.02	Cu	0.49	Dy	10.5
MgO (%)	0.037	Zn	13.6	Ho	1.67
Al (%)	6.60	Ga	18.6	Er	6.04
Al ₂ O ₃ (%)	12.47	Ge	1.70*	Tm	1.16
Si (%)	35.91	As	0.68*	Yb	6.85
SiO ₂ (%)	76.83	Pb	301	Lu	1.22
P (%)	0.001	Sr	17.9	Hf	4.73
P ₂ O ₅ (%)	0.002	Y	86.5	Ta	2.76
S	7.0*	Zr	97.6	W	23.0
K (%)	3.91	Nb	14.7	Re (ng/g)	0.016*
K ₂ O (%)	4.71	Mo	0.37	Ir (ng/g)	0.0040*
Ca (%)	0.50	Ag	0.019*	Pt (ng/g)	<0.5*
CaO (%)	0.70	Cd	0.004*	Au (ng/g)	0.059
Sc	2.42	In	0.021*	Hg (ng/g)	3.3*
Ti (%)	0.026	Sn	3.00	Tl	1.55
TiO ₂ (%)	0.044	Sb	0.057*	Pb	31.5
V	3.78	Cs	6.79	Bi	0.64
Cr	6.37	Ba	81.0	Th	31.6
Mn (%)	0.012	La	19.9	U	11.3
MnO (%)	0.016	Ce	48.3		
		Pd (ng/g)	<0.2*		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JG-2 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JG-3

Granodiorite

Geological Survey of Japan (Japan)

Description:

The material for JG-3 is Mitoya granodiorite collected at Mitoya-cho, Simane Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	20.9	MnO (%)	0.071	Pr	4.70
Be	1.60*	Fe (%)	2.58	Nd	17.2
B	2.15	FeO (%)	1.83	Sm	3.39
C	120*	Fe ₂ O ₃ (%)	1.62	Eu	0.90
F	317*	Co	11.7	Gd	2.92
Na (%)	2.94	Ni	14.3	Tb	0.46
Mg (%)	1.08	Ni ₂ O (%)	3.96	Dy	2.59
MgO (%)	1.79	Cu	6.81	Ho	0.38
Al (%)	8.19	Zn	46.5	Er	1.52
Al ₂ O ₃ (%)	15.48	Ga	17.1	Tm	0.24
Si (%)	31.45	Ge	1.06*	Yb	1.77
SiO ₂ (%)	67.29	As	0.37*	Lu	0.26
P (%)	0.053	Pb	67.3	Hf	4.29
P ₂ O ₅ (%)	0.122	Sr	379	Ta	0.70
S	54.7*	Y	17.3	W	14.1*
Cl	156*	Zr	144	Re (ng/g)	0.033*
K (%)	2.19	Nb	5.88	Ir (ng/g)	0.0016*
K ₂ O (%)	2.64	Mo	0.45	Pt (ng/g)	<0.5*
Ca (%)	2.64	Ag	0.029*	Au (ng/g)	0.17
CaO (%)	3.69	Cd	0.054*	Hg (ng/g)	2.4*
Sc	8.76	Sn	1.40	Tl	0.40*
Ti (%)	0.29	Sb	0.08*	Pb	11.7
TiO ₂ (%)	0.48	Cs	1.78	Bi	0.058
V	70.1	Ba	466	Th	8.28
Cr	22.4	La	20.6	U	2.21
Mn (%)	0.055	Ce	40.3		
		Pd (ng/g)	<0.2*		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JGb-1

Gabbro

Geological Survey of Japan (Japan)

Description:

The material for JGb-1 is gabbro collected at Utsushigatake, Funehiki-machi, Fukushima Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	4.59	MnO (%)	0.189	Pd (ng/g)	0.18*
Be	0.34*	Fe (%)	10.53	Pr	1.13
B	4.03	FeO (%)	9.43	Nd	5.47
C	300*	Fe ₂ O ₃ (%)	4.79	Sm	1.49
F	133	Co	60.1	Eu	0.62
Na (%)	0.89	Ni	25.4	Gd	1.61
Mg (%)	4.73	Ni ₂ O (%)	1.20	Tb	0.29
MgO (%)	7.85	Cu	85.7	Dy	1.56
Al (%)	9.26	Zn	109	Ho	0.33
Al ₂ O ₃ (%)	17.49	Ga	17.9	Er	1.04
Si (%)	20.41	Ge	1.01	Tm	0.16
SiO ₂ (%)	43.66	As	1.09	Yb	1.06
P (%)	0.024	Se	0.15*	Lu	0.15
P ₂ O ₅ (%)	0.056	Pb	6.87	Hf	0.88
S	1910	Sr	327	Ta	0.18
Cl	81*	Y	10.4	W	0.81*
K (%)	0.20	Zr	32.8	Re (ng/g)	0.27*
K ₂ O (%)	0.24	Nb	3.34	Pt (ng/g)	<0.5*
Ca (%)	8.50	Mo	0.59	Au (ng/g)	1.02
CaO (%)	11.90	Ag	0.024*	Hg (ng/g)	4.2*
Sc	35.8	Cd	0.087	Tl	0.066*
Ti (%)	0.96	Sn	0.48	Pb	1.92
TiO ₂ (%)	1.60	Sb	0.085*	Bi	0.014*
V	635	Cs	0.26	Th	0.48
Cr	57.8	Ba	64.3	U	0.13
Mn (%)	0.146	La	3.60		
		Ce	8.17		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JGb-2

Gabbro

Geological Survey of Japan (Japan)

Description:

JGb-2, leucogabbro, is from the Tsukuba Tunnel No. 2 for Kasumigaura Irrigation Project (sampling point corresponds to under the northeastern slope of Mt. Tsukuba), Yasato, Ibaraki Prefecture, Japan (36° 13' 31" N; 140° 06' 54" E). In Tsukuba district, several different types of granite rocks of Early Paleogene age are widely distributed, and a small gabbroic mass is cropped out in the central part of the porphyritic granodiorite in Mt. Tsukuba. The gabbroic mass is intruded by aplite, pegmatite, and fine-grained biotite granite which are considered to be derivatives of the main porphyritic granodiorite. The main constituent minerals are plagioclase and secondary amphibole. Anhedral plagioclase crystals (1 - 3 mm) are most abundant, and they are generally fresh. Colorless to light green amphibole is observed as tiny feather-like crystals, and they make aggregate with small needles of sphene. Rarely, a relict of clinopyroxene is observed in amphibole. Secondary biotite and carbonate minerals are recognized. Cleaned rock pieces were broken with a sledge-hammer to 4 to 8 cm, crushed to 1 - 2 cm pieces with a jaw crusher, milled in a high alumina-lined ball mill of 110 L capacity with balls made of the rock samples to be processed for about 120 hrs, screened with a 100 mesh stainless steel sieve, mixed, and packaged in 100-g portions in glass bottles.

Analytical results ($\mu\text{g/g}$ unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	1.36	S	707	Ni	13.8
H ₂ O ⁻ (%)	0.16	K ₂ O (%)	0.06	As	1.06
Li	16	CaO (%)	14.20	Cu	11
Be	<0.4	TiO ₂ (%)	0.58	Zn	48
C	710	V	175	Pb	<3
Na ₂ O (%)	0.92	Cr	130	Sr	435
MgO (%)	6.25	MnO (%)	0.127	Cs	<0.4
Al ₂ O ₃ (%)	23.32	FeO (%)	5.62	Pb	<3
SiO ₂ (%)	46.68	Fe ₂ O ₃ (%)	0.60		
P ₂ O ₅ (%)	0.007	Co	28		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Sasada, M., H. Hattori, H. Kanaya, M. Bunno, and Y. Sakamaki (1987) New evidence on the intrusive relation between the Tsukubasan gabbro and the surrounding granitic rocks, based on the wall-rock geology of the Tsukuba Tunnel No. 1 for Kasumigaura Irrigation Project, Ibaraki, Japan. Bull. Geol. Surv. Japan, 38:217-20.

JGb-2 (cont.)

Terashima, S., S. Itoh, M. Ujiie, H. Kamioka, T. Tanaka, and H. Hattori (1993) Three new GSJ reference samples: rhyolite JR-3, gabbro JGb-2 and hornblende JH-1. Geostands. Newsletter, 17(1):1-4.

JH-1

Hornblendite

Geological Survey of Japan (Japan)

Description:

JH-1, a dark grey olivine-orthopyroxene-clinopyroxene hornblendite is taken from Nishi-Dohira, Hase, Hitachi-Ota, Ibaraki Prefecture, Japan (36° 33' 21" N; 140° 33' 59" E). The small igneous body is composed of "cortlandtite", hornblendite, gabbro and quartz diorite, and situated in the southwestern slope of the Abukuma Plateau. The geology surrounding the igneous body consists essentially of biotite schist and biotite gneiss, intruded by other kinds of igneous rocks, such as pegmatite, aplite, and granite. Irregularly shaped large crystals (2 - 10 mm) of amphibole contain clinopyroxene, orthopyroxene and olivine grains. Amphibole is composed of light brown hornblende, and it changes to colorless amphibole without distinct boundary. It often contains many small needles and grains of opaque minerals smaller than 0.05 mm. Colorless amphibole is also observed in the form of aggregates. Clinopyroxene (1 - 8 mm) is replaced by amphibole along its cleavage, and it is observed only as small patches in amphibole. Anhedral orthopyroxene (1 - 3 mm) and round-shaped olivine (1 - 2 mm) are sometimes contained together, and they are partly altered. Small amount of secondary biotite and carbonate are also observed. Cleaned rock pieces were broken with a sledge-hammer to 4 to 8 cm, crushed to 1 - 2 cm pieces with a jaw crusher, milled in a high alumina-lined ball mill of 110 L capacity with balls made of the rock samples to be processed for about 120 hrs, screened with a 100 mesh stainless steel sieve, mixed, and packaged in 100-g portions in glass bottles.

Analytical results ($\mu\text{g/g}$ unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	1.82	SiO ₂ (%)	48.48	Ni	56
H ₂ O ⁻ (%)	0.23	K ₂ O (%)	0.52	Cu	9
Li	12	CaO (%)	15.02	Zn	62
Be	0.4	TiO ₂ (%)	0.67	As	1.12
C	1630	V	231	Pb	12
P ₂ O ₅ (%)	0.11	Cr	630	Sr	155
S	650	MnO (%)	0.186	Cs	0.5
Na ₂ O (%)	0.72	FeO (%)	8.39	Pb	<3
MgO (%)	17.12	Fe ₂ O ₃ (%)	1.01		
Al ₂ O ₃ (%)	5.56	Co	53		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., S. Itoh, M. Ujiie, H. Kamioka, T. Tanaka, and H. Hattori (1993) Three new GSJ reference samples: rhyolite JR-3, gabbro JGb-2 and hornblendite JH-1. Geostands. Newsletter, 17(1):1-4.

JLs-1

Limestone

Geological Survey of Japan (Japan)

Description:

JLs-1 is Garo limestone (Triassic), Kamiliso-cho, Kamiliso-gun, Hokkaido, Japan.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	<0.05	P ₂ O ₅ (%)	0.029	Ni	0.3
H ₂ O ⁻ (%)	0.12	S	135	Cu	<0.5
Li	0.2	K ₂ O (%)	0.003	Zn	2.9
Be	<0.1	CaO (%)	55.02	As	0.15
C	11.98%	TiO ₂ (%)	<0.002	Sr	296
CO ₂ (%)	43.86	V	<5	Pb	<0.2
Na ₂ O (%)	0.002	Cr	3	Cs	<0.2
MgO (%)	0.62	MnO (%)	0.002	Tl	0.003
Al ₂ O ₃ (%)	0.021	Fe ₂ O ₃ (%)	0.015	Pb	<1
SiO ₂ (%)	0.11	Co	<0.3	LOI (%)	43.73

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., A. Ando, T. Okai, Y. Kanai, M. Taniguchi, F. Takizawa, and S. Itoh (1990) Elemental concentrations in nine new GSJ rock reference samples "Sedimentary rock series". Geostands. Newsletter, 14(1):1-5.

JMn-1

Manganese Nodule

Geological Survey of Japan (Japan)

Description:

JMn-1 was collected from the flat floor of the southern Central Pacific Basin using a large bucket dredge during the R/V Hakurei-Marui cruise as part of the GSJ manganese nodule program in 1982. The dredge sample consisted of 2 - 4-cm spherical manganese nodules and minor amounts of zeolite rocks and fossil shark teeth. The nodule deposits rest on the surface of the Quaternary to Pliocene pelagic siliceous clay sediments with the abundance of 10 to 16 kg/m². The dredge was carried out on the floor depths of 5200 to 5225 m (0° 47.2' S, 166° 7.1' W). The core stratigraphy shows a slow pelagic sedimentation in this area since the early Miocene to Plio-Pleistocene hiatus. The geology, nodule occurrence, chemistry and mineralogy have been described by Usui (1992). JMn-1 is being distributed for collaborative studies.

Preliminary results (µg/g dry weight unless noted):

Component	Value	Component	Value	Component	Value
Be	1.21	Ga	1.51	Eu	7.26
Na ₂ O (%)	2.88	As	73.38	Gd	26.05
MgO (%)	3.4	Rb	11.04	Tb	4.42
Al ₂ O ₃ (%)	4.48	Sr	737	Dy	25.65
SiO ₂ (%)	13.99	Y	106.49	Ho	5.49
P ₂ O ₅ (%)	0.87	Zr	350	Er	13.26
K ₂ O (%)	0.92	Nb	27.42	Tm	2.04
CaO (%)	3.01	Mo	316	Yb	12.86
TiO ₂ (%)	1.05	Cd	13.47	Lu	2.06
V	397	In	0.25	Hf	6.1
Cr	21.43	Sn	6.26	Ta	0.68
MnO (%)	32.51	Sb	37.18	W	37.49
Fe ₂ O ₃ (%)	14.13	Cs	0.41	Tl	76.44
Co	1692	Ba	1702	Pb	444
Ni	12552	La	124.88	Bi	4.34
Cu	12004	Ce	286	Th	11.93
Zn	1042	Pr	29.72	U	4.81
Ga	32.51	Nd	127.88		
		Sm	29.25		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Terashima, S., A. Usui, and N. Imai (1995) Two new GSJ geochemical reference samples: syenite JSy-1 and manganese nodule JMn-1. Geostands. Newsletter, 19:(in press).

Usui, A. (ed.) (1992) Marine geology, geophysics and manganese nodule deposits in the southern part of the Central Pacific Basin. GSJ Cruise Rep. 22. Geological Survey of Japan, Ibaraki, Japan. 276 pp.

JP-1

Peridotite

Geological Survey of Japan (Japan)

Description:

The material for JP-1 is Horoman peridotite collected at Horoman, Hokkaido, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	1.79*	FeO (%)	5.99	Pr	0.020*
Be	<0.1*	Fe ₂ O ₃ (%)	1.98	Nd	0.072*
B	1.4*	Co	116	Sm	0.019
C	764*	Ni	2460	Eu	0.004*
F	14*	Ni ₂ O (%)	0.021	Gd	0.015*
Na (%)	0.02	Cu	6.72	Tb	0.003*
Mg (%)	26.9	Zn	41.8	Dy	0.022*
MgO (%)	44.60	Ga	0.70*	Hb	0.018*
Al (%)	0.35	Ge	0.49*	Er	0.016*
Al ₂ O ₃ (%)	0.66	As	0.34	Tm	<0.041*
Si (%)	19.81	Pb	0.80*	Yb	0.022
SiO ₂ (%)	42.38	Sr	3.32*	Lu	0.0044*
P ₂ O ₅ (%)	0.002*	Y	1.54	Hf	0.20
S	26.9*	Zr	5.92	Ta	0.02*
Cl	97*	Nb	1.48	W	0.85*
K (%)	0.002	Mo	0.087*	Re (ng/g)	0.015*
K ₂ O (%)	0.003	Ru (ng/g)	6.5*	Os (ng/g)	7.9*
Ca (%)	0.39	Ag	1.5*	Ir (ng/g)	2.0*
CaO (%)	0.55	Cd	0.011*	Pt (ng/g)	4.9*
Sc	7.24	Sn	0.05*	Au (ng/g)	0.23+
TiO ₂ (%)	0.006*	Sb	0.034*	Hg (ng/g)	5.3*
V	27.6	Cs	0.15*	Tl	0.003*
Cr	2807	Ba	19.5	Pb	0.12*
Mn (%)	0.094	La	0.084	Th	0.19
MnO (%)	0.121	Ce	0.19*	U	0.036
Fe (%)	5.85	Pd (ng/g)	1.3*		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JR-1

Rhyolite

Geological Survey of Japan (Japan)

Description:

The material for JR-1 is Wada Toge obsidian collected at Wada-mura, Nagano Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	61.4	Fe (%)	0.62	Ce	47.2
Be	3.34	FeO (%)	0.49	Pd (ng/g)	<0.2*
B	117	Fe ₂ O ₃ (%)	0.35	Pr	5.58
C	70.8	Co	0.83	Nd	23.3
F	991	Ni	1.67*	Sm	6.03
Na (%)	2.98	Ni ₂ O (%)	4.02	Eu	0.30
Mg (%)	0.07	Cu	2.68	Gd	5.06
MgO (%)	0.12	Zn	30.6	Tb	1.01
Al (%)	6.79	Ga	16.1	Dy	5.69
Al ₂ O ₃ (%)	12.83	Ge	1.88	Ho	1.11
Si (%)	35.27	As	16.3	Er	3.61
SiO ₂ (%)	75.45	Se	0.006*	Tm	0.67
P (%)	0.009	Br	6 *	Yb	4.55
P ₂ O ₅ (%)	0.021	Rb	257	Lu	0.71
S	13.3	Sr	29.1	Hf	4.51
Cl	920	Y	45.1	Ta	1.86
K (%)	3.66	Zr	99.9	W	1.59
K ₂ O (%)	4.41	Nb	15.2	Re (ng/g)	0.046*
Ca (%)	0.48	Mo	3.25	Pt (ng/g)	<0.5*
CaO (%)	0.67	Ag	0.031*	Au (ng/g)	0.25
Sc	5.07	Cd	0.026	Hg (ng/g)	3.4 *
Ti (%)	0.066	In	0.028*	Tl	1.56
TiO ₂ (%)	0.11	Sn	2.86	Pb	19.3
V	7.0	Sb	1.19	Bi	0.56
Cr	2.83	I	0.080*	Th	26.7
Mn (%)	0.077	Cs	20.8	U	8.88
MnO (%)	0.099	Ba	50.3		
		La	19.7		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JR-1 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JR-2

Rhyolite

Geological Survey of Japan (Japan)

Description:

The material used for JR-2 is Wada Toge obsidian collected at Shimosuwa-machi, Nagano Prefecture, Japan. The 1994 compilation values are listed below (Imai *et al.*, 1995).

Recommended and preferable (asterisked) values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
Li	79.2	Fe (%)	0.54	Pd (ng/g)	<0.2*
Be	3.75	FeO (%)	0.44	Pr	4.75
B	145	Fe ₂ O ₃ (%)	0.27	Nd	20.4
C	63*	Co	0.46	Sm	5.63
F	1109	Ni	1.99*	Eu	0.14
Na (%)	2.96	Ni ₂ O (%)	3.99	Gd	5.83
Mg (%)	0.02	Cu	1.36	Tb	1.10
MgO (%)	0.04	Zn	27.8	Dy	6.63
Al (%)	6.73	Ga	17.9	Hb	1.39
Al ₂ O ₃ (%)	12.72	Ge	1.88*	Er	4.36
Si (%)	35.38	As	19.2	Tm	0.74
SiO ₂ (%)	75.69	Se	0.0028*	Yb	5.33
P (%)	0.005	Pb	303	Lu	0.88
P ₂ O ₅ (%)	0.012	Sr	8.11	Hf	5.14
S	9.6*	Y	51.1	Ta	2.29
Cl	736*	Zr	96.3	W	1.8*
K (%)	3.69	Nb	18.7	Re (ng/g)	0.023*
K ₂ O (%)	4.45	Mo	3.35	Ir (ng/g)	0.0022*
Ca (%)	0.36	Ag	0.028*	Pt (ng/g)	<0.5*
CaO (%)	0.50	Cd	0.023	Au (ng/g)	0.13
Sc	5.59	Sn	3.51	Hg (ng/g)	0.9*
Ti (%)	0.04	Sb	1.51	Tl	1.85
TiO ₂ (%)	0.07	I	0.067*	Pb	21.5
V	3.00	Cs	25.0	Bi	0.62
Cr	3.10	Ba	39.5	Th	31.4
Mn (%)	0.087	La	16.3	U	10.9
MnO (%)	0.112	Ce	38.8		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

JR-1 (cont.)

References:

Ando, A., and K. Shibata (1988) Isotopic data and rare gas compositions of GSJ rock reference samples, "Igneous rock series", 1988. Geochem. J., 22:149-56.

Imai, N., S. Terashima, S. Itoh, and A. Ando (1995) 1994 compilation values for GSJ reference samples, "Igneous rock series". Geochem. J., 29(1):91-5.

JR-3

Rhyolite

Geological Survey of Japan (Japan)

Description:

JR-3, pale bluish green peralkaline rhyolite was collected near Unomisaki of Usubae, Cape Ashizuri, Tosashimizu, Kochi Prefecture, Japan (32° 43' 44" N; 132° 58' 44" E). The rhyolite is the final product of the Cape Ashizuri A-type granitic activities of Miocene age in the Outer Zone of Southwest Japan. The rock is anomalously rich in several rare metals. Ishihara *et al.* (1990) have studied the geology of this district and the geochemical characteristics of the rhyolite. The major bluish green part contains some phenocrysts of alkali feldspar smaller than 0.5 by 0.9 mm. The ground mass is composed of fine-grained laths of alkali feldspar, irregularly shaped crystals of quartz, fine needles of alkali amphibole, and accessory amounts of opaque minerals and zircon. The white part is similar to the bluish green part but is characterized by the absence of amphibole which makes the color difference. Trace amounts of zircon and other unknown minerals are observed. Cleaned rock pieces were broken with a sledge-hammer to 4 to 8 cm, crushed to 1 - 2 cm pieces with a jaw crusher, milled in a high alumina-lined ball mill of 110 L capacity with balls made of the rock samples to be processed for about 120 hrs, screened with a 100 mesh stainless steel sieve, mixed, and packaged in 100-g portions in glass bottles.

Analytical results (µg/g unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	0.83	P ₂ O ₅ (%)	0.009	Ni	1.1
H ₂ O ⁻ (%)	0.32	K ₂ O (%)	4.33	Cu	2.1
Li	118	CaO (%)	0.09	Zn	204
Be	7.6	TiO ₂ (%)	0.21	As	0.72
C	230	V	<10	Pb	458
S	39	Cr	2.5	Sr	9
Na ₂ O (%)	4.68	MnO (%)	0.085	Cs	1.0
MgO (%)	0.05	FeO (%)	1.91	Pb	34.5
Al ₂ O ₃ (%)	12.10	Fe ₂ O ₃ (%)	2.63		
SiO ₂ (%)	72.48	Co	1.0		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

References:

Ishihara, S., T. Tanaka, S. Terashima, S. Togashi, S. Murao, and H. Kamioka (1990) Peralkaline rhyolite dikes at the Cape Ashizuri: a new type of REE and rare metal mineral resources. Mining Geol., 40:107-15.

Terashima, S., S. Itoh, M. Ujiie, H. Kamioka, T. Tanaka, and H. Hattori (1993) Three new GSJ reference samples: rhyolite JR-3, gabbro JGb-2 and hornblendite JH-1. Geostands. Newsletter, 17(1):1-4.

JSI-1

Slate

Geological Survey of Japan (Japan)

Description:

The material used for JSI-1 is Toyoma clay slate (Permian) collected at Toyoma-cho, Miyagi Prefecture, Japan.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	4.00	S	1633	Cu	40.0
H ₂ O ⁻ (%)	0.63	K ₂ O (%)	2.85	Zn	112
Li	54.8	CaO (%)	1.43	As	15.6
Be	2.3	TiO ₂ (%)	0.73	Sr	192
C	1.01%	V	135	Pb	116
Na ₂ O (%)	2.20	Cr	58	Cs	8.6
MgO (%)	2.48	MnO (%)	0.062	Tl	0.61
Al ₂ O ₃ (%)	17.62	FeO (%)	3.95	Pb	18
SiO ₂ (%)	59.35	Fe ₂ O ₃ (%)	2.45	LOI (%)	5.96
P ₂ O ₅ (%)	0.19	Co	14.7		
		Ni	38.5		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., A. Ando, T. Okai, Y. Kanai, M. Taniguchi, F. Takizawa, and S. Itoh (1990) Elemental concentrations in nine new GSJ rock reference samples "Sedimentary rock series". Geostands. Newsletter, 14(1):1-5.

JSI-2

Slate

Geological Survey of Japan (Japan)

Description:

The material used for JSI-2 is Toyoma clay slate (Permian) collected at Okatsu-cho, Miyagi Prefecture, Japan.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Constituent	Value	Constituent	Value	Constituent	Value
H ₂ O ⁺ (%)	4.27	S	588	Ni	39.1
H ₂ O ⁻ (%)	0.33	K ₂ O (%)	2.93	Cu	40.8
Li	54.9	CaO (%)	1.93	Zn	107
Be	2.8	TiO ₂ (%)	0.75	As	11.6
C	1.28%	V	127	Sr	231
Na ₂ O (%)	1.39	Cr	64	Rb	117
MgO (%)	2.43	MnO (%)	0.085	Cs	9.2
Al ₂ O ₃ (%)	17.98	FeO (%)	4.79	Pb	21
SiO ₂ (%)	59.26	Fe ₂ O ₃ (%)	1.30	LOI (%)	6.28
P ₂ O ₅ (%)	0.17	Co	14.8		

Order information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., A. Ando, T. Okai, Y. Kanai, M. Taniguchi, F. Takizawa, and S. Itoh (1990) Elemental concentrations in nine new GSJ rock reference samples "Sedimentary rock series". Geostands. Newsletter, 14(1):1-5.

JSy-1

Syenite

Geological Survey of Japan (Japan)

Description:

The raw material for JSy-1, nepheline syenite, was collected in Nephton, Ontario, Canada, approximately 100 mi southeast of Toronto. It is uniform syenite rock body from a 2200-acre deposit. The rock resembles granite in texture and hardness. Chemically, the rock is an anhydrous sodium potassium aluminium silicate but it is not an aluminium silicate clay. JMn-1 is being distributed for collaborative studies.

Preliminary results ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Be	0.81	Ga	24.54	Eu	0.15
Na ₂ O (%)	10.95	Ge	0.67	Gd	0.25
MgO (%)	<0.005	As	0.92	Tb	0.048
Al ₂ O ₃ (%)	23.26	Pb	67.18	Dy	0.35
SiO ₂ (%)	59.76	Sr	16.14	Hb	0.09
P ₂ O ₅ (%)	0.03	Y	2.43	Er	0.27
K ₂ O (%)	4.75	Zr	71.08	Tm	0.05
CaO (%)	0.24	Nb	0.03	Yb	0.41
TiO ₂ (%)	<0.01	Mo	0.06	Lu	0.07
V	0.4	Sn	0.23	Hf	1.24
Cr	1.34	Sb	0.17	Ta	0.008
MnO (%)	<0.005	Cs	0.89	W	0.07
Fe ₂ O ₃ (%)	0.08	Ba	13.74	Pb	5.34
Co	0.04	La	1.24	Bi	0.04
Ni	0.64	Ce	2.44	Th	0.36
Cu	1.49	Pr	0.29	U	0.4
Zn	2.57	Nd	1.19	LOI (%)	0.81
		Sm	0.26		

Order Information:

Samples are available free of charge. Please contact to Dr. N. Imai, Geochemistry Section, GSJ.

Reference:

Terashima, S., A. Usui, and N. Imai (1995) Two new GSJ geochemical reference samples: syenite JSy-1 and manganese nodule JMn-1. Geostands. Newsletter, 19:(in press).

Diatomaceous Earth

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 49% opal, 26% kaolinite, 10% micas of the muscovite series, 10% quartz and trace levels of calcite, ilmenite, chlorite, plagioclase, and limonite. The granulometric composition is: larger than 0.090 mm, 0.4%; 0.063 to 0.090 mm, 12%; 0.040 to 0.063 mm, 2.9%; and smaller than 0.040 mm, 95.5%. The material was prepared in 1979. Minimum sample amount recommended is 0.1 g.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
Na ₂ O (%)	0.074	0.015	Fe ₂ O ₃ (%)	1.68	0.08
MgO (%)	0.251	0.018	Ni	13	4
Al ₂ O ₃ (%)	14.47	0.23	Cu	19	5
SiO ₂ (%)	74.21	0.59	Zn	33	4
K ₂ O (%)	0.67	0.05	Pb	51	6
CaO (%)	0.158	0.016	Sr	122	25
TiO ₂ (%)	0.557	0.034	Y	11.8	2.0
V	51	17	Zr	115	21
Cr	44	12	Pb	28	4
Mn	53	14	Th	13.2	1.8

Non-attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Component	Mean	Component	Mean
H ₂ O ⁺ (%)	6.8	Ga	17	Tb	0.66
Li	51	Nb	19	Yb	1.5
Be	2	Cd	3	Hf	2.9
B	17.8	Sn	3.5	Ta	1.15
P ₂ O ₅ (%)	0.09	Sb	0.28	W	6.5
S (%)	0.03	Cs	6.09	Hg	0.15
Sc	6.9	La	33	U	2.5
Co	2.7	Ce	55	LOI (%)	7.2
As	10.3	Sm	3		
		Eu	0.48		

Order information:

KB can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

Reference:

Institute of Mineral Raw Materials (1984?) Diatomaceous earth KB. Certificate. ST SEV 4328-84. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breitländer, Hamm, Germany.)

Kaolin

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 85-90% kaolinite with trace levels of mica, chlorite, quartz, montmorillonite, tourmaline, biotite, pyrite, siderite, rutile, and anatase. The granulometric composition is: larger than 0.090 mm, 0.2%; 0.071 to 0.090 mm, traces; 0.056 to 0.071 mm, traces; 0.020 to 0.056 mm, 0.2%; and smaller than 0.020 mm, 99.6%. The material was prepared in 1973.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
H ₂ O ⁺ (%)	12.77	0.17	Cr	10	3.8
Li	176	29	MnO (%)	0.015	0.002
Be	11.7	1.8	Fe ₂ O ₃ (%)	0.975	0.040
B	30	6	Co	2.7	1.0
CO ₂ (%)	0.164	0.051	Cu	9.6	3.7
Na ₂ O (%)	0.030	0.009	Zn	48.1	8.3
MgO (%)	0.196	0.058	As	15.2	4.0
Al ₂ O ₃ (%)	36.75	0.30	Pb	164	31
SiO ₂ (%)	47.05	0.24	Sr	75	17.2
P ₂ O ₅ (%)	0.092	0.016	Sn	33.4	10.5
S (%)	0.019	0.005	Cs	26.1	3.2
K ₂ O (%)	1.07	0.05	Ba	172	37
CaO (%)	0.26	0.05	La	50.6	12.9
Sc	6.9	1.9	Pb	116	37
TiO ₂ (%)	0.166	0.021	LOI (%)	13.12	0.32

Non-attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Component	Mean	Component	Mean
F	824	Cd	5	Hf	4.0
V	19	Sb	0.7	Ta	4.4
Ni	7.5	Ce	154	W	14.5
Ga	43	Nd	47	Au	0.00085
Br	0.48	Sm	13.8	Hg	0.09
Y	30.8	Eu	1.6	Bi	10
Zr	74	Tb	1.6	Th	21.7
Nb	21	Tm	0.95	U	5.7
Mo	1.2	Yb	7.4		
Ag	0.9	Lu	0.3		

KK (cont.)

Order Information:

KK can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

Reference:

Institute of Mineral Raw Materials (1976?) Kaolin KK. Certificate. ST CMEA 326-76. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breitländer, Hamm, Germany.)

MA-N

Granite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The material for this CRM is an albite-lepidolite granite ("quartz albitite") collected at Beauvoir, Clermont-Ferrand, Massif Central, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	1.08	Sc	0.2	Zr	25
H ₂ O ⁻ (%)	0.21	TiO ₂ (%)	0.01	Nb	173
Li	4900	V	1	Ag	1.8
Li ₂ O (%)	1.06	Cr	3	Cd	2
Be	300	MnO (%)	0.04	Sn	900
B	17	FeO (%)	0.31	Sb	1.7
CO ₂ (%)	0.13	Fe ₂ O ₃ (%)	0.13	Cs	640
F	17000	Co	0.5	Cs ₂ O (%)	0.07
Na ₂ O (%)	5.84	Ni	3	Ba	42
MgO (%)	0.04	Cu	140	Ce	0.9
Al ₂ O ₃ (%)	17.62	Zn	220	Hf	4.5
SiO ₂ (%)	66.60	Ga	59	Ta	290
P ₂ O ₅ (%)	1.39	As	13	W	70
Cl	140	Pb	3600	Pb	29
K ₂ O (%)	3.18	Rb ₂ O (%)	0.39	Th	1.4
CaO (%)	0.59	Sr	84	U	12.5

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
S	100	Eu	0.02	Yb	0.04
Y	0.4	Gd	0.08	Lu	0.005
Mo	0.3	Tb	0.01	Au	0.003
La	0.5	Dy	0.07	Hg	0.035
Pr	0.1	Hb	0.017	Tl	15
Nd	0.4	Er	0.03		
Sm	0.09	Tm	0.007		

Order information:

MA-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. MA-N is packaged in 30-g units.

MA-N (cont.)

Reference:

Govindaraju, K., and I. Roelandts (1993) Second report (1993) on the first three GIT-IWG rock reference samples: anorthosite from Greenland, AN-G; basalt d'Essey-la-Côte, BE-N; granite de Beauvoir, MA-N. Geostand. Newsletter, 17(2):227-94.

MGR-1

Gabbro

Canada Centre for Mineral and Energy Technology (Canada)

Description:

MGR-1 is an augite-olivine gabbro from Mount Royal, Montreal, Quebec, intruded into sedimentary rocks of the lower Paleozoic.

Recommended values (percent dry weight):

Component	Value	Component	Value
F	0.025	K ₂ O	0.18
Na ₂ O	0.71	CaO	14.77
MgO	13.49	TiO ₂	3.69
Al ₂ O ₃	8.5	MnO	0.17
SiO ₂	39.32	FeO	8.63
P ₂ O ₅	0.06	Fe ₂ O ₃	8.26
S	0.06		

Order Information:

This material can be purchased for Canadian \$105 per unit (100 g). Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

Mica-Fe

Biotite Mica-Fe

Centre de Recherches Pétrographiques et Géochimiques (France)

Description:

The material for Mica-Fe was collected at The Massif de Saint-Sylvestre (Massif Central), France. The massif is composed of two mica granites containing uranium deposits. The material was obtained as large pieces of biotite. Biotite was separated from biotite before processing as a reference sample.

Recommended values (µg/g dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	2.91	FeO (%)	18.91	Nd	180
H ₂ O ⁻ (%)	0.43	Fe ₂ O ₃ (%)	4.64	Sm	33
Li	1200	Co	23	Eu	0.7
Be	4.5	Ni	35	Gd	21
CO ₂ (%)	0.19	Cu	5	Tb	2.7
F (%)	1.60	Zn	1300	Dy	11
Na ₂ O (%)	0.30	Ga	95	Ho	1.6
MgO (%)	4.55	As	3	Er	3.8
Al ₂ O ₃ (%)	19.50	Rb	2200	Tm	0.48
SiO ₂ (%)	34.40	Sr	5	Yb	3.5
P ₂ O ₅ (%)	0.45	Y	48	Lu	0.5
Cl	500	Zr	800	Hf	26
K ₂ O (%)	8.75	Nb	270	Ta	35
CaO (%)	0.43	Mo	1.2	W	15
Sc	14.8	Sn	70	Tl	16
TiO ₂ (%)	2.50	Cs	180	Pb	13
V	135	Ba	150	Th	150
Cr	90	La	200	U	80
MnO (%)	0.35	Ce	420		
		Pr	49		

Proposed values (µg/g dry weight unless noted):

Element	Value
S	70
Ge	3.2
In	0.6
Bi	1.9
LOI (%)	2

Order information:

Mica-Fe is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K.

Mica-Fe (cont.)

Govindaraju at Geostandards. Membership dues subject to change without notice. Mica-Fe is packaged in 10-g units.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Govindaraju, K. (1995) 1995 working values with confidence limits for twenty-six CRPG, ANRT and IWG-GIT geostandards. Geostands. Newsletter, 19(Special issue):1-32.

Govindaraju, K., and I. Roelandts (1988) Compilation report (1966-1987) on trace elements in five CRPG geochemical reference samples: basalt BR; granites, GA and GH; micas, biotite Mica-Fe and phlogopite Mica-Mg. Geostands. Newsletter, 12(1):119-201.

Mica-Mg

Phlogopite Mica-Mg

Centre de Recherches Pétrographiques et Géochimiques (France)

Description:

The material for Mica-Mg was collected from the pyroxenite-containing phlogopite deposits of Bekily, Southern Madagascar.

Recommended values (µg/g dry weight unless noted):

Element	Value	Element	Value	Element	Value
Li	110	Cr	100	Sr	27
F (%)	2.85	MnO (%)	0.26	Zr	16
Na ₂ O (%)	0.12	FeO (%)	6.73	Nb	116
MgO (%)	20.40	Fe ₂ O ₃ (%)	1.98	Sn	5
Al ₂ O ₃ (%)	15.20	Co	24	Ta	4.4
SiO ₂ (%)	38.30	Ni	110	W	0.6
K ₂ O (%)	10.00	Cu	4	Cs	55
CaO (%)	0.08	Zn	290	Ba	4000
TiO ₂ (%)	1.63	Ga	21	Pb	9
V	90	Rb	1300		

Proposed values (µg/g dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	2.09	Cd	0.1	Hb	0.002
H ₂ O ⁻ (%)	0.31	In	0.01	Er	0.00
CO ₂ (%)	0.15	La	0.32	Tm	0.002
P ₂ O ₅ (%)	0.01	Ce	0.35	Yb	0.015
S	125	Pr	0.025	Lu	0.003
Cl	800	Nd	0.08	Hf	0.29
Sc	1.2	Sm	0.025	Tl	0.55
Ga	0.55	Eu	0.08	Th	0.1
Y	0.04	Gd	0.015	U	0.15
Mo	0.25	Tb	0.002	LOI (%)	1.75
		Dy	0.02		

Order information:

Mica-Mg is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. Mica-Mg is packaged in 10-g units.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Mica-Mg (cont.)

Govindaraju, K. (1995) 1995 working values with confidence limits for twenty-six CRPG, ANRT and IWG-GIT geostandards. Geostands. Newsletter, 19(Special issue):1-32.

Govindaraju, K., and I. Roelandts (1988) Compilation report (1966-1987) on trace elements in five CRPG geochemical reference samples: basalt BR; granites, GA and GH; micas, biotite Mica-Fe and phlogopite Mica-Mg. Geostands. Newsletter, 12(1):119-201.

Magnesite

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 90% magnesite with trace levels of dolomite, leuchtenbergite, clinocllore, quartz, rutile, graphite, pyrite, zircon, and limonite. The granulometric composition is: larger than 0.1 mm, 0.07%; 0.09 to 0.1 mm, 1.00%; 0.075 to 0.09 mm, 2.14%; and smaller than 0.075 mm, 96.79%. The material was prepared in 1970.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
B	37.8	12.7	K ₂ O (%)	0.013	0.004
C (%)*	0.13	0.03	CaO (%)	0.581	0.039
CO ₂ (%)	50.31	0.27	TiO ₂ (%)	0.019	0.003
Na ₂ O (%)	0.024	0.005	MnO (%)	0.160	0.016
MgO (%)	45.22	0.21	FeO (%)	2.191	0.038
Al ₂ O ₃ (%)	0.414	0.025	Ni	4.9	1.3
SiO ₂ (%)	0.593	0.022	Cu	2.5	0.8
P ₂ O ₅ (%)	0.055	0.006	Zn	15.3	3.4

* Non-carbonate C.

Non-attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Component	Mean	Component	Mean
H ₂ O+ (%)	4000	Co	1.21	Ce	1.8
Li	12	Pb	3.65	Eu	0.12
Be	<1	Sr	6.2	Yb	0.4
C (graphite)	240	Y	32	Lu	0.11
F (%)	170	Ag	0.5	Hf	0.051
S (%)	57	Cd	0.4	Pb	1.5
Cl	360	Sb	0.19	Bi	0.85
Sc	1.1	Cs	0.14	Th	0.4
V	9.2	Ba	17		
Cr	6.5	La	2		

Order information:

MK can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

Reference:

Institute of Mineral Raw Materials (1976?) Magnesite MK. Certificate. ST SEV 328-76. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breiitländer, Hamm, Germany.)

MK-1

Granodiorite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

MK-1 is also known as CRM No. 2124-81 and was issued in 1981.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O (%)	1.32	0.07	Fe(II)O (%)	2.87	0.05
Li	20	5	Fe(III) ₂ O ₃ (%)	2.04	0.03
Be	3.7	0.5	Fe [Fe ₂ O ₃ (%)]	5.23	0.07
B	27	3	Co	13	2
CO ₂ (%)	0.14	0.03	Ni	15	3
Na ₂ O (%)	3.25	0.04	Cu	57	8
MgO (%)	1.87	0.06	Zn	120	20
Al ₂ O ₃ (%)	15.35	0.09	Pb	160	30
SiO ₂ (%)	64.08	0.12	Sr	480	70
P ₂ O ₅ (%)	0.228	0.010	Ga	22	3
S (%)	0.019	0.004	Ge	1.8	0.4
K ₂ O (%)	3.98	0.04	Zr	210	30
CaO (%)	3.93	0.05	Nb	8.8	1.6
Sc	13	2	Mo	3.2	0.6
TiO ₂ (%)	0.517	0.010	Sn	8.0	1.0
V	90	7	Ba (%)	0.14	0.02
Cr	37	5	Hf	3.2	0.6
MnO (%)	0.160	0.006	Pb	160	30

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. *Geostands. Newsletter*, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Granodiorite (MK-1). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-1

Diabase

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The minimum sample size recommended is 0.05 g. It was prepared in 1981. This material is also known as CRM No. 2115-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁻ (%)	1.34	0.08	Fe(III) ₂ O ₃ (%)	2.12	0.11
H ₂ O ⁺ (%)	0.11	0.01	Fe [Fe ₂ O ₃ (%)]	11.57	0.09
Be	1.6	0.2	Co	34	3
CO ₂ (%)	0.24	0.02	Ni	20	2
F (%)	0.046	0.006	Cu	59	5
Na ₂ O (%)	3.01	0.03	Zn	104	7
MgO (%)	3.18	0.05	Ca	23	2
Al ₂ O ₃ (%)	13.95	0.08	Ga	1.7	0.3
SiO ₂ (%)	57.98	0.08	Pb	66	14
P ₂ O ₅ (%)	0.194	0.009	Sr	330	50
S (%)	0.086	0.006	Y	27	50
K ₂ O (%)	2.04	0.03	Zr	180	20
CaO (%)	6.35	0.05	Nb	8.4	1.3
Sc	33	4	Mo	2.7	0.6
TiO ₂ (%)	1.24	0.02	Sn	5.9	0.7
V	200	20	Ba	690	60
Cr	21	3	La	6.6	1.3
MnO (%)	0.142	0.003	Yb	0.28	0.5
Fe(II)O (%)	8.50	0.09	Pb	22	3

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Diabase RM No. 2115-81 (MO-2). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-2

Basalt

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The minimum sample size recommended is 0.05 g. It was prepared in 1981. This material is also known as CRM No. 2116-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁻ (%)	1.34	0.08	Fe(III) ₂ O ₃ (%)	2.50	0.11
H ₂ O (%)	1.78	0.08	Fe [Fe ₂ O ₃ (%)]	11.07	0.09
Li	9.3	1.0	Co	3.7	3
Be	2.3	0.4	Ni	86	9
F (%)	0.048	0.007	Cu	61	6
Na ₂ O (%)	3.74	0.07	Zn	82	8
MgO (%)	6.56	0.06	Ga	22	2
Al ₂ O ₃ (%)	16.53	0.10	Ge	1.1	0.2
SiO ₂ (%)	49.15	0.12	Rb	14	4
P ₂ O ₅ (%)	0.40	0.02	Sr	500	50
K ₂ O (%)	0.98	0.02	Y	29	4
CaO (%)	8.87	0.06	Zr	190	20
Sc	22	3	Mo	1.8	0.3
TiO ₂ (%)	1.65	0.03	Sn	7.0	0.8
V	150	20	Ba	300	30
Cr	99	12	La	40	8
MnO (%)	0.164	0.003	Yb	2.6	0.5
Fe(II)O (%)	7.71	0.08	Pb	12	2

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special Issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Basalt RM No. 2116-81 (MO-2). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This CRM was prepared in 1981. This material is also known as RM No. 2117-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
F (%)	0.072	0.009	Fe(II)O (%)	9.05	0.15
Na ₂ O (%)	0.72	0.02	Fe(III) ₂ O ₃ (%)	8 48	0 29
MgO (%)	8.66	0.08	Fe [Fe ₂ O ₃ (%)]	18.54	0.16
Al ₂ O ₃ (%)	13.67	0.17	Co	65	8
SiO ₂ (%)	37.62	0.14	Ni	28	4
P ₂ O ₅ (%)	2.15	0.05	Zn	136	15
S (%)	0.124	0.010	Ga	21	2
K ₂ O (%)	0.204	0 010	Ge	2.1	0.5
CaO (%)	15.75	0.12	Sr (%)	0.104	0.014
Sc	37	5	Mo	2.0	0.4
TiO ₂ (%)	1.46	0.05	Sn	6.5	0.8
V (%)	0.096	0.012	Ba (%)	0.011	0.002
Cr	14	3	Yb	2.6	0.5
MnO (%)	0.222	0 014	Pb	6.0	1.2

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Gabbro RM No. 2117-81 (MO-3). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-4

Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This CRM was prepared in 1981. This material is also known as RM No. 2119-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	13	2	Fe ₂ O ₃ (%)	9.93	0.09
Be	2.9	0.4	Co	24	2
CO ₂ (%)	0.37	0.04	Ni	14	2
Na ₂ O (%)	4.20	0.09	Cu	100	10
MgO (%)	3.74	0.07	Zn	77	8
Al ₂ O ₃ (%)	16.94	0.14	Ga	24	2
SiO ₂ (%)	52.04	0.09	Ge	1.1	0.3
P ₂ O ₅ (%)	0.476	0.014	Rb	42	5
K ₂ O (%)	2.25	0.06	Sr	810	100
CaO (%)	7.36	0.06	Y	38	7
Sc	24	3	Zr	160	20
TiO ₂ (%)	1.02	0.02	Mo	2.0	0.4
V	220	30	Sn	5.5	0.7
Cr	21	3	Ba (%)	0.13	0.02
MnO (%)	0.187	0.010	La	46	7
Fe(II)O (%)	5.43	0.08	Yb	2.8	0.5
Fe(III) ₂ O ₃ (%)	3.89	0.11	Pb	20	3

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Gabbro CRM No. 2118-81 (MO-4). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-5

Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This CRM was prepared in 1981. This material is also known as RM No. 2119-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O (%)	1.39	0.09	V	120	20
Be	0.82	0.15	Cr	56	9
CO ₂ (%)	0.33	0.03	MnO (%)	0.198	0.009
F (%)	0.16	0.02	Fe(II)O (%)	14.98	0.22
Na ₂ O (%)	2.35	0.04	Fe(III) ₂ O ₃ (%)	4.33	0.15
MgO (%)	7.48	0.08	Fe ₂ O ₃ (%)	20.98	0.20
Al ₂ O ₃ (%)	13.35	0.33	Co	69	10
SiO ₂ (%)	37.66	0.14	Ni	63	11
P ₂ O ₅ (%)	2.21	0.06	Cu	69	13
S (%)	0.082	0.009	Zn	120	40
K ₂ O (%)	0.80	0.02	Ga	13	2
CaO (%)	7.81	0.10	Zr (%)	0.100	0.0015
Sc	17	4	Sn	4.4	1.4
TiO ₂ (%)	6.99	0.12	Ba (%)	0.044	0.009
			Pb	11	2

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Gabbro CRM No. 2119-81 (MO-5). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-6

Anorthosite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This CRM was prepared in 1981. This material is also known as CRM No. 2120-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O (%)	0.40	0.04	V	130	20
Be	0.9	0.2	Cr	36	4
CO ₂ (%)	0.36	0.02	MnO (%)	0.076	0.004
Na ₂ O (%)	4.04	0.07	Fe(II)O (%)	4.66	0.11
MgO (%)	2.10	0.05	Fe ₂ O ₃ (%)	6.26	0.08
Al ₂ O ₃ (%)	22.78	0.15	Co	23	4
SiO ₂ (%)	51.77	0.12	Ni	10	2
P ₂ O ₅ (%)	0.140	0.007	Cu	31	7
S (%)	0.069	0.007	Zn	83	13
K ₂ O (%)	0.76	0.03	Ga	17	3
CaO (%)	10.06	0.10	Zr	72	11
Sc	23	5	Ba	510	80
TiO ₂ (%)	1.87	0.04	Pb	7	2

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Gabbro RM No. 2120-81 (MO-6). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-7

Orthoclase - Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-7 is: plagioclase 33%, monoclinic pyroxene 38%, olivine 8%, biotite 11%, ore minerals 6%, and accessory minerals 2%. The minimum sample size recommended is 0.05 g. This CRM was prepared in 1994. This material is also known as RM No. 1046-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.70	0.09	Cr	76	2
H ₂ O ⁻ (%)	0.12	0.01	MnO (%)	0.15	0.01
H ₂ O (%)	0.82	0.08	Fe(II)O (%)	7.76	0.02
Li	5.4	0.2	Fe(III) ₂ O ₃ (%)	3.73	0.02
B	4.5	0.5	Fe [Fe ₂ O ₃ (%)]	12.35	0.02
F (%)	0.13	0.01	Co	49	3 *
Na ₂ O (%)	2.05	0.01	Ni	45	8 *
MgO (%)	6.46	0.05	Cu	59	2
Al ₂ O ₃ (%)	17.60	0.05	Zn	65	6
SiO ₂ (%)	40.79	0.05	Pb	12	7 *
P ₂ O ₅ (%)	1.08	0.03	Sr	1745	46
S (%)	0.18	0.01	Zr	53	6 *
Cl (%)	0.075	0.007	Nb	12	1
K ₂ O (%)	0.75	0.01	Ag	0.031	0.005
CaO (%)	14.62	0.05	Cs	1.1	0.1
TiO ₂ (%)	3.39	0.01	Ba	7480	316
V	270	2 *	La	37	5
			Pb	7.6	0.6
			Th	1.2	0.4

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
Be	1.2
CO ₂ (%)	0.03
Ga	18
Se	0.11
Mo	2.4
Pd (ng/g)	2
Sn	3.8
Pt (ng/g)	5
Au	1

Order Information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Orthoclase - gabbro RM No. 1046-94 (MO-7). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-8

Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-8 is: plagioclase 71%, pyroxenes 26%, ore minerals 2%, and accessory minerals 1%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1041-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.088	0.010	MnO (%)	0.16	0.01
H ₂ O (%)	0.31	0.10	Fe(II)O (%)	9.61	0.02
Li	5.5	0.2	Fe(III) ₂ O ₃ (%)	0.85	0.02
Be	0.8	14 *	Fe [Fe ₂ O ₃ (%)]	11.53	0.03
B	7.5	0.4	Co	48	3 *
CO ₂ (%)	0.43	0.03	Ni	18	10 *
F (%)	0.039	0.004	Cu	40	2
Na ₂ O (%)	3.27	0.01	Zn	84	5
MgO (%)	6.39	0.05	Ga	18	4 *
Al ₂ O ₃ (%)	16.39	0.05	Rb	4.0	10 *
SiO ₂ (%)	51.98	0.04	Sr	477	6 *
P ₂ O ₅ (%)	0.21	0.04	Y	18	9 *
S (%)	0.17	0.01	Zr	48	6 *
Cl (%)	0.027	0.004	Mo	3.2	28 *
K ₂ O (%)	0.46	0.01	Ag	0.024	0.003
CaO (%)	9.02	0.03	Sn	2.7	16 *
Sc	31	5 *	Cs	1.1	0.2
TiO ₂ (%)	1.15	0.01	Ba	272	21 *
V	199	2 *	La	26	9
Cr	126	3	Yb	2.0	6 *
			Pb	7.3	0.6

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.22	0.13
Se	0.09	
Nb	3.7	

Order Information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breiitländer.

MO-8 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Gabbro RM No. 1041-94 (MO-8). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-9

Anorthosite - Gabbro

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-9 is: plagioclase 71%, rhombic pyroxene 3%, monoclinic pyroxene 2%, olivine 19%, ore minerals 1%, and accessory minerals 3%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1038-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁻ (%)	0.10	0.01	Fe(II)O (%)	7.06	0.02
H ₂ O (%)	0.47	0.09	Fe(III) ₂ O ₃ (%)	1.06	0.02
Li	9.0	0.2	Fe [Fe ₂ O ₃ (%)]	8.91	0.03
Be	0.9	13 *	Co	47	3 *
B	9.3	0.3	Ni	81	8 *
CO ₂ (%)	0.16	0.02	Cu	39	2
F (%)	0.035	0.004	Zn	66	6
Na ₂ O (%)	3.80	0.01	Ga	20	4
MgO (%)	4.90	0.05	Pb	4.6	10 *
Al ₂ O ₃ (%)	21.78	0.07	Sr	404	6 *
SiO ₂ (%)	50.63	0.04	Y	14	12 *
P ₂ O ₅ (%)	0.12	0.04	Zr	54	6 *
S (%)	0.038	0.004	Mo	82.4	26 *
Cl (%)	0.028	0.003	Ag	0.041	0.006
K ₂ O (%)	0.47	0.01	Sn	3.6	14 *
CaO (%)	9.00	0.03	Cs	1.6	0.1
Sc	10	6 *	Ba	186	23 *
TiO ₂ (%)	0.49	0.01	La	39	5
V	51	2 *	Yb	1.9	6 *
Cr	25	2	Pb	6.9	0.6
MnO (%)	0.10	0.01	Th	0.7	0.3

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.37	0.12
Se	0.02	
Nb	3.5	

Order Information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breittländer.

MO-9 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Anorthosite - gabbro RM No. 1038-94 (MO-9). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Anorthosite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-10 is: plagioclase 87%, rhombic pyroxene 3%, monoclinic pyroxene 4%, olivine 1%, ore minerals 0.5%, apatite 0.5%, quartz and potassium feldspar 2%, and accessory minerals 2%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1037-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁻ (%)	0.095	0.011	MnO (%)	0.073	0.003
H ₂ O (%)	0.36	0.10	Fe(II)O (%)	4.40	0.03
Li	7.1	0.2	Fe(III) ₂ O ₃ (%)	1.45	0.02
Be	1.1	11 *	Fe [Fe ₂ O ₃ (%)]	6.34	0.03
B	8.7	0.3	Co	27	3 *
CO ₂ (%)	0.14	0.02	Ni	32	9 *
F (%)	0.038	0.004	Cu	44	2
Na ₂ O (%)	3.99	0.01	Zn	96	5
MgO (%)	2.24	0.07	Ga	26	4 *
Al ₂ O ₃ (%)	23.91	0.09	Pb	5.5	18 *
SiO ₂ (%)	51.65	0.04	Sr	477	6 *
P ₂ O ₅ (%)	0.13	0.04	Y	17	9 *
S (%)	0.046	0.003	Zr	58	6 *
Cl (%)	0.024	0.004	Mo	2.0	26 *
K ₂ O (%)	0.50	0.01	Ag	0.034	0.003
CaO (%)	10.18	0.03	Sn	5.0	13 *
Sc	11	6 *	Cs	0.55	0.08
TiO ₂ (%)	0.83	0.01	Ba	294	21 *
V	109	2 *	Yb	2.0	6 *
Cr	23	2	Pb	8.0	0.6
			Th	0.6	0.2

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.26	0.13
Se	0.12	
Nb	3.9	
La	24	

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Anorthosite RM No. 1037-94 (MO-10). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Anorthosite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-15 is: plagioclase 95%, pyroxenes 1.5%, olivine 1%, ilmenite 0.5%, and accessory minerals 2%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1042-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.088	0.011	Fe(II)O (%)	1.09	0.04
H ₂ O (%)	0.42	0.10	Fe(III) ₂ O ₃ (%)	0.53	0.02
Li	7.5	0.2	Fe [Fe ₂ O ₃ (%)]	1.74	0.04
Be	0.8	13 *	Co	9.6	5 *
B	4.5	0.5	Ni	14	11 *
F (%)	0.042	0.004	Cu	26	2
Na ₂ O (%)	4.39	0.01	Zn	50	6
MgO (%)	0.49	0.08	Ga	21	4 *
Al ₂ O ₃ (%)	27.42	0.13	Pb	2.7	12 *
SiO ₂ (%)	53.46	0.04	Sr	802	18
S (%)	0.010	0.004	Y	8	20 *
Cl (%)	0.024	0.004	Zr	42	7 *
K ₂ O (%)	0.65	0.01	Mo	1.2	33 *
CaO (%)	10.95	0.03	Ag	0.006	0.001
Sc	5	8 *	Sn	5.1	13 *
TiO ₂ (%)	0.18	0.01	Cs	0.73	0.08
V	24	3 *	Ba	319	21 *
Cr	12	2	Yb	1.1	9
MnO (%)	0.037	0.005	Pb	6.8	0.6

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.33	0.12
P ₂ O ₅ (%)	0.04	
Nb	2.6	
La	20	

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

MO-11 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Anorthosite RM No. 1042-94 (MO-11). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Andesite - Basalt

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This CRM was prepared in 1994. The mineral composition is: plagioclase 67%, monoclinic pyroxene 23%, olivine 5%, and other minerals 5%. This material is also known as RM No. 1034-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.095	0.010	Fe(III) ₂ O ₃ (%)	2.96	0.02
H ₂ O (%)	0.28	0.09	Fe [Fe ₂ O ₃ (%)]	10.54	0.02
Li	9.2	0.2	Co	44	3 *
Be	2.3	6 *	Ni	137	9 *
B	9.3	0.3	Cu	54	2
F (%)	0.060	0.04	Zn	130	7
Na ₂ O (%)	3.85	0.01	Ga	19	4 *
MgO (%)	7.38	0.05	Pb	16	7 *
Al ₂ O ₃ (%)	16.74	0.04	Sr	865	7 *
SiO ₂ (%)	49.87	0.04	Y	34	7 *
P ₂ O ₅ (%)	0.45	0.03	Zr	152	5 *
S (%)	0.006	0.004	Nb	14	2
Cl (%)	0.024	0.004	Mo	3.9	31 *
K ₂ O (%)	1.12	0.01	Ag	0.033	0.003
CaO (%)	8.73	0.03	Sn	3.9	13 *
Sc	22	5 *	Cs	0.6	0.1
TiO ₂ (%)	1.61	0.01	Ba	311	21 *
V	199	2 *	La	45	4
Cr	181	5	Yb	3.3	5 *
MnO (%)	0.14	0.01	Pb	11	0.6
Fe(II)O (%)	6.82	0.02	Th	2.8	0.3

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.18	0.13
Au (ng/g)	4	
Pd (ng/g)	4	
U	0.5	

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

MO-12 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Andesite - basalt. RM No. 1043-94 (MO-12). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MO-13

Olivine - Basalt

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-13 is: plagioclase 59%, monoclinic pyroxenes 28%, olivine 7%, ore minerals 5%, and accessory minerals 1%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1044-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O (%)	0.43	0.08	Fe [Fe ₂ O ₃ (%)]	10.47	0.02
H ₂ O ⁻ (%)	0.16	0.01	Co	47	3 *
Li	15.0	0.6	Ni	76	8 *
Be	2.6	6 *	Cu	60	2
B	9.3	0.3	Zn	74	5
F (%)	0.052	0.004	Ga	20	4 *
Na ₂ O (%)	3.90	0.01	Pb	13	7 *
MgO (%)	5.85	0.05	Sr	692	7 *
Al ₂ O ₃ (%)	17.92	0.05	Y	36	7 *
SiO ₂ (%)	49.50	0.04	Zr	180	5 *
P ₂ O ₅ (%)	0.40	0.04	Nb	13	1
Cl (%)	0.034	0.003	Mo	3.0	28 *
K ₂ O (%)	0.95	0.01	Ag	0.031	0.003
CaO (%)	9.08	0.03	Sn	3.2	15 *
Sc	22	5 *	Cs	0.9	0.2
TiO ₂ (%)	0.166	0.01	Ba	272	21 *
V	226	2 *	La	40	5
Cr	115	3	Yb	2.6	5 *
MnO (%)	0.14	0.01	Pb	9.3	0.7
Fe(II)O (%)	5.93	0.03	Th	2.8	0.3
Fe(III) ₂ O ₃ (%)	3.88	0.02			

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
H ₂ O ⁺ (%)	0.27	0.13
S (%)	0.006	
Se	0.02	
U	0.3	

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breiitländer.

MO-13 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Olivine - basalt RM No. 1044-94 (MO-13). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Olivine - Basalt

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-14 is: plagioclase 50%, monoclinic pyroxenes 38%, olivine 4%, ore minerals 4%, and accessory minerals 4%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1045-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	1.73	0.10	Fe(III) ₂ O ₃ (%)	3.26	0.02
H ₂ O ⁻ (%)	0.81	0.02	Fe [Fe ₂ O ₃ (%)]	10.85	0.02
H ₂ O (%)	2.54	0.08	Co	50	3 *
Li	7.5	0.2	Ni	111	9 *
Be	1.9	7 *	Cu	66	2
B	8.7	0.3	Zn	108	6
F (%)	0.047	0.004	Ga	15	5 *
Na ₂ O (%)	3.00	0.01	Pb	4.0	11 *
MgO (%)	8.05	0.06	Sr	468	6 *
Al ₂ O ₃ (%)	17.06	0.05	Y	39	8 *
SiO ₂ (%)	46.85	0.04	Zr	162	5 *
P ₂ O ₅ (%)	0.37	0.04	Nb	11	1
Cl (%)	0.026	0.004	Mo	2.5	26 *
K ₂ O (%)	0.46	0.01	Ag	0.029	0.003
CaO (%)	9.60	0.03	Sn	2.4	18 *
Sc	25	5 *	Cs	1.5	0.2
TiO ₂ (%)	1.62	0.01	Ba	172	24 *
V	181	2 *	La	34	6
Cr	152	4	Yb	3.0	5 *
MnO (%)	0.15	0.01	Pb	8.6	0.7
Fe(II)O (%)	6.83	0.02	Th	1.3	0.3

* Relational error in percent.

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error
Se (%)	0.006	0.004
U	0.3	

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

MO-14 (cont.)

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Olivine - basalt RM No. 1045-94 (MO-14). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Porphyritic Andesite - Basalt

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MO-15 is: plagioclase 59%, pyroxenes 14%, olivine 6%, K-feldspar 9%, ore minerals 11%, and accessory minerals 1%. The minimum sample size recommended is 0.05 g. It was prepared in 1994. This material is also known as RM No. 1017-94.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	1.34	0.08	Fe(II)O (%)	4.60	0.03
H ₂ O ⁻ (%)	0.32	0.01	Fe(III) ₂ O ₃ (%)	4.96	0.02
H ₂ O (%)	1.66	0.06	Fe [Fe ₂ O ₃ (%)]	10.07	0.02
Li	16.0	0.6	Cr	136	3
Be	2.2	6 *	Ni	90	9 *
B	9.9	0.3	Cu	28	2
CO ₂ (%)	0.20	0.02	Zn	33	8
F (%)	0.16	0.01	Ga	20	4 *
Na ₂ O (%)	4.35	0.01	Pb	50	9 *
MgO (%)	5.23	0.05	Sr	554	6 *
Al ₂ O ₃ (%)	16.93	0.05	Y	39	8 *
SiO ₂ (%)	49.55	0.04	Zr	152	5 *
P ₂ O ₅ (%)	0.39	0.04	Nb	13	1
S (%)	0.016	0.004	Mo	3.4	29 *
Cl (%)	0.065	0.006	Ag	0.018	0.005
K ₂ O (%)	1.51	0.01	Sn	4.2	13 *
CaO (%)	8.30	0.03	Cs	1.4	0.3
Sc	29	5 *	Ba	225	22 *
TiO ₂ (%)	1.68	0.01	La	69	9
V	234	2 *	Yb	2.6	5 *
Co	34	3 *	Pb	8.8	0.6
MnO (%)	0.059	0.004	Th	1.8	0.3

* Relational error in percent.

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

MO-15 (cont.)

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Porphyritic andesite - basalt RM No. 1017-94 (MO-15). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MSCH-1

Miaskite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This material, an amphibolic nepheline syenite or nepheline plagiocsyenite of miaskite type, is composed principally of nepheline (24%), microcline (54%) and albite (6%). This CRM was prepared in 1981 and is known as MW-1 and CRM No. 2121-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Co	4.9	0.9
			Ni	7.1	0.9
Li	6.6	0.8	Cu	51	4
Be	4.5	0.5	Zn	66	8
Na ₂ O (%)	8.50	0.07	Ba	160	20
CaO (%)	1.10	0.03	Ga	41	4
Al ₂ O ₃ (%)	21.72	0.13	Ge	1.2	0.2
SiO ₂ (%)	58.00	0.09	Rb	189	13
P ₂ O ₅ (%)	0.050	0.004	Sr	126	11
K ₂ O (%)	6.12	0.06	Y	19	3
TiO ₂ (%)	0.400	0.010	Zr	850	70
V	30	3	Nb	150	20
Cr	11.7	1.3	Mo	1.1	0.2
MnO (%)	0.128	0.004	Sn	7.9	0.8
Fe [Fe ₂ O ₃ (%)]	3.04	0.04	La	74	11
Fe(II)O (%)	1.47	0.04	Yb	1.9	0.4
Fe(III) ₂ O ₃ (%)	1.41	0.06	Pb	12.0	1.3

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Miaskite. CRM No. 2121-81 (MSCH-1). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MSCH-2

Mariupolite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MSCH-2 is: nepheline 25%, albite 60%, potassium feldspar 2%, egryrine 1.5%, lepidomelane 0.5%, sodalite 8%, cancrinite 1%, magnetite 1%, sphene 1%, carbonate 1%, fluorite 1%, and ceolite 1%. The minimum sample size recommended is 0.1 g. This CRM was prepared in 1980. This material is also known as MW-2 and CRM No. 2122-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	4.3	0.6	Ni	6.5	1.0
Be	8.6	1.1	Cu	21	3
CO ₂ (%)	0.72	0.03	Zn	69	9
Na ₂ O (%)	10.79	0.19	Ga	80	10
Al ₂ O ₃ (%)	21.96	0.19	Ge	1.4	0.4
SiO ₂ (%)	56.29	0.09	Pb	300	30
K ₂ O (%)	4.30	0.05	Sr	120	20
CaO (%)	1.20	0.05	Y	64	10
TiO ₂ (%)	0.045	0.008	Zr	700	100
V	13	3	Nb	340	50
Cr	9.8	1.3	Mo	5.2	0.9
MnO (%)	0.085	0.006	Sn	15	2
Fe(II)O (%)	0.88	0.04	Ba	170	40
Fe(III) ₂ O ₃ (%)	2.05	0.10	La	130	30
Fe [Fe ₂ O ₃ (%)]	0.03	0.07	Yb	5.7	1.3
			Pb	25	4

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1980?) Mariupolite CRM No. 2122-81 (MSCH-2). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MSCH-3

Urtite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MSCH-3 is: nepheline 87%, egyptine-anhite 6%, alkaline amphibole 0.5%, lepidomelane 0.3%, sodalite 2%, cancrinite 0.6%, ceolite 1%, sphene 2%, and apatite 0.6%. The minimum sample size recommended is 0.05 g. This CRM was prepared in 1980. This material is also known as MW-3 and CRM No. 2123-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	8.9	0.9	Co	8.1	1.1
Be	5.1	0.7	Ni	6.5	1.0
Na ₂ O (%)	13.33	0.19	Cu	24	4
MgO (%)	1.14	0.06	Zn	44	6
Al ₂ O ₃ (%)	26.47	0.20	Ga	48	7
SiO ₂ (%)	42.80	0.09	Rb	79	9
P ₂ O ₅ (%)	0.388	0.010	Sr	1000	150
K ₂ O (%)	5.16	0.04	Y	26	5
CaO (%)	3.73	0.04	Zr	220	40
TiO ₂ (%)	1.79	0.04	Nb	97	13
V	86	10	Mo	2.3	0.4
Cr	9.7	0.9	Sn	3.4	0.7
MnO (%)	0.084	0.005	Ba	350	50
Fe(II)O (%)	1.40	0.07	La	100	14
Fe(III) ₂ O ₃ (%)	2.67	0.09	Yb	1.7	0.4
Fe [Fe ₂ O ₃ (%)]	4.23	0.07	Pb	5.8	1.2

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breiländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1980?) Urtite CRM No. 2123-81 (MSCH-3). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MSCH-4

Lujvrite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The minimum sample size recommended is 0.1 g. This CRM was prepared in 1980 and is also known as MW-4 and CRM No. 2124-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	37	5	Co	6.3	1.1
Be	13.9	0.14	Ni	7.8	1.4
Na ₂ O (%)	9.2 6	0.13	Cu	11.1	1.5
MgO (%)	0.74	0.07	Zn	120	20
Al ₂ O ₃ (%)	16.96	0.15	Ga	63	8
SiO ₂ (%)	56.13	0.11	Ge	1.3	0.3
K ₂ O (%)	6.23	0.08	Pb	250	15
CaO (%)	1.25	0.04	Sr	800	100
TiO ₂ (%)	0.92	0.02	Y	81	13
V	86	8	Nb	340	50
Cr	12.5	1.5	Mo	2.8	0.4
MnO (%)	0.254	0.008	Sn	14	2
Fe(II)O (%)	1.14	0.06	Ba	800	100
Fe(III) ₂ O ₃ (%)	5.52	0.19	La	400	80
Fe [Fe ₂ O ₃ (%)]	6.79	0.10	Yb	5.7	1.1
			Pb	20	3

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1980?) Lujvrite CRM No. 2124-81 (MSCH-4). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MY-1

Peridotite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This material was prepared in 1981 and is also known as CRM No. 2111-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
CO ₂ (%)	0.69	0.06	Fe(III) ₂ O ₃ (%)	1.76	0.15
Na ₂ O (%)	0.105	0.009	Fe [Fe ₂ O ₃ (%)]	11.58	0.10
MgO (%)	37.12	0.13	Co (%)	0.0159	0.0011
Al ₂ O ₃ (%)	1.84	0.09	Ni (%)	0.160	0.015
SiO ₂ (%)	45.54	0.07	Cu	140	12
S (%)	0.030	0.004	Zn	137	14
K ₂ O (%)	0.044	0.006	Ga	5.9	0.7
CaO (%)	1.26	0.05	Zr	21	4
Sc	11.3	1.2	Mo	1.3	0.2
TiO ₂ (%)	0.107	0.008	Sn	3.2	0.7
V	39	4	Ba	66	12
Cr (%)	0.320	0.016	Yb	1.5	0.4
MnO (%)	0.183	0.008	Pb	6.7	0.9
Fe(II)O (%)	8.83	0.12			

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breiländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostand. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Peridotite CRM No. 2111-81 (MY-1). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MY-2

Dunite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The mineral composition of MY-2 is: olivine, 21%; serpentine, 78%; and chromspinelide, 1%. It was prepared in 1980. This material is also known as RM No. 2112-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O (%)	11.35	0.21	Co	129	13
CO ₂ (%)	0.46	0.05	Ni (%)	0.133	0.014
MgO (%)	42.40	0.21	Cu	27	6
SiO ₂ (%)	35.07	0.14	Zn	82	11
V	6.9	1.2	Mo	1.4	0.3
MnO (%)	0.176	0.011	Sn	2.2	0.4
Fe [Fe ₂ O ₃ (%)]	10.06	0.13			

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1994?) Dunite RM No. 1017-94 (MY-2). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MY-3

Hornblende

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

This material was prepared in 1981 and is also known as CRM No. 2112-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Na ₂ O (%)	2.14	0.05	Fe(III) ₂ O ₃ (%)	7.46	0.15
MgO (%)	12.70	0.08	Fe [Fe ₂ O ₃ (%)]	18.26	0.15
Al ₂ O ₃ (%)	14.24	0.11	Co	74	7
SiO ₂ (%)	37.95	0.12	Ni	57	6
S (%)	0.054	0.006	Cu	740	90
K ₂ O (%)	0.382	0.010	Zn	137	14
CaO (%)	11.04	0.12	Ga	25	4
Sc	58	8	Zr	21	4
TiO ₂ (%)	1.91	0.05	Mo	1.3	0.2
V	39	4	Sn	2.9	0.5
Cr	15	3	Ba	9.9	14
MnO (%)	0.144	0.005	Yb	1.5	0.4
Fe(II)O (%)	9.72	0.13	Pb	4.9	0.8

Order Information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breittländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Hornblende CRM No. 2113-81 (MY-3). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

MY-4

Kimberlite

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (Russia)

Description:

The minimum recommended sample size is 0.05 g. It was prepared in 1981. This material is also known as CRM No. 2114-81.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Be	1.4	0.2	Fe(II)O (%)	2.24	0.11
CO ₂ (%)	5.71	0.13	Fe(III) ₂ O ₃ (%)	5.08	0.18
Na ₂ O (%)	0.087	0.010	Fe [Fe ₂ O ₃ (%)]	7.57	0.08
MgO (%)	26.96	0.17	Co	73	8
Al ₂ O ₃ (%)	2.66	0.13	Ni	1060	110
SiO ₂ (%)	37.66	0.26	Cu	35	4
P ₂ O ₅ (%)	0.216	0.009	Zn	63	7
S (%)	0.032	0.005	Ga	6.8	1.2
K ₂ O (%)	0.412	0.014	Sr	280	30
CaO (%)	6.42	0.11	Y	9.1	1.2
Sc	1.9	1.4	Zr	83	12
TiO ₂ (%)	0.97	0.03	Nb	38	6
V	47	6	Mo	1.3	0.2
Cr	680	60	Sn	2.5	0.5
MnO (%)	0.111	0.013	Ba	250	30
			Pb	6.2	1.1

Order information:

This CRM can be purchased for DM175 per unit (40 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry (1981?) Kimberlite CRM No. 2114-81 (MY-4). Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences, IGEM RAS, Moscow, Russia.

Nod-A-1

Manganese Nodule

US Geological Survey (USA)

Description:

This reference material was collected in the Blake Plateau (31° 02' N, 78° 22' W) in the Atlantic Ocean (Flanagan and Gottfried, 1980). The material was processed through a roller crusher, dried overnight at about 65°C, and processed in a ball mill. Washing with water did not remove all the soluble sea salt present in the material. During processing, the cover of the mill was not secured in place until the following day. The partly powdered material absorbed sufficient moisture to form a cement-like mixture, which was deposited as layers in the mill as it operated. The layers were removed, broken, redried and re-milled. The material in these layers showed variegated colors from black to purple to dark brown, characteristic of manganese oxides. Nod-A-1 can absorb up to 10% by weight of moisture when exposed overnight to air. The original estimates for elemental concentrations by Flanagan and Gottfried (1980) using the results of various analysts are listed below.

Best available concentrations (µg/g dry weight unless noted):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
Na (%)	0.775	0.0056	Co (%)	0.311	0.0011
Mg (%)	2.87	0.0099	Ni (%)	0.636	0.0024
Al (%)	2.05	0.032	Cu (%)	0.1099	0.0010
Si (%)	1.775	0.022	Zn	587	4.6
P (%)	0.60	0.007	Sr	1748	13.7
K (%)	0.50	0.0086	Mo	448	8.7
Ca (%)	11.03	0.039	Ru	18	-
Ti (%)	0.32	0.004	Ba	1670	30.8
V	770	6.2	Pd (ng/g)	2.5	-
Mn (%)	18.545	0.050	Pt (ng/g)	453	-
Fe (%)	10.932	0.042	Pb	846	8.2

Order information:

Nod-A-1 is available for US\$65 per bottle. Please contact USGS.

Reference:

Flanagan, F. J., and D. Gottfried (1980) USGS Rock Standards, III: Manganese-nodule reference samples USGS-Nod-A-1 and USGS-Nod-P-1. Geological Survey Professional Paper 1155, 39 pp. U.S. Geological Survey, Reston, VA, USA.

Nod-P-1

Manganese Nodule

US Geological Survey (USA)

Description:

This reference material was collected in the Pacific Ocean (14° 50' N, 124° 28' W) (Flanagan and Gottfried, 1980). The material was processed through a roller crusher, dried overnight at about 65°C, and processed in a ball mill. Washing with water did not remove all the soluble sea salt present in the material. During processing, the cover of the mill was not secured in place until the following day. The partly powdered material absorbed sufficient moisture to form a cement-like mixture, which was deposited as layers in the mill as it operated. The layers were removed, broken, redried and re-milled. The material in these layers showed variegated colors from black to purple to dark brown, characteristic of manganese oxides. Nod-P-1 can absorb up to 10% by weight of moisture when exposed overnight to air. The original estimates for elemental concentrations by Flanagan and Gottfried (1980) using the results of various analysts are listed below.

Best available concentrations (µg/g dry weight unless noted):

Element	Value	Uncertainty (±)	Element	Value	Uncertainty (±)
Na (%)	1.64	0.0043	Co (%)	0.224	0.0011
Mg (%)	1.990	0.0085	Ni (%)	1.337	0.0064
Al (%)	2.55	0.049	Cu (%)	1.151	0.0049
Si (%)	6.508	0.016	Zn	1595	5.9
P (%)	0.203	0.002	Sr	682	3.3
K (%)	1.05	0.012	Mo	762	4.1
Ca (%)	2.187	0.012	Ru	4.7	-
Ti (%)	0.30	0.002	Ba	3350	27.7
V	567	10.3	Pd (ng/g)	5.6	-
Mn (%)	29.14	0.080	Pt (ng/g)	123	-
Fe (%)	5.78	0.031	Pb	555	5.8

Order information:

Nod-P-1 is available for US\$65 per bottle. Please contact USGS.

Reference:

Flanagan, F. J., and D. Gottfried (1980) USGS Rock Standards, III: Manganese-nodule reference samples USGS-Nod-A-1 and USGS-Nod-P-1. Geological Survey Professional Paper 1155, 39 pp. U.S. Geological Survey, Reston, VA, USA.

PM-S

Microgabbro

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The Inch Gabbro is one of six major sill-like basic intrusions of late Caledonian age that occur in northeastern Scotland. Pyroxenes are often overgrown by brown amphibole. The Inch Gabbro is elongate in shape outcropping over an area of 180 km². The Gabbro comprises a range of basic and ultra-basic rocks including peridotite, troctolite, olivine-norite, hypersphene-gabbro and quartzdiorite, together with syenite and granite intrusions. The candidate reference material, PM-S, was collected from Pitscurrie quarry, a roadstone quarry located near Pitcaple in the Grampian Region of Scotland on the southern margin of the Inch Gabbro. The quarry contains exposures of fine-to-coarse grained layered gabbro, which are well displayed on its northern face. Sheets/sills of tourmaline-bearing granitepegmatite intrude the gabbro on the north-western face of the quarry. Eleven blocks of fine-grained, dark grey microgabbro, having a total weight of 402 kg were collected from a fresh pile of loose blocks on the quarry floor on the northern margin of the quarry during December 1991. Microgabbro PM-S comprises a fine-grained intergrowth of unzoned equidimensional plagioclase feldspar and ophitic orthopyroxene crystals, ranging up to 2 mm across but uninterrupted domains are no more than 0.4 mm in extent. Pyroxenes are often overgrown by brown amphibole. Opaque oxides are very fine grained (<0.3 mm). Veinlets rich in serpentine occur and are up to 1 mm wide. Selected blocks of the quarries material were washed thoroughly with tap water to remove mud and any other contamination and then allowed to dry. Each block was then split into pieces about 3 to 4 cm across using a hydraulic splitter. Any weathered or jointed surfaces observed during splitting were removed and discarded. Split pieces from each block were kept in batches until all the material for that sample had been split. The split material was then crushed until particles < 4 mm were obtained. The crushate was then split into two batches. One was stored and the other further processed. The processed material was milled, sieved, and packaged. Details of the collection, preparation and calculation of recommended, provisional, and proposed values can be found in Govindaraju *et al.*, (1994).

Recommended values (µg/g dry weight unless noted):

Component	Value	St. dev.	Component	Value	St. dev.
H ₂ O ⁺	0.70	-	V	192	22.49
H ₂ O ⁻	0.12	-	Cr	314	26.9
Li	7.3	1.39	MnO (%)	0.16	0.01
CO ₂ (%)	0.22	-	FeO (%)	7.80	0.41
Na ₂ O (%)	2.08	0.11	Co	49	7.17
MgO (%)	9.34	0.39	Ni	115	11.83
Al ₂ O ₃ (%)	17.15	0.48	Cu	59	7.33
SiO ₂ (%)	47.00	0.65	Zn	60	6.74
K ₂ O (%)	0.14	0.02	Ga	16	2.22
CaO (%)	12.48	0.26	Sr	280	23.15
Sc	34	3.09	Y	11	2.27
TiO ₂ (%)	1.10	0.05	Zr	39	7.2
			Ba	148	14.95
			La	2.8	0.6

PM-S (cont.)

Component	Value	St. dev.	Component	Value	St. dev.
Nd	5.5	0.88	Tm	0.17	0.03
Sm	1.75	0.17	Yb	1	0.15
Gd	2	0.23	Lu	0.15	0.02
Tb	0.36	0.04	Hf	1.12	0.29
Dy	2	0.26	Ti	0.04	0.011
Hb	0.42	0.07	LOI (%)	0.30	-
Er	1.1	0.15			

Provisional values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	St. dev.
Be	0.5	0.44
P ₂ O ₅ (%)	0.03	0.05
Fe ₂ O ₃ (%)	1.43	0.61
Rb	1	1.16
Mo	1.9	1.02
Nb	2.6	1.78
Sn	3	1.66
Cs	0.35	0.12
Ce	6.8	4.63
Pr	1.08	0.39
Ta	0.18	0.1
Pb	2.5	1.7

Proposed values ($\mu\text{g/g}$ dry weight):

Component	Value	St. dev.
F	100	
S	1000	
Cd	0.12	
W	0.3	
Th	0.05	
U	0.03	

Order Information:

PM-S is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. PM-S is packaged in 40-g units.

Reference:

Govindaraju, K., P. J. Potts, P. C. Webb, and J. S. Watson (1994) 1994 report on Whin Sill dolerite WS-E from England and Pitscurrie microgabbro PM-S from Scotland: assessment by one hundred and four international laboratories. Geostand. Newsletter, 18(2):211-300.

QLO-1

Quartz Latite

US Geological Survey (USA)

Description:

This reference material is composed of dense black volcanic rock collected in Lake County, Oregon, USA (42° 44.8' N, 119° 58' W). A complete description of QLO-1, including mineralogical information, can be found in Walker *et al.* (1976). Values for elemental concentrations have been calculated by Gladney and Goode (1981), Abbey (1982, 1983) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations (µg/g dry weight unless noted):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
Li	25	2	Zr	185	16
Be	1.89	0.17	Nb	10.3	1.3
B	36	3	Mo	2.6	0.3
C	27	2	Ru	<0.46	-
O (%)	47.83	-	Rh (ng/g)	<0.1	-
F	280	20	Pd (ng/g)	0.1	-
Na (%)	3.12	0.10	Ag (ng/g)	64	5
Mg (%)	0.60	0.04	Cd (ng/g)	50	-
Al (%)	8.56	0.10	In (ng/g)	180	-
Si (%)	30.61	0.22	Sn	2.31	0.09
P	1110	70	Sb	2.1	0.4
S	30	15	Te (ng/g)	<5	-
Cl	219	18	Cs	1.75	0.19
K (%)	2.99	0.10	Ba	1370	80
Ca (%)	2.27	0.06	La	27	2
Sc	8.9	1.3	Ce	54	6
Ti	3740	200	Pr	6.01	0.11
V	54	6	Nd	26	6
Cr	3.2	1.7	Sm	4.88	0.16
Mn	721	49	Eu	1.43	0.12
Fe (%)	3.04	0.10	Gd	4.7	0.8
Co	7.2	0.5	Tb	0.71	0.07
Ni	5.8	3.6	Dy	3.8	0.3
Cu	29	3	Ho	0.86	0.22
Zn	61	3	Er	2.3	0.1
Ga	17	2	Tm (ng/g)	370	40
Ge	1.34	-	Yb	2.32	0.24
As	3.5	1.8	Lu (ng/g)	370	40
Se (ng/g)	9	2	Hf	4.6	0.3
Br	2.07	-	Ta	0.82	0.10
Rb	74	3	W	0.58	0.05
Sr	336	12	Re	<10	-
Y	24	3	Os	<22	-

QLO-1 (cont.)

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Ir	<6.8	-	Pb	20.4	0.8
Pt (ng/g)	<1	-	Bi (ng/g)	63	3
Au (ng/g)	1.2	0.3	Th	4.5	0.5
Hg (ng/g)	6.79	-	U	1.94	0.12
Tl (ng/g)	220	40			

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
H ₂ O ⁺	0.37	0.11	K ₂ O	3.60	0.12
H ₂ O ⁻	0.18	0.06	CaO	3.17	0.08
CO ₂	0.010	0.001	TiO ₂	0.624	0.033
Na ₂ O	4.20	0.13	MnO	0.093	0.006
MgO	1.00	0.07	FeO	2.97	0.05
Al ₂ O ₃	16.18	0.19	Fe ₂ O ₃	1.02	0.13
SiO ₂	65.55	0.47	Cl	0.022	0.002
P ₂ O ₅	0.254	0.016	F	0.028	0.002
			S	0.003	0.002

Order information:

QLO-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

Walker, G. W., F. J. Flanagan, A. L. Sutton, H. Bastron, S. Berman, J. I. Dinnin, and L. B. Jenkins (1976) Quartz latite (dellenite), QLO-1, from southeastern Oregon. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, p.15-20. US Government Printing Office, Washington, DC, USA.

RGM-1

Rhyolite

US Geological Survey (USA)

Description:

The material for RGM-1 was collected from a single block of obsidian (41° 37.2'N, 121° 29.0'W) near the terminal front of a Holocene obsidian flow near Glass Mountain, which is northeast of Mount Shasta in California, USA. A complete mineralogical description of this material can be found in Tatlock *et al.* (1976). Values for elemental concentrations have been calculated by Abbey (1982, 1983), Gladney and Goode (1981) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations (µg/g dry weight unless noted):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
Li	57	8	Y	25	4
Be	2.37	0.17	Zr	219	20
B	28	3	Nb	8.9	0.6
C	38	11	Mo	2.3	0.5
O (%)	49.18	-	Ru	<0.46	-
F	342	30	Rh (ng/g)	<0.1	-
Na (%)	3.02	0.11	Pd (ng/g)	0.2	-
Mg (%)	0.166	0.016	Ag (ng/g)	108	8
Al (%)	7.26	0.10	Cd (ng/g)	65	10
Si (%)	34.30	0.25	In (ng/g)	150	-
P	210	15	Sn	4.1	0.4
S	54	32	Sb	1.26	0.07
Cl	510	50	Te (ng/g)	<5	-
K (%)	3.57	0.08	Cs	9.6	0.6
Ca (%)	0.82	0.05	Ba	807	46
Sc	4.4	0.3	La	24.0	1.1
Ti	1600	150	Ce	47	4
V	13	2	Pr	4.7	0.5
Cr	3.7	1.2	Nd	19	1
Mn	282	30	Sm	4.3	0.3
Fe (%)	1.30	0.04	Eu	0.66	0.08
Co	2.0	0.2	Gd	3.7	0.4
Ni	4.4	2.0	Tb	0.66	0.06
Cu	11.6	1.4	Dy	4.08	0.12
Zn	32	6	Ho	0.95	0.22
Ga	15	2	Er	2.6	0.3
Ge	1.26	-	Tm (ng/g)	370	40
As	3.0	0.4	Yb	2.6	0.3
Se (ng/g)	6	3	Lu (ng/g)	410	30
Br	1.34	0.12	Hf	6.2	0.3
Rb	149	8	Ta	0.95	0.10
Sr	108	10	W	1.50	0.18

RGM-1 (cont.)

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Re	<10	-	Tl (ng/g)	930	220
Os	<22	-	Pb	24	3
Ir	<6.8	-	Bi (ng/g)	274	19
Pt (ng/g)	<1	-	Th	15.1	1.3
Au (ng/g)	0.33	-	U	5.8	0.5
Hg (ng/g)	21.6	-			

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
H ₂ O ⁺	0.59	0.26	CaO	1.15	0.07
H ₂ O ⁻	0.11	0.02	TiO ₂	0.267	0.025
CO ₂	0.014	0.004	MnO	0.036	0.004
Na ₂ O	4.07	0.15	FeO	1.27	0.05
MgO	0.275	0.026	Fe ₂ O ₃	0.50	0.01
Al ₂ O ₃	13.72	0.19	Cl	0.051	0.005
SiO ₂	73.45	0.54	F	0.034	0.003
P ₂ O ₅	0.048	0.034	S	0.005	0.003
K ₂ O	4.30	0.10			

Order Information:

RGM-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

Tatlock, D. B., F. J. Flanagan, H. Bastron, S. Berman, and A. L. Sutton (1976) Rhyolite, RGM-1, from Glass Mountain, California. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, p. 11-14. US Government Printing Office, Washington, DC.

SARM 1

Granite

South Africa Bureau of Standards (South Africa)

Description:

SARM 1 (NIM-G) is one of six materials in the NIMROC series. This reference material is a granitic rock-type which consists mainly of quartz and K-feldspar, and has smaller amounts of mica and Na-feldspar. The reference material is used in the analysis of rock samples, some non-metalliferous ores, and geochemical samples. Orders of magnitude for S, Co and P are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.49	Mn	160	La	109
F (%)	0.42	FeO (%)	1.30	Ce	195
Na ₂ O (%)	3.36	Cu	12	Nd	72
Al ₂ O ₃ (%)	12.08	Zn	50	Sm	15.8
SiO ₂ (%)	75.70	Ga	27	Eu	0.35
K ₂ O (%)	4.99	Pb	325	Tb	3.0
CaO (%)	0.78	Sr	10	Yb	14.2
Ti	540	Y	143	Pb	40
Cr	12	Zr	300	Th	51
		Nb	53		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Li	12	Fe ₂ O ₃ (%)	0.6	Dy	17
CO ₂ (%)	0.10	Ni	8	Tm	2
MgO (%)	0.06	Ba	120	Lu	2
V	2	Gd	14	U	15

Order information:

SARM 1 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 2

Syenite

South Africa Bureau of Standards (South Africa)

Description:

SARM 1 (NIM-S) is one of six materials in the NIMROC series. This reference material is a syenitic rock-type which consists mainly of K-feldspar and has minor amounts of quartz, Na-feldspar, and alkali-amphiboles. The reference material is used in the analysis of silicate samples, but can also be used as an RM for the analysis of non-metalliferous raw materials and geochemical prospecting samples. Orders of magnitude for Li, F, S, Y, Nb, Gd, Tb, Tm, Lu and U are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.22	K ₂ O (%)	15.35	Ga	11
CO ₂ (%)	0.09	CaO (%)	0.68	Pb	530
Na ₂ O (%)	0.43	Ti	265	Sr	62
MgO (%)	0.46	V	10	BaO (%)	0.27
Al ₂ O ₃ (%)	17.34	Cr	12	Ba	2400
SiO ₂ (%)	63.63	Mn	80	Ce	11.9
P ₂ O ₅ (%)	0.12	FeO (%)	0.30	Eu	0.30
P	520	Fe ₂ O ₃ (%)	1.11	Th	1.0
		Cu	19		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Co	3	La	5	Yb	0.07
Ni	7	Nd	6	Pb	5
Zn	10	Sm	1		
Zr	33	Dy	0.4		

Order information:

SARM 2 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 3

Lujaurite

South Africa Bureau of Standards (South Africa)

Description:

SARM 3 (NIM-L) is one of six materials in the NIMROC series. This rock-type is a Lujaurite and is an undersaturated igneous rock which consists of nepheline, sphene, aegirine, magnetite, and some feldspar. This reference material is useful for the analysis of silicate rocks, but can be used in the analysis of some non-metalliferous ores and for geochemical exploration reference material. Because of its unusual trace element concentrations it is also a valuable trace element reference material. Orders of magnitude for Co, Ni, Gd, Dy and Tm are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	2.31	TiO ₂ (%)	0.48	Y	22
CO ₂ (%)	0.17	Ti	2900	ZrO ₂ (%)	1.49
F (%)	0.44	V	81	Zr	11000
Na ₂ O (%)	8.37	MnO (%)	0.77	Nb ₂ O ₅ (%)	0.14
MgO (%)	0.28	Mn	6000	Nb	960
Al ₂ O ₃ (%)	13.64	FeO (%)	1.13	Ba	450
SiO ₂ (%)	52.40	Fe ₂ O ₃ (%)	8.78	Nd	48
P	260	Cu	13	Eu	1.2
Cl (%)	0.12	Zn	395	Pb	43
K ₂ O (%)	5.51	Pb	190	Th	66
CaO (%)	3.22	SrO (%)	0.54	U	14
		Sr	4600		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Li	48	La	250	Tb	0.7
S	650	Ce	240	Lu	0.4
Cr	10	Yb	3		
Ga	54	Sm	5		

Order information:

SARM 3 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 4

Norite

South Africa Bureau of Standards (South Africa)

Description:

SARM 4 (NIM-N) is one of six materials in the NIMROC series. This rock-type is a norite which consists of orthopyroxene, plagioclase, magnetite, ilmenite, and clinopyroxene and minor amounts of quartz and alteration products. It is a useful silicate reference material for intermediate rocks but is also used for the analysis of geochemical exploration samples. Orders of magnitude for Li, F, S, Rb, Nb, Gd, Tb, Dy, Tm, Pb, Th and U are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.33	Ti	1200	Cu	14
Na ₂ O (%)	2.46	TiO ₂ (%)	0.20	Zn	68
MgO (%)	7.50	V	220	Ga	16
Al ₂ O ₃ (%)	16.50	Mn	1400	Sr	260
SiO ₂ (%)	52.64	MnO (%)	0.18	Ba	102
K ₂ O (%)	0.25	FeO (%)	7.47	Eu	0.63
CaO (%)	11.50	Co	58		
		Ni	120		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
CO ₂ (%)	0.10	Zr	23	Nd	3
P	130	Y	7	Sm	0.8
Cr	30	Ce	6	Yb	0.7
Fe ₂ O ₃ (%)	0.8	La	3	Lu	0.2

Order information:

SARM 4 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 5

Pyroxenite

South Africa Bureau of Standards (South Africa)

Description:

SARM 5 (NIM-P) is one of six materials in the NIMROC series. This rock-type is a pyroxenite which consists of orthopyroxene, clinopyroxene, and plagioclase and minor amounts of olivine and chromite. This reference material is used for the analysis of mafic silicate rocks but can also be used for the analysis of geochemical exploration samples. Orders of magnitude for Li, F, S, Rb, Zr, Nb, Ce, Nd, Sm, Gd, Tb, Dy, Tm, Lu, Pb, Th and U are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	0.26	Ti	1200	Cr	24000
Na ₂ O (%)	0.37	TiO ₂ (%)	0.20	Cr ₂ O ₃ (%)	3.50
MgO (%)	25.33	V	230	Ni	555
Al ₂ O ₃ (%)	4.18	Mn	1700	Cu	18
SiO ₂ (%)	51.10	MnO (%)	0.22	Zn	100
P	90	FeO (%)	10.59	Sr	32
K ₂ O (%)	0.09	Fe ₂ O ₃ (%)	0.87	Ba	46
CaO (%)	2.66	Co	110		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
CO ₂ (%)	0.08	La	2
Ga	8	Yb	0.6
Y	5	Eu	0.2

Order information:

SARM 5 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 6

Dunite

South Africa Bureau of Standards (South Africa)

Description:

SARM 6 (NIM-D) is one of six materials in the NIMROC series. This rock-type is a dunite and consists of olivine and orthopyroxene and minor amounts of clinopyroxene, plagioclase, and chromite. This reference material is used in the analysis of basic silicate rock samples and can also be used for the analysis of non-metalliferous ores and geochemical exploration samples. Orders of magnitude for Li, F, S, Ga, Rb, Y, Zr, Nb, Ce, Nd, Sm, Eu, Gd, Tb, Dy, Tm, Yb, Lu, Pb, Th and U are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	V	40		
		Component	Value	Fe_2O_3 (%)	0.71
H_2O^+ (%)	0.30			Co	208
CO_2 (%)	0.40	Cr	2900	Ni	2040
MgO (%)	43.51	Cr_2O_3 (%)	0.42	NiO (%)	0.26
SiO_2 (%)	38.96	Mn	1700	Cu	10
CaO (%)	0.28	MnO (%)	0.22	Zn	90
Ti	120	FeO (%)	14.63		
		Component	Value		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na_2O (%)	0.04	Sr	3
P	40	Ba	10
K_2O (%)	0.01	La	0.2
Al_2O_3 (%)	0.3		

Order information:

SARM 6 can be purchased for US\$113 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 39

Kimberlite

South Africa Bureau of Standards (South Africa)

Description:

SARM 39 comes from the Kimberley area in the Cape Province. It consists of large round grains of olivine, ilmenite, garnet, mica and pyroxene which are set in a fine grained micro-crystalline matrix. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
MgO (%)	26.24	V	109	Rb	52
Al ₂ O ₃ (%)	4.29	Cr ₂ O ₃ (%)	0.19	Sr	1400
SiO ₂ (%)	33.44	MnO (%)	0.17	Y	17
P ₂ O ₅ (%)	1.46	Fe ₂ O ₃ (%)	9.29	Zr	239
K ₂ O (%)	1.04	Co	77	Nb	110
CaO (%)	9.69	Ni	994	Ba	1700
TiO ₂ (%)	1.58	Cu	58		
		Zn	70		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na ₂ O (%)	0.5	Mo	5
S (%)	0.15	Ce	85
FeO (%)	4.0	Pb	25
Ga	10	Th	10

Order information:

SARM 39 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 40

Carbonatite

South Africa Bureau of Standards (South Africa)

Description:

SARM 40 comes from the Kimberley area in the Cape Province. It consists of large round grains of olivine, ilmenite, garnet, mica and pyroxene which are set in a fine grained micro-crystalline matrix. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
MgO (%)	1.97	MnO (%)	0.18
Al ₂ O ₃ (%)	0.41	Fe ₂ O ₃ (%)	2.75
SiO ₂ (%)	3.08	Zn	25
P ₂ O ₅ (%)	2.05	Sr	1600
CaO (%)	49.77	Y	33
TiO ₂ (%)	0.05	Zr	87
V	27		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na ₂ O (%)	0.05	Ga	10
S (%)	0.05	Rb	10
K ₂ O (%)	0.03	Nb	10
Cr	35	Mo	10
FeO (%)	0.4	Ba	310
Co	20	Ce	160
Ni	25	Pb	20
Cu	10	Th	12

Order information:

SARM 40 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 41

Carbonaceous Shale

South Africa Bureau of Standards (South Africa)

Description:

SARM 41 comes from the Marico District of the Transvaal. This is an extremely fine-grained rock consisting of quartz, sericite, chlorite, clays and carbonaceous materials. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na ₂ O (%)	0.93	Fe ₂ O ₃ (%)	4.23
Al ₂ O ₃ (%)	13.50	Ni	122
SiO ₂ (%)	56.67	Cu	53
P ₂ O ₅ (%)	0.05	Zn	76
K ₂ O (%)	1.39	Pb	59
CaO (%)	1.50	MgO (%)	8.10
TiO ₂ (%)	0.55	Sr	54
V	139	Y	17
Cr	123	Zr	146
MnO (%)	0.06	Nb	8
		Ba	820

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
S (%)	0.15	Mo	5
FeO (%)	0.3	Ce	60
Co	15	Pb	30
Ga	20	Th	12

Order information:

SARM 41 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 43

Magnesite

South Africa Bureau of Standards (South Africa)

Description:

SARM 43 comes from the Kaapmuiden area of the Eastern Transvaal. It consists mainly of magnesite with small amounts of quartz, magnetite, chlorite and secondary hematite. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
SiO_2 (%)	5.99	Ni	252
CaO (%)	0.75	Sr	8
Fe_2O_3 (%)	0.26	MgO (%)	44.11
Co	4		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na_2O (%)	0.05	MnO (%)	0.01
Al_2O_3 (%)	0.06	FeO (%)	0.1
P_2O_5 (%)	0.02	Cu	15
S (%)	0.04	Zn	10
K_2O (%)	0.04	Ba	25
TiO_2 (%)	0.01	Ce	20
Cr	195		

Order information:

SARM 43 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 44

Sillimanite Schist

South Africa Bureau of Standards (South Africa)

Description:

SARM 44 comes from the Pofadder District in the Northern Cape Province. It consists of sillimanite, muscovite, biotite, chlorite and magnetite. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Al_2O_3 (%)	58.80	V	395	Sr	5
SiO_2 (%)	34.84	Cr	384	Y	84
P_2O_5 (%)	0.10	MnO (%)	0.03	Zr	406
K_2O (%)	0.18	Fe_2O_3 (%)	2.06	Nb	96
CaO (%)	0.14	Zn	271	Th	50
TiO_2 (%)	1.83	Rb	13		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value				
		Ni	15	Mo	15
Na_2O (%)	0.05	Cu	10	Ba	50
S (%)	0.03	Ga	55	Ce	220
FeO (%)	1.0	MgO (%)	0.1	Pb	30
Co	8				
Component	Value	Component	Value		

Order information:

SARM 44 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 45

Kinzingite

South Africa Bureau of Standards (South Africa)

Description:

SARM 45 comes from the Augrabies area of the Northern Cape Province. It consists primarily of biotite, quartz, orthoclase, garnet and accessory amounts of epidote, sillimanite, sericite and chlorite. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Na ₂ O (%)	0.84	V	266	Rb	142
Al ₂ O ₃ (%)	26.22	Cr	256	MgO (%)	3.39
SiO ₂ (%)	49.62	MnO (%)	0.10	Sr	92
P ₂ O ₅ (%)	0.08	Fe ₂ O ₃ (%)	12.60	Y	63
K ₂ O (%)	3.18	Co	41	Zr	322
CaO (%)	0.78	Ni	80	Nb	27
TiO ₂ (%)	1.82	Cu	11		
		Zn	74		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
S (%)	0.05	Ce	100
FeO (%)	10.0	Pb	20
Ga	35	Th	21
Ba	900		

Order Information:

SARM 45 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 47

Serpentinite

South Africa Bureau of Standards (South Africa)

Description:

SARM 47 comes from the M'Sauli mine in the Eastern Transvaal. This is a completely serpentinitized dunite with antigorite, magnetite, epidote and prehnite present. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Al_2O_3 (%)	1.09	Co	79
SiO_2 (%)	36.30	Ni	2221
Cr_2O_3 (%)	0.29	Zn	45
MnO (%)	0.06	MgO (%)	42.09
Fe_2O_3 (%)	4.14		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na_2O (%)	0.05	FeO (%)	0.4
P_2O_5 (%)	0.02	Cu	5
S (%)	0.02	Ga	5
K_2O (%)	0.02	Sr	3
CaO (%)	0.1	Y	5
TiO_2 (%)	0.01	Ba	75
V	16	Ce	20
		Pb	60

Order Information:

SARM 47 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 48

Fluorspar Granite

South Africa Bureau of Standards (South Africa)

Description:

SARM 48 comes from the Buffalo mine in the Northern Transvaal. It consists of quartz, orthoclase, microcline, albite and smaller amounts of hornblende and fluorite. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Na ₂ O (%)	3.22	Cr	23	Sr	29
Al ₂ O ₃ (%)	11.24	MnO (%)	0.02	Y	436
SiO ₂ (%)	67.11	Fe ₂ O ₃ (%)	0.58	Zr	300
K ₂ O (%)	4.26	Zn	53	Nb	202
CaO (%)	8.90	Pb	291	Pb	135
TiO ₂ (%)	0.10	MgO (%)	0.18	Th	113

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
P ₂ O ₅ (%)	0.09	Mo	5
V	8	Ba	290
FeO (%)	0.2	Ce	850
Qu	10		

Order information:

SARM 48 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 49

Quartz

South Africa Bureau of Standards (South Africa)

Description:

SARM 49 comes from the Pietersburg area of the Northern Transvaal. Apart from the quartz, accessory amounts of muscovite, chlorite and sericite are present. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
SiO ₂ (%)	99.6

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
Na ₂ O (%)	0.05	TiO ₂	0.01
MgO (%)	0.05	MnO (%)	0.01
Al ₂ O ₃ (%)	0.05	Fe ₂ O ₃ (%)	0.05
K ₂ O (%)	0.01	Sr	5
CaO (%)	0.01		

Order Information:

SARM 49 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SARM 50

Dolerite

South Africa Bureau of Standards (South Africa)

Description:

SARM 50 comes from the Jamestown District of the Eastern Cape Province. It consists mainly of plagioclase and clinopyroxene with minor amounts of olivine, magnetite and ilmenite. Orders of magnitude for As, Ga, Se, W, Au, Br, Cs, Eu, Hf, La, Lu, Sc, Sm, Ta, Tb, Yb and Sb are available from SABS.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
Na ₂ O (%)	2.30	V	216	Rb	14
Al ₂ O ₃ (%)	15.28	Cr	357	MgO (%)	7.57
SiO ₂ (%)	51.56	MnO (%)	0.17	Sr	195
P ₂ O ₅ (%)	0.15	Fe ₂ O ₃ (%)	11.0	Y	23
K ₂ O (%)	0.61	FeO (%)	8.49	Zr	86
CaO (%)	10.80	Co	40	Ba	220
TiO ₂ (%)	0.86	Cu	84		
		Zn	81		

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
S (%)	0.03	Ce	30
Ni	85	Pb	25
Nb	10	Th	6

Order information:

SARM 50 can be purchased for US\$56 per unit (100 g). Price subject to change. Please contact SABS.

Reference:

South African Committee for Certified Reference Materials (1990) Catalogue of certified reference materials. South Africa Bureau of Standards, Private Bag X191, Pretoria, Transvaal 0001, South Africa. 36 pp.

SCo-1

Cody Shale

US Geological Survey (USA)

Description:

The material for SCo-1 was collected in 1963 from a bulldozer cut in an abandoned road on the west side of Teapot Dome in Natrona County, Wyoming, USA. It is from the upper part of the Cody Shale, typical of Upper Cretaceous silty marine shales, intermediate between fine-grained offshore marine shales common farther to the east and the coarser nearshore marine siltstones and sandstone. A complete mineralogical description of this material can be found in Schultz *et al.* (1976). Values for elemental concentrations have been calculated by Abbey (1982, 1983), Gladney and Goode (1981) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Li	45	3	Sr	174	16
Be	1.84	0.20	Y	26	4
B	72	6	Zr	160	30
C	8100	1200	Nb	11	3
O (%)	50.77	-	Mo	1.37	0.16
F	770	60	Ru	<0.46	-
Na (%)	0.667	0.046	Rh (ng/g)	<1.0	-
Mg (%)	1.64	0.11	Pd (ng/g)	1.0	0.3
Al (%)	7.23	0.11	Ag (ng/g)	134	7
Si (%)	29.32	0.31	Cd (ng/g)	140	12
P	900	90	In (ng/g)	110	-
S	630	90	Sn	3.7	0.8
Cl	51	10	Sb	2.50	0.13
K (%)	2.30	0.07	Te (ng/g)	77	-
Ca (%)	1.87	0.14	Cs	7.8	0.7
Sc	10.8	1.1	Ba	570	30
Ti	3760	390	La	29.5	1.1
V	131	13	Ce	62	6
Cr	68	5	Pr	6.6	0.9
Mn	408	30	Nd	26	2
Fe (%)	3.59	0.13	Sm	5.3	0.3
Co	10.5	0.8	Eu	1.19	0.12
Ni	27	4	Gd	4.6	0.7
Cu	28.7	1.9	Tb	0.70	0.06
Zn	103	8	Dy	4.2	0.5
Ga	15	3	Hb	0.97	0.06
Ge	1.21	-	Er	2.5	0.4
As	12.4	1.4	Tm (ng/g)	420	100
Se (ng/g)	890	60	Yb	2.27	0.24
Br	1.03	-	Lu (ng/g)	338	33
Pb	112	4	Hf	4.6	0.3

SCo-1 (cont.)

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
Ta	0.92	0.09	Hg (ng/g)	52.3	-
W	1.4	0.2	Tl (ng/g)	720	130
Re	<10	-	Pb	31	3
Os	<22	-	Bi (ng/g)	370	70
Ir	<6.8	-	Th	9.7	0.5
Pt (ng/g)	<1	-	U	3.0	0.2
Au (ng/g)	2.1	0.4			

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
H ₂ O ⁺	3.69	0.60	CaO	2.62	0.20
H ₂ O ⁻	2.11	0.44	TiO ₂	0.628	0.065
CO ₂	2.97	0.44	MnO	0.053	0.004
Na ₂ O	0.899	0.062	FeO	0.90	0.16
MgO	2.72	0.18	Fe ₂ O ₃	4.19	0.19
Al ₂ O ₃	13.67	0.21	Cl	0.005	0.001
SiO ₂	62.78	0.66	F	0.077	0.006
P ₂ O ₅	0.206	0.021	S	0.063	0.009
K ₂ O	2.77	0.08			

Order information:

SCo-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada, 114 pp.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

Schultz, L. G., H. A. Tourtelot, and F. J. Flanagan (1976) Cody Shale, SCo-1, from Natrona County, Wyoming. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, US Government Printing Office, Washington, DC, USA, pp. 21-23.

SDC-1

Mica Schist

US Geological Survey (USA)

Description:

Mica schist was excavated from a sewer tunnel at an estimated depth of 80 ft in the northern part of Rock Creek Park in Washington, DC, USA. A more complete description of SDC-1, including mineralogical information, can be found in Flanagan and Carroll (1976). Values for elemental concentrations have been calculated by Abbey (1982, 1983), Gladney and Goode (1981) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Li	34	3	Nb	18	3
Be	3.0	0.5	Mo	0.25	0.14
B	12.8	1.8	Ru	<0.46	-
C	270	90	Rh (ng/g)	<0.1	-
F	595	27	Pd (ng/g)	1.1	-
Na (%)	1.52	0.07	Ag (ng/g)	41	6
Mg (%)	1.02	0.06	Cd (ng/g)	80	50
Al (%)	8.33	0.18	In (ng/g)	120	-
Si (%)	30.75	0.20	Sn	2.98	0.18
P	690	110	Sb	0.54	0.05
S	650	110	Te (ng/g)	6.2	-
Cl	32	9	Cs	4.0	0.2
K (%)	2.72	0.08	Ba	630	60
Ca (%)	1.00	0.05	La	42	3
Sc	17	2	Ce	93	7
Ti	6050	220	Pr	9.8	1.1
V	102	12	Nd	40	4
Cr	64	7	Sm	8.2	0.5
Mn	880	60	Eu	1.71	0.12
Fe (%)	4.82	0.16	Gd	7.2	0.4
Co	17.9	1.2	Tb	1.18	0.14
Ni	38	8	Dy	6.7	0.9
Cu	30	3	Ho	1.5	0.3
Zn	103	8	Er	4.1	0.7
Ga	21.2	1.4	Tm (ng/g)	650	100
Ge	1.54	-	Yb	4.0	0.7
As	0.218	0.012	Lu (ng/g)	530	110
Se (ng/g)	32	6	Hf	8.3	0.2
Br	0.097	-	Ta	1.21	0.19
Rb	127	7	W	0.80	0.06
Sr	183	9	Re	<10	-
Y	40	6	Os	<22	-
Zr	290	30	Ir	<6.8	-

SDC-1 (cont.)

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Pt (ng/g)	1.1	-	Pb	25	2
Au (ng/g)	1.2	0.6	Bi (ng/g)	260	40
Tl (ng/g)	700	150	Th	12.1	0.9
Hg (ng/g)	22.7	-	U	3.14	0.20

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
H ₂ O ⁺	1.81	0.14	CaO	1.40	0.07
H ₂ O ⁻	0.10	0.06	TiO ₂	1.01	0.04
CO ₂	0.099	0.033	MnO	0.114	0.008
Na ₂ O	2.05	0.09	FeO	3.93	0.15
MgO	1.69	0.10	Fe ₂ O ₃	2.62	0.15
Al ₂ O ₃	15.75	0.34	Cl	0.003	0.001
SiO ₂	65.85	0.43	F	0.060	0.003
P ₂ O ₅	0.158	0.025	S	0.065	0.011
K ₂ O	3.28	0.10			

Order information:

SDC-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada, 114 pp.

Flanagan, F. J., and G. V. Carroll (1976) Mica schist, SDC-1, from Rock Creek Park, Washington, D.C. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, US Government Printing Office, Washington, DC, USA, pp. 29-32.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

SDO-1

Shale

US Geological Survey (USA)

Description:

The material for this reference sample was collected from the Huron Member of the Ohio Shale near Morehead, KY. It can be used to establish analytical accuracy in the analysis of organic- and sulfur-rich sedimentary rocks. The sample is moderately radioactive. The recommended values from Kane *et al.* (1990) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Li	28.6	5.5	Sn	2.9	1.2
Be	3.3	0.57	Cs	6.9	1.2
B	128	11	Ba	397	38
Sc	13.2	1.5	La	38.5	4.4
Ti	8.3		Ce	79.3	7.8
V	160	21	Pr	8.9	0.66
Cr	66.4	7.6	Nd	36.6	3.3
Co	46.8	6.3	Sm	7.7	0.81
Ni	99.5	9.9	Eu	1.6	0.22
Cu	60.2	9.6	Gd	7.4	1.9
Zn	64.1	6.9	Tb	1.2	0.24
Ga	16.8	1.8	Dy	6.0	0.65
Ge	1.3		Ho	1.2	0.11
As	68.5	8.6	Er	3.6	0.55
Rb	126	3.9	Tm	0.45	0.08
Sr	75.1	11.0	Yb	3.4	0.46
Y	40.6	6.5	Lu	0.54	0.14
Zr	165	24	Hf	4.7	0.75
Nb	11.4	1.2	Ta	1.1	0.13
Mo	134	21	Hg	0.19	0.08
Cd	<2 - <10		Pb	27.9	5.2
In	<0.2		U	48.8	6.5

SDO-1 (cont.)

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
H	1.34	0.06	SiO ₂	49.28	0.63
H ₂ O	1.21	0.50	P ₂ O ₅	0.11	0.007
C	9.95	0.44	K ₂ O	3.35	0.061
CO ₂	1.01	0.021	CaO	1.05	0.047
N	0.347	0.043	TiO ₂	0.71	0.031
Na ₂ O	0.38	0.26	MnO	0.1042	0.005
MgO	1.54	0.038	Fe ₂ O ₃	9.34	0.21
Al ₂ O ₃	12.27	0.23	S	5.35	0.044

Order information:

SDO-1 is available for US\$65 per bottle. Please contact USGS.

References:

Kane, J. S., B. F. Arbogast, and J. S. Leventhal (1990) Characterization of Devonian Ohio shale SDO-1 as a USGS geochemical reference sample. Geostand. Newsletter, 14:169-96.

US Geological Survey (1991) Certificate, report of analysis, reference shale sample SDO-1. USGS, Reston, VA, USA.

SDO-1

Terrigenous Clay

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as OOPe101 or CRM No. 5368-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	50	10	Fe_2O_3 (%)	6.92	0.06
Be	1.4	0.4	Co	38	4
B	50	20	Ni	190	20
CO_2 (%)	6.00	0.30	Cu	170	20
Na_2O (%)	4.45	0.06	Zn	240	20
MgO (%)	3.21	0.06	Ga	10	2
Al_2O_3 (%)	12.70	0.13	Pb	28	4
SiO_2 (%)	41.80	0.20	Sr	500	50
P_2O_5 (%)	0.23	0.01	Y	30	5
S (%)	0.12	0.01	Zr	90	10
K_2O (%)	1.33	0.04	Mo	4	0.8
CaO (%)	9.20	0.15	Sn	2.0	0.5
Sc	23	5	Ba (%)	0.32	0.03
TiO_2 (%)	0.73	0.01	La	13	3
V	120	10	Ce	25	8
Cr	66	8	Yb	3	1
MnO (%)	1.04	0.02	Pb	10	3
FeO (%)	0.6	0.1	Th	2.4	0.8
			LOI (%)	17.5	0.5

Mineral composition:

Mineral	Percent
Montmorillonite	25 - 30
Hydromica	20 - 25
Calcite	8 - 12
Quartz	8 - 12
Magnesite	3 - 5
Galite	5 - 7
Kaolinite (chlorite)	2 - 4
Amphibole	1 - 2
Plagioclase (bas.)	2 - 3
Feldspar	10 - 15
Accessory minerals	1 - 2

Granulometric composition:

Fraction size (μm)	Percent
< 10	44
10 - 20	23
20 - 30	15
30 - 40	9
40 - 50	3
50 - 60	3
60 - 70	2
70 - 80	1
> 80	0

SDO-1 (cont.)

Order information:

SDO-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Terrigenous clay CRM No. 5368-90 (SDO-1). Certificate. State University, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SDO-2

Volcanogenic Ooze

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as OOPE201 or CRM No. 5369-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	35	8	Fe ₂ O ₃ (%)	11.82	0.11
Be	1.8	0.6	Co	46	5
CO ₂ (%)	2.40	0.20	Ni	150	20
Na ₂ O (%)	4.00	0.06	Cu	180	20
MgO (%)	4.58	0.08	Zn	130	20
Al ₂ O ₃ (%)	14.37	0.14	Ga	120	20
SiO ₂ (%)	43.50	0.30	Pb	37	4
P ₂ O ₅ (%)	0.27	0.01	Sr (%)	0.051	0.005
S (%)	0.17	0.01	Y	33	6
K ₂ O (%)	1.34	0.04	Zr	170	20
CaO (%)	7.63	0.14	Mo	1.7	0.3
Sc	26	5	Sn	3.3	0.8
TiO ₂ (%)	2.30	0.03	Ba (%)	0.13	0.01
V (%)	0.020	0.002	La	25	6
Cr (%)	0.026	0.001	Ce	50	20
MnO (%)	0.265	0.006	Pb	18	5
FeO (%)	2.9	0.3	Th	5	1
			LOI (%)	9.2	0.3

Mineral composition:

Mineral	Percent
Accessory minerals	2 - 3
Amphibole	2 - 4
Bydromica	20 - 25
Calcite	5 - 8
Feldspar	10 - 15
Fillipsite	2 - 3
Galite	4 - 6
Ilmenite	4 - 6
Kaolinite (chlorite)	2 - 4
Magnesite	4 - 6
Magnetite	7 - 10
Montmorillonite	5 - 10
Plagioclase (bas.)	3 - 5
Pyroxene	5 - 8
Quartz	10 - 15
Volcanic glass	4 - 8

Granulometric composition:

Fraction size (μm)	Percent
< 10	32
10 - 20	28
20 - 30	15
30 - 40	9
40 - 50	6
50 - 60	4
60 - 70	3
70 - 80	2
> 80	1

Order Information:

SDO-2 can be purchased for DM265 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Volcanogenic ooze CRM No. 5369-90 (SDO-2). Certificate. State University, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SDO-3

Calcareous Ooze

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as CRM No. 5370-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	13	4	Fe_2O_3 (%)	2.44	0.04
Be	1.0	0.4	Co	12	1
CO_2 (%)	32.20	0.50	Ni	38	3
Na_2O (%)	1.86	0.05	Cu	30	4
MgO (%)	3.44	0.07	Zn	100	10
Al_2O_3 (%)	3.60	0.09	Ga	5	2
SiO_2 (%)	11.90	0.20	Pb	11	2
P_2O_5 (%)	0.23	0.01	Sr (%)	0.12	0.01
S (%)	0.19	0.01	Y	9	1
K_2O (%)	0.51	0.02	Zr	80	10
CaO (%)	39.23	0.32	Mo	4	0.8
Sc	6	2	Sn	210	30
TiO_2 (%)	0.30	0.01	Ba	100	20
V	57	5	La	7	3
Cr	34	5	Pb	11	4
MnO (%)	0.218	0.006	Th	3	1
FeO (%)	0.17	0.06	LOI (%)	36.6	0.7

Mineral composition:

Mineral	Percent
Accessory minerals	1 - 2
Calcite	65 - 70
Feldspar	3 - 5
Galite	3 - 5
Hydromica	5 - 8
Kaolinite (chlorite)	5 - 7
Magnesite	5 - 7
Montmorillonite	1 - 2
Quartz	3 - 5

Granulometric composition:

Fraction size (μm)	Percent
< 10	55
10 - 20	16
20 - 30	10
30 - 40	7
40 - 50	6
50 - 60	3
60 - 70	2
70 - 80	1
> 80	0

Order information:

SDO-3 can be purchased for DM265 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Calcareous ooze CRM No. 5370-90 (SDO-3). Certificate. State University, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SDO-4 - SDO-6

Fe-Mn Nodules

Research Institute of Applied Physics (Russia)

Description:

SDO-4 was collected at 146° 26' W, 9° 50' N, at a depth of 5200 m. The new sample name is OOPE601. SDO-5 was collected at 153° 22' W, 10° 58' N, at a depth of 4800 m. The new sample name is OOPE602. No information is available on the collection site of SDO-6. The new name is OOPE603.

Certified concentrations (µg/g dry weight unless noted):

Component	Value	Abs. error	Value	Abs. error	Value	Abs. error
	SDO-4		SDO-5		SDO-6	
Li	140	20	70	10	40	10
CO ₂ (%)	0.43	0.09	0.39	0.08	0.6	0.1
Na ₂ O (%)	2.94	0.05	2.61	0.05	2.4	0.05
MgO (%)	3.40	0.07	2.74	0.06	2.24	0.05
Al ₂ O ₃ (%)	5.68	0.10	5.21	0.09	5.46	0.09
SiO ₂ (%)	16.60	0.20	16.20	0.20	14.5	0.2
P ₂ O ₅ (%)	0.68	0.02	0.65	0.02	0.8	0.02
S (%)	0.10	0.01	0.12	0.01	0.16	0.01
Cl (%)	0.7	0.1	0.8	0.1	0.9	0.1
K ₂ O (%)	1.27	0.03	1.18	0.03	0.83	0.03
CaO (%)	2.82	0.10	2.77	0.08	3.01	0.1
Sc	11	3	12	3	13	4
TiO ₂ (%)	0.74	0.01	1.47	0.02	1.91	0.02
V	430	50	400	40	480	50
Cr	18	3	17	3	19	3
MnO (%)	35.09	0.30	29.91	0.29	25.16	0.28
MnO ₂ (%)	41.7	0.5	35.8	0.4	31.1	0.4
Fe ₂ O ₃ (%)	9.28	0.07	17.21	0.17	24.87	0.21
Co	2200	70	3100	100	4700	200
Ni	13700	400	8400	300	4200	200
Cu	10100	400	5100	200	2200	100
Zn	1200	100	770	60	580	50
As	60	20	110	30	170	40
Rb	21	4	16	3	10	2
Sr	640	50	900	70	1100	100
Y	110	20	160	30	140	20
Zr	320	20	600	40	600	40
Nb	20	4	48	8	90	10
Mo	520	40	430	40	330	30
Pd					0.003	0.001
Cd	17	4	9	3	5	2
Ba	1800	200	1900	200	1700	200

SDO-4 - SDO-6 (cont.)

Component	Value	Abs. error	Value	Abs. error	Value	Abs. error
	SDO-4		SDO-5		SDO-6	
La	90	20	150	40	140	40
Ce	200	50	500	200	900	200
Nd	80	30	150	40	140	40
Sm	22	7	40	10	30	10
Yb	13	4	21	7	14	4
Pt	0.1	0.04	0.19	0.07	0.21	0.07
Au	0.005	0.003	0.008	0.004	0.01	0.006
Pb	400	30	710	40	980	50
Th	17	2	31	3	38	4
U	4	1	5	2	8	2
TOC	0.18	0.04	0.18	0.04	0.22	0.05
LOI (%)	15.3	0.5	14.8	0.5	13.8	0.4

Mineral composition:

Mineral	Percent	Percent	Percent
Montmorillonite	10 - 15	5 - 10	5 - 10
Hydromica	10 - 15	5 - 10	5 - 10
Quartz	3 - 5	4 - 6	
Galite	1 - 2	1 - 2	1 - 2
Kaolinite	5 - 10	2 - 5	6 - 10
Pyroxene	2 - 5	2 - 5	
Amphibole	2 - 5		1 - 2
Plagioclase	4 - 7	3 - 5	2 - 4
Asbolane	15 - 20	35 - 40	8 - 12
Bernadite	3 - 5	4 - 6	5 - 7
Todorokite	15 - 20	3 - 5	10 - 15
Ferroxygite	2 - 4	2 - 4	4 - 7
Buzerite	2 - 6		5 - 8
Bernessite	1 - 3		3 - 5
Volcanic glass	2 - 4	3 - 5	2 - 4
Magnetite	1 - 2	2 - 5	2 - 4
Ilmenite	1 - 2	2 - 4	2 - 4
Gematite			2 - 4
Amorphous pahse Fe, Mn			5 - 8
Others	1 - 2	2 - 3	2 - 3

Granulometric composition:

Fraction size (µm)	Percent	Percent	Percent
<10	47	48	55
10 - 20	20	20	21
20 - 30	13	15	10
30 - 40	8	9	6
40 - 50	6	5	3
50 - 60	3	2	3
60 - 70	2	1	1
70 - 80	1	0	1
> 80	0	0	0

Order Information:

These CRMs can each be purchased for DM265 per unit (50 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Research Institute of Applied Physics (1990?) Fe-Mn nodule CRM No. 5373-90 (SDO-4). Certificate. Research Institute of Applied Physics, State University of Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

Research Institute of Applied Physics (1990?) Fe-Mn nodule CRM No. 5374-90 (SDO-5). Certificate. Research Institute of Applied Physics, State University of Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

Research Institute of Applied Physics (1990?) Fe-Mn nodule CRM No. 5375-90 (SDO-6). Certificate. Research Institute of Applied Physics, State University of Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SDO-7

Ore Crust

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as CRM No. 5376-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	19	4	Cu (%)	0.13	0.01
Be	3	1	Zn (%)	0.060	0.005
CO ₂ (%)	0.50	0.10	As	140	30
Na ₂ O (%)	2.24	0.05	Rb	19	3
MgO (%)	2.29	0.05	Sr (%)	0.11	0.01
Al ₂ O ₃ (%)	6.71	0.12	Y	160	30
SiO ₂ (%)	22.30	0.20	Zr	550	40
P ₂ O ₅ (%)	1.61	0.04	Nb	60	10
S (%)	0.16	0.01	Mo	350	30
K ₂ O (%)	1.18	0.03	Ba (%)	0.16	0.02
CaO (%)	5.13	0.12	La	120	30
Sc	19	5	Ce (%)	0.10	0.03
TiO ₂ (%)	1.56	0.02	Nd	100	30
V	540	60	Sm	27	8
Cr	67	8	Yb	6	2
MnO (%)	19.85	0.24	Tl	100	10
MnO ₂ (%)	24.2	0.4	Pb (%)	0.105	0.005
Fe ₂ O ₃ (%)	22.13	0.19	Th	28	3
Co (%)	0.27	0.01	U	6	2
Ni (%)	0.34	0.02	LOI (%)	11.4	0.4

SDO-7 (cont.)

Mineral composition:

Mineral	Percent
Amorphous phase,	
Fe, Mn	2 - 4
Amphibole	2 - 4
Asbolane	6 - 10
Bernadite	20 - 25
Feldspar	2 - 4
Ferroxygite	3 - 6
Galite	1 - 2
Ilmenite	2 - 4
Kaolinite (chlorite)	6 - 10
Magnetite	4 - 6
Montmorillonite	10 - 15
Plagioclase (bas.)	3 - 5
Pyroxene	2 - 5
Quartz	5 - 8
Uydromica	5 - 10
Volcanic glass	1 - 3
Accessory minerals	1 - 2

Granulometric composition:

Fraction size (µm)	Percent
< 10	63
10 - 20	18
20 - 30	10
30 - 40	6
40 - 50	2
50 - 60	1
60 - 70	0
70 - 80	0
> 80	0

Order information:

SDO-7 can be purchased for DM265 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Ore crust. CRM No. 5376-90 (SDO-7). Certificate. State University, Irkutsk, Russia.

SDO-8

Siliceous Silt

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as CRM No. 5371-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	18	4	Cu	140	20
Be	1.6	0.5	Zn	90	7
B	70	30	Ga	11	2
C (%)	0.34	0.06	As	20	6
CO ₂ (%)	2.70	0.20	Rb	46	4
Na ₂ O (%)	4.52	0.06	Sr	340	40
MgO (%)	3.16	0.06	Y	16	3
Al ₂ O ₃ (%)	8.96	0.12	Zr	100	10
SiO ₂ (%)	59.60	0.30	Nb	10	2
P ₂ O ₅ (%)	0.12	0.01	Mo	2.8	0.5
S (%)	0.17	0.01	Sn	3.2	0.8
K ₂ O (%)	1.39	0.04	Cs	3.0	0.7
CaO (%)	6.40	0.13	Ba	0.15	0.02
Sc	17	5	La	15	4
TiO ₂ (%)	0.59	0.01	Ce	33	9
V	85	7	Nd	13	4
Cr	80	10	Sm	2.5	0.8
MnO (%)	0.37	0.02	Yb	2.2	0.6
FeO (%)	1.2	0.2	Au	0.004	0.002
Fe ₂ O ₃ (%)	5.05	0.05	Pb	24	5
Co	30	4	Th	5	1
Ni	100	10	U	1.5	0.7
			LOI (%)	9.6	0.3

Mineral composition:

Mineral	Percent	Mineral	Percent
Accessory minerals	1 - 2	Magnetite	2 - 4
Amphibole	2 - 4	Montmorillonite	3 - 55
Calcite	4 - 6	Plagioclase (bas.)	5 - 10
Galite	4 - 6	Pyroxene	5 - 7
Hydromica	5 - 10	Quartz	40 - 45
Kaolinite (chlorite)	3 - 5	Volcanic glass	5 - 10
Magnesite	1 - 3		

SDO-8 (cont.)

Granulometric composition:

Fraction size (μm)	Percent
< 10	42
10 - 20	38
20 - 30	13
30 - 40	4
40 - 50	2
50 - 60	1
60 - 70	0
70 - 80	0
> 80	0

Order Information:

SDO-8 can be purchased for DM265 per unit (100 g). Price subject to change without notice. Please contact Breittländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Siliceous silt. CRM No. 5371-90 (SDO-8). Certificate. State University, Irkutsk, Russia. (Available from Breittländer, Hamm, Germany.)

SDO-9

Red Clay (Deep - Water)

State University of Irkutsk (Russia)

Description:

This material was prepared in 1990 and is also known as CRM No. 5372-90.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li (%)	50	10	Cu	320	30
Li	60	10	Zn	160	20
Be	2.1	0.6	Ga	14	2
B	70	30	As	32	8
CO ₂ (%)	1.00	0.10	Rb	90	7
Na ₂ O (%)	3.50	0.06	Sr	290	30
MgO (%)	3.17	0.06	Y	150	30
Al ₂ O ₃ (%)	15.97	0.14	Zr	190	20
SiO ₂ (%)	48.80	0.30	Nb	12	2
P ₂ O ₅ (%)	0.72	0.02	Mo	38	7
S (%)	0.15	0.01	Sn	4.0	0.9
K ₂ O (%)	2.79	0.06	Cs	5	2
CaO (%)	3.03	0.10	Ba (%)	0.11	0.01
Sc	32	6	La	80	20
TiO ₂ (%)	0.98	0.01	Ce	100	30
V	150	20	Sm	20	5
Cr	90	10	Yb	15	5
MnO (%)	1.77	0.03	Au	0.005	0.003
FeO (%)	0.20	0.06	Pb	62	8
Fe ₂ O ₃ (%)	9.23	0.07	Th	14	2
Co	160	20	U	2.5	0.8
Ni	370	30	LOI (%)	9.3	0.3

Mineral composition:

Mineral	Percent	Mineral	Percent
Accessory minerals	2 - 3	Kaolinite (chlorite)	10 - 15
Amorphous phase, Fe, Mn	1 - 2	Magnetite	1 - 2
Amphibole	3 - 5	Montmorillonite	10 - 15
Feldspar	1 - 3	Plagioclase (bas.)	3 - 5
Phillipsite	1 - 2	Pyroxene	6 - 10
Galite	2 - 4	Quartz	25 - 30
Hydromica	10 - 15	Volcanic glass	5 - 10
Ilmenite	1 - 2		

SDO-9 (cont.)

Granulometric composition:

Fraction size (μm)	Percent
< 10	61
10 - 20	19
20 - 30	10
30 - 40	4
40 - 50	3
50 - 60	2
60 - 70	1
70 - 80	0
> 80	0

Order Information:

SDO-9 can be purchased for DM265 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1990?) Red clay (deep-water). CRM No. 5372-90 (SDO-9). Certificate. State University, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SDU-1

Dunite Rock Composition

Russian Federation Academy of Sciences (Russia)

Description:

This material was sampled in the coastal outcrop of Lake Baikal (Sakhjurty Settlement of the Olkhon region, Irkutsk area). This occurrence of dunites is located within the band of ultrabasic rocks of the Olkhon region which belong to the Baikal-Muya basitic-ultrabasic rock belt of the Baikal highland. The ultrabasic massifs consist of small blocks and lenses of ultramafic rocks occurring in highly metamorphic gneiss-carbonate formations of the Lower Proterozoic age. Rocks are dense, fine-grained, dark-colour with a light greenish hue. This material was prepared in 1988. It is also known as CRM No. 4233-88.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	2.0	0.3	Cr (%)	0.41	0.01
Na ₂ O (%)	0.035	0.005	MnO (%)	0.13	0.01
MgO (%)	41.86	0.28	Fe ₂ O ₃ (%)	8.91	0.07
Al ₂ O ₃ (%)	0.97	0.07	Co	120	10
SiO ₂ (%)	39.58	0.13	Ni (%)	0.22	0.01
K ₂ O (%)	0.010	0.001	Cu	33	4
CaO (%)	1.52	0.07	Zn	30	4
Sc	9	1	Ga	1.1	0.1
TiO ₂ (%)	0.018	0.002	Sr	18	3
V	33	5	LOI (%)	6.31	0.06

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
H ₂ O ⁻ (%)	0.4
H ₂ O ⁺ (%)	4.82
CO ₂ (%)	1.61
P ₂ O ₅ (%)	0.01
S (%)	0.041
FeO (%)	5.54

Mineral composition:

Mineral	Percent	Mineral	Percent
Amphibole	7.19 \pm 1.40	Ore	4.89 \pm 0.80
Carbonate	0.81 \pm 0.30	Orthopyroxene	2.42 \pm 1.22
Chlorite	2.82 \pm 0.85	Serpentine	19.14 \pm 6.19
Clinopyroxene	1.77 \pm 1.14	Talk	0.18 \pm 0.12
Olivine	60.77 \pm 6.52		

SDU-1 (cont.)

Granulometric composition:

Fraction size (µm)	Percent
80	0.03
-80 + 63	4.92
-63 + 50	12.70
-50 + 40	13.65
-40	68.70

Ore minerals include chrome spinelides and magnetites, the former often replaced by magnetite. Accessory minerals are single grains of sulphides (pyrrhotite, pyrite, chalcopyrite), limonite, zircon, rutile and apatite.

Order information:

SDU-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1988?) Dunite rock composition. CRM No. 4233-88 (SDU-1). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breiitländer, Hamm, Germany.)

SG-1a

Albitized Granite

Research Institute of Applied Physics (Russia)

Description:

The material for SG-1a was collected from the apogranitic massif confined to a dome-like structure of a large intrusion of Caledonian biotitic granites in Northern Kazakhstan. These are light-grey, in places pink, reddish or greenish fine-grained rocks of porphyry appearance. This material was prepared in 1984. It is also known as CRM No. 520-84n.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.21	0.04	Rb (%)	0.11	0.01
Li	390	20	Y	62	9
Be	10	1	Zr	690	70
C (%)	0.04	0.01	Nb	380	30
F (%)	0.30	0.03	Mo	1.0	0.1
Na ₂ O (%)	5.46	0.05	Ag	0.10	0.05
MgO (%)	0.05	0.01	Cd	0.20	0.05
Al ₂ O ₃ (%)	13.84	0.04	Sn	11	2
SiO ₂ (%)	73.36	0.08	Cs	12	1
P ₂ O ₅ (%)	0.013	0.003	Ba	19	4
S	130	50	La	32	8
K ₂ O (%)	4.14	0.06	Ce	62	6
CaO (%)	0.14	0.02	Pr	5	1
Sc	5	1	Nd	18	2
TiO ₂ (%)	0.072	0.005	Sm	5	2
V	5	1	Ho	1.5	0.3
Cr	12	3	Tm	1.1	0.3
MnO (%)	0.20	0.01	Yb	12	6
FeO (%)	1.41	0.05	Lu	1.9	0.5
Fe ₂ O ₃ (%)	2.23	0.05	Ta	24	4
Co	1.4	0.3	W	2.3	0.4
Ni	11	3	Pb	230	20
Cu	31	1	Th	130	10
Zn	270	30	U	63	4
Ga	40	3	TOC (%)	0.027	0.003
Ge	3.3	0.4	Trace		
Sr	20	3	oxides (%)	0.047	0.004

Information values ($\mu\text{g/g}$ dry weight unless noted):

B	3
C (%)	0.02
As	1
Sb	0.7
Eu	0.1
Gd	7
Tb	0.8
Dy	6
Er	6
Au	0.001
Bi	3

Mineral composition:

Mineral	Percent
Albite	15 - 65
Microcline	8 - 45
Quartz	12 - 40
Biotite	0 - 5
Others	0 - 3

Granulometric composition:

Fraction size (μm)	Percent
80 - 63	0.4
63 - 50	6.6
50 - 40	8.7
< 40	84.3

Order Information:

SG-1a can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1984?) Albitized granite CRM No. 520-84n. Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SG-3

Alkaline Aegpaitc Granite

Russian Federation Academy of Sciences (Russia)

Description:

The alkaline aegpaitic granite for this CRM was collected from the main phase rocks, the Khan-Bogda massif of aegpaitic granites in Mongolia. These are median- and coarse-grained alkaline aegirineriebeckite granite of a compact structure and idiomorphic-grained texture. This material was prepared in 1985. It is also known as CRM No. 3333-85.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	52	4	Ga	2.2	0.4
Be	5	1	Pb	140	10
B	11	3	Sr	8	2
F	620	50	Y	60	12
Na ₂ O (%)	4.24	0.05	Zr	470	50
MgO (%)	0.10	0.02	Nb	17	2
Al ₂ O ₃ (%)	10.64	0.07	Mo	1.7	0.4
SiO ₂ (%)	74.76	0.15	Sn	5	1
P ₂ O ₅ (%)	0.024	0.003	Cs	4.5	0.5
K ₂ O (%)	4.64	0.06	Ba	90	20
CaO (%)	0.32	0.03	La	45	5
Sc	4.6	0.8	Ce	90	10
TiO ₂ (%)	0.26	0.01	Sm	10	1
V	6	1	Yb	7	1
Cr	31	3	Lu	0.9	0.2
MnO (%)	0.120	0.005	Hf	12	2
FeO (%)	1.61	0.06	Ta	1.1	0.2
Fe ₂ O ₃ (%)	4.50	0.07	Nd	50	10
Co	1.3	0.3	Pb	10	2
Ni	6	1	Eu	0.4	0.1
Cu	12	1	Tb	1.7	0.3
Zn	140	20	Th	8	1
Ga	27	4	U	1.8	0.3
			LOI (%)	0.27	0.02

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁺ (%)	0.30	Ag	0.06
S (%)	0.016	Sb	0.5
As	4	Dy	10
Br	6	W	1.1

SG-3 (cont.)

Mineral composition:

Mineral	Percent
Quartz	28 - 40
K-feldspar	50 - 65
Albite	1 - 3.5
Amphibole	1.8 - 3.6
Pyroxene	1 - 3
Accessory minerals	0.5 - 1.5

Granulometric composition:

Fraction size (μm)	Percent
-80 + 60	2.2
-60 + 50	3.6
-50 + 40	5.5
-40	88.7

Order information:

SG-3 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiöländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Alkaline agpaite granite CRM No. 3333-85 (SG-3). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breiöländer, Hamm, Germany.)

SGD-1a

Essexitic Gabbro

Research Institute of Applied Physics (Russia)

Description:

The essexitic gabbro for this CRM was sampled from the Dalbyrkey massif situated within the Uruljunguy-Urovsky volcanic zone of the Akatuy magmatic complex in East Trans-Baikal area. This is a coarse-grained rock of gabbro texture, partially altered by secondary processes. This material was prepared in 1984. It is also known as CRM No. 521-84n.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.83	0.11	Pb	73	4
Li	14	3	Y	30	4
Be	20	0.4	Zr	240	20
B	16	2	Nb	8	1
C (%)	0.06	0.01	Mo	1.5	0.5
F	1200	100	Ag	0.10	0.05
Na ₂ O (%)	2.82	0.04	Sn	3.7	0.6
MgO (%)	7.0	0.1	Cs	3.8	0.4
Al ₂ O ₃ (%)	14.88	0.07	Ba (%)	0.13	0.01
SiO ₂ (%)	46.4	0.1	La	80	20
P ₂ O ₅ (%)	1.01	0.03	Ce	150	10
S	140	60	Pr	15	5
K ₂ O (%)	2.96	0.05	Nd	70	10
CaO (%)	10.97	0.08	Sm	17	1
Sc	27	3	Eu	5	1
TiO ₂ (%)	1.71	0.04	Gd	10	3
V	240	20	Tb	1.4	0.2
Cr	55	4	Dy	6	1
MnO (%)	0.17	0.01	Ho	1.2	0.3
FeO (%)	6.86	0.06	Er	3.2	0.7
Fe ₂ O ₃ (%)	11.66	0.24	Tm	5	0.2
Co	40	5	Yb	2.9	5
Ni	50	5	Ta	1.1	0.4
Cu	68	7	W	1.0	0.1
Zn	120	10	Pb	17	2
As	1.8	0.2	Th	9	1
Ga	19	2	U	2.0	0.5
Ge	1.5	0.2	TOC (%)	0.035	0.003
Sr (%)	0.23	0.02	Trace oxides (%)	0.047	0.004

Information values ($\mu\text{g/g}$ dry weight):

Cl	0.022
Sb	1.5
Lu	0.3
Au	0.002

Mineral composition:

Mineral	Percent
Plagioclase	35 - 45
Olivine	3 - 8
Nepheline	4 - 7
Ore minerals	2 - 4
Monoclinic pyroxene	15 - 28
Potash feldspar	4 - 15
Biotite	2 - 10
Apatite	1 - 3
Others	3 - 8

Granulometric composition:

Fraction size (μm)	Percent
80 - 63	1.1
63 - 50	5.0
50 - 40	7.5
< 40	86.4

Order information:

SGD-1a can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1984?) Dolomitized limestone CRM No. 813 (GPOS301). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breiitländer, Hamm, Germany.)

SGH-1

Carbonate Silt (Background)

Russian Federation Academy of Sciences (Russia)

Description:

The carbonate silt with a background content of elements-admixtures was sampled from a stream of the Aldan region Yakutia. It consists of elastic material of rocks and minerals representing the hydrological network of the region. This material was prepared in 1985. It is also known as CRM No. 3131-85 and OOK0303.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	96	4	Co	21	2
Be	2.4	0.4	Ni	40	4
B	70	20	Cu	37	4
Na ₂ O (%)	0.53	0.02	Zn	50	10
MgO (%)	6.06	0.11	Ga	11	1
Al ₂ O ₃ (%)	9.48	0.14	Rb	61	3
SiO ₂ (%)	47.0	0.20	Sr (%)	0.025	0.004
P ₂ O ₅ (%)	0.13	0.01	Y	22	3
K ₂ O (%)	2.26	0.07	Zr	130	10
CaO (%)	7.76	0.10	Nb	11	1
Sc	11	2	Mo	2.4	0.4
TiO ₂ (%)	0.50	0.02	Sn	5	1
V	110	10	Cs	4	1
Cr	68	6	Ba (%)	0.062	0.003
MnO (%)	0.30	0.01	Pb	20	3
Fe ₂ O ₃ (%)	5.92	0.04	LOI (%)	20.10	0.13

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
S (%)	0.037
Ge	1.2
As	16
Ag	0.2
Cd	2.3
La	38
Ce	60
Yb	2.8

SGH-1 (cont.)

Mineral composition:

Mineral	Percent
Dolomite	25
Microcline	1
Quartz	24
Rock fragments	50

Granulometric composition:

Fraction size (μm)	Percent
+63	1.3
-63 + 50	1.1
-50	97.1

Order information:

SGH-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breidländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Carbonate silt (background) CRM No. 3131-85 (SGH-1). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breidländer, Hamm, Germany.)

SGH-3

Terrigenous Background Silt

Russian Federation Academy of Sciences (Russia)

Description:

Terrigenous background silt was sampled in the Oymyakon region, Yakutia. This sample consists of eluvial loose sediments (subsoil horizon) and clastic of rocks and minerals. This material was prepared in 1985. It is also known as CRM No. 3132-85 and OOK0301.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	71	4	Ni	72	5
Be	2.8	0.5	Cu	48	3
B	70	10	Zn	120	10
Na ₂ O (%)	1.61	0.05	Ga	16	2
MgO (%)	1.60	0.05	Ge	1.6	0.2
Al ₂ O ₃ (%)	16.46	0.19	Pb	77	5
SiO ₂ (%)	60.54	0.20	Sr	130	10
P ₂ O ₅ (%)	0.19	0.01	Y	30	3
K ₂ O (%)	2.43	0.08	Zr	220	10
CaO (%)	0.41	0.03	Nb	13	2
Sc	20	5	Mo	2.5	0.3
TiO ₂ (%)	0.98	0.03	Sn	3.9	0.5
V	180	20	Cs	4.1	0.5
Cr	140	10	Ba	570	40
MnO (%)	0.13	0.01	La	43	4
Fe ₂ O ₃ (%)	8.76	0.08	Yb	4.3	0.6
Co	30	4	Pb	23	3
			LOI (%)	6.78	0.12

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
S (%)	0.027
As	38
Ag	0.17
Cd	0.2
Sb	1.9
Ce	60

SGH-3 (cont.)

Mineral composition:

Mineral	Percent
Clastic rock	95
Anorthoclase	4.9
Quartz	0.1

Granulometric composition:

Fraction size (µm)	Percent
+63	2.6
-63 + 50	2.0
-50	95.4

Order information:

SGH-3 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breilnder.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Terrigenous background silt CRM No. 3132-85 (SGH-3). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breilnder, Hamm, Germany.)

SGH-5

Anomalous Silt

Russian Federation Academy of Sciences (Russia)

Description:

This CRM is a composite sample of river silts collected in the Aldan, Oymyakon and Tompon regions of Yakutia. It has high content of some elements-admixtures. The sample consists of elastic rocks and minerals. This material was prepared in 1985. It is also known as CRM No.3133-85 and OOK0302.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	37	3	Cu	190	10
Be	3.7	0.4	Zn	0.009	0.001
B	60	10	Ga	16	2
Na ₂ O (%)	2.33	0.06	Ge	1.4	0.2
MgO (%)	2.54	0.06	Pb	120	10
Al ₂ O ₃ (%)	14.40	0.11	Sr	280	30
SiO ₂ (%)	60.85	0.14	Y	26	6
P ₂ O ₅ (%)	0.18	0.01	Zr	230	20
K ₂ O (%)	3.56	0.09	Nb	17	4
CaO (%)	2.95	0.05	Mo	10	2
Sc	17	4	Sn	5	1
TiO ₂ (%)	0.62	0.01	Cs	5.8	0.6
V	110	10	Ba	910	70
Cr	88	6	La	61	4
MnO (%)	0.087	0.003	Ce	80	10
Fe ₂ O ₃ (%)	5.45	0.10	Yb	3.3	0.5
Co	13	1	Pb	58	5
Ni	36	3	LOI (%)	6.39	0.09

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
S	0.10
As	0.043
Ag	0.8
Cd	1.5
Sb	15

Mineral composition:

Mineral	Percent
Rock fragments	80
Quartz	15
Dolomite	5

Granulometric composition:

Fraction size (µm)	Percent
+63	0.6
-63 + 50	0.4
-50	99.0

Order Information:

SGH-5 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breittländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Anomalous silt CRM No. 3133-85 (SGH-5). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breittländer, Hamm, Germany.)

SGHM-1

Carbonate-Silicate Loose Sediments

Russian Federation Academy of Sciences (Russia)

Description:

The material for this CRM was collected from loose formations of the subsoil horizon in the Aldan region, Yakutia. It is a fine sand - clay fraction of eluvial-deluvial deposits. This material was prepared in 1986 and is also known as CRM No. 3483-86 and OOK0202.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	100	10	Fe ₂ O ₃ (%)	4.62	0.06
Be	2.0	0.4	Co	14	2
Na ₂ O (%)	0.87	0.05	Ni	33	6
MgO (%)	5.82	0.10	Cu	48	5
Al ₂ O ₃ (%)	11.60	0.13	Zn	50	10
SiO ₂ (%)	45.59	0.29	Ga	12	2
P ₂ O ₅ (%)	0.15	0.01	Pb	90	10
S (%)	0.05	0.01	Sr (%)	0.030	0.004
K ₂ O (%)	2.96	0.07	Y	23	7
CaO (%)	7.05	0.20	Zr	140	20
Sc	9	2	Nb	12	2
TiO ₂ (%)	0.63	0.04	Sn	3.7	0.5
V	90	10	Ba (%)	0.047	0.007
Cr	66	7	La	32	2
MnO (%)	0.073	0.004	Yb	2.5	0.3
			Pb	16	3

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
B	90
FeO (%)	1.3
As	40
Mo	1.5
Ag	0.5
Cd	2
LOI (%)	20.33

SGHM-1 (cont.)

Mineral composition:

Mineral	Percent
Accessory minerals	1 - 2
Calcite	1 - 2
Clay particles	10 - 15
Coaly substance	3 - 5
Dolomite	15 - 20
Feldspar	15 - 20
Magnesite	1 - 2
Magnetite	2 - 4
Micas	3 - 5
Pyroxenes	2 - 4
Quartz	30 - 35

Granulometric composition:

Fraction size (µm)	Percent
+80	0.02
- 80 + 60	0.60
- 60 + 50	2.02
- 50 + 40	2.88
- 40	94.48

Order information:

SGHM-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1986?) Carbonate-silicate loose sediments. CRM No. 3483-86 (SGHM-1). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SGHM-2

Alume-Silicate Loose Sediments

Russian Federation Academy of Sciences (Russia)

Description:

The material for this CRM was collected from loose formations of the subsoil horizon in the Oymyakon region, Yakutia. It is a fine sand-clay fraction of eluvial-deluvial deposits. This material was prepared in 1986 and is also known as CRM No. 3484-86 and OOK0203.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	60	5	Fe_2O_3 (%)	6.33	0.09
Be	2.3	0.4	Co	18	3
Na_2O (%)	1.37	0.05	Ni	58	3
MgO (%)	1.53	0.07	Cu	52	4
Al_2O_3 (%)	16.76	0.18	Zn	90	10
SiO_2 (%)	51.95	0.28	Ga	17	2
P_2O_5 (%)	0.18	0.01	Pb	100	10
S (%)	0.05	0.01	Sr	200	20
K_2O (%)	2.51	0.07	Y	30	10
CaO (%)	1.13	0.06	Nb	12	1
Sc	15	5	Sn	4.4	0.4
TiO_2 (%)	0.85	0.04	Ba	580	60
V	140	20	La	34	3
Cr	120	10	Yb	3.2	0.4
MnO (%)	0.071	0.002	Pb	16	3

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
B	80
FeO (%)	2.2
Fe_2O_3 (%)	3.5
As	40
Zr	180
Mo	3
Ag	0.7
Cd	1.9
Au	0.025
LOI (%)	17.17

SGHM-2 (cont.)

Mineral composition:

Mineral	Percent
Clay particles	10 - 15
Coaly substance	6 - 8
Dolomite	10 - 15
Feldspar	20 - 25
Micas	5 - 8
Quartz	30 - 35
Siderite	2 - 4

Granulometric composition:

Fraction size (µm)	Percent
+80	0.02
-80 + 60	0.86
-60 + 50	3.90
-50 + 40	7.40
-40	87.82

Order Information:

SGHM-2 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1986?) Alum-silicate loose sediments. CRM No. 3484-86 (SGHM-2). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SGHM-3

Carbonate-Silicate Loose Sediments

Russian Federation Academy of Sciences (Russia)

Description:

This CRM is a composite sample of 3 portions of loose sediments from the subsoil horizon collected in the Aldan region, Yakutia. It is a fine sand-clay fraction of eluvial-deluvial sediments having high content of some element-admixtures. This material was prepared in 1986 and is also known as CRM No. 3485-86 and OOK0204.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	20	2	Co	11	2
Be	2.5	0.5	Ni	19	3
Na ₂ O (%)	0.61	0.04	Cu	260	20
MgO (%)	11.70	0.14	Zn	140	10
Al ₂ O ₃ (%)	5.03	0.10	Ga	9	2
SiO ₂ (%)	25.07	0.29	Pb	40	10
P ₂ O ₅ (%)	1.82	0.05	Sr	180	20
S (%)	0.05	0.01	Y	40	10
K ₂ O (%)	1.13	0.04	Zr	70	10
CaO (%)	17.76	0.22	Mo	29	3
Sc	9	2	Ag	2.6	0.4
TiO ₂ (%)	0.27	0.01	Sn	4	1
V	70	10	Ba	350	60
Cr	28	3	La	260	20
MnO (%)	0.50	0.03	Yb	3.3	0.5
Fe ₂ O ₃ (%)	10.59	0.20	Au	1.3	0.1

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
As	90
FeO (%)	0.24
Fe ₂ O ₃ (%)	10.2
B	14
Nb	7
Cd	3.5
Pb	200
Bi	10
LOI (%)	25.14

SGHM-3 (cont.)

Mineral composition:

Mineral	Percent
Accessory minerals	1 - 2
Apatite	2 - 4
Calcite	25 - 30
Dolomite	20 - 25
Feldspar	15 - 20
Ferric hydroxides	1 - 2
Goethite hydrogoethite	4 - 6
Magnesite	10 - 15
Magnetite	1 - 2
Micas	1 - 2
Pyroxenes	2 - 4
Quartz	10 - 15

Granulometric composition:

Fraction size (µm)	Percent
+80	0.01
-80 + 60	0.23
-60 + 50	1.82
-50 + 40	2.94
-40	95.00

Order information:

SGHM-3 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1986?) Carbonate-silicate loose sediments. CRM No. 3485-86 (SGHM-3). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breiitländer, Hamm, Germany.)

SGHM-4

Aluminosilicate Loose Sediments

Russian Federation Academy of Sciences (Russia)

Description:

This CRM is a composite sample of two portions of loose sediments from a subsoil horizon. Collected in the Oimyakon region of Yakutia, it is a fine sand-clay fraction of eluvial-deluvial deposits having high content of some element admixtures. This material was prepared in 1986 and is also known as CRM No. 3486-86 and OOK0201.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	150	10	Co	9	2
Be	3.6	0.6	Ni	25	2
B	160	20	Cu	250	30
Na ₂ O (%)	1.67	0.05	Zn	390	40
MgO (%)	0.48	0.03	Ga	16	2
Al ₂ O ₃ (%)	11.29	0.12	Pb	190	30
SiO ₂ (%)	70.54	0.27	Sr	200	30
P ₂ O ₅ (%)	0.28	0.02	Y	16	6
S (%)	0.43	0.03	Zr	210	20
K ₂ O (%)	2.21	0.04	Nb	17	4
CaO (%)	0.52	0.04	Cd	9	1
Sc	8	2	Sn	400	100
TiO ₂ (%)	0.62	0.03	Sb	170	30
V	60	10	Ba	390	60
Cr	76	5	La	32	4
MnO (%)	0.11	0.01	Yb	2.4	0.2
Fe ₂ O ₃ (%)	5.24	0.07	Pb	110	10

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
FeO (%)	1.3
Fe ₂ O ₃ (%)	3.5
As (%)	0.7
Mo	3
Ag	34
Cs	18
Au	1.1
Bi	70
LOI (%)	5.44

SGHM-4 (cont.)

Mineral composition:

Mineral	Percent
Accessory minerals	2 - 4
Feldspar	35 - 45
Micas	2 - 6
Quartz	45 - 55

Granulometric composition:

Fraction size (µm)	Percent
+80	0.03
-80 + 60	0.28
-60 + 50	0.87
-50 + 40	2.27
-40	96.55

Order information:

SGHM-4 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1986?) Aluminosilicate loose sediments. CRM No. 3486-86 (SGHM-4). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SGR-1

Green River Shale

US Geological Survey (USA)

Description:

Values for elemental concentrations have been calculated by Abbey (1982, 1983), Gladney and Goode (1981) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
H (%)	3.04	-	Pd (ng/g)	5.2	2.4
Li	147	26	Cd (ng/g)	930	140
Be	1.06	0.16	In (ng/g)	96	-
B	54	3	Sn	1.9	0.6
C	31600	3000	Sb	3.4	0.5
F	1960	240	Te (ng/g)	248	-
Na (%)	2.22	0.10	Cs	5.2	0.3
Mg (%)	2.68	0.12	Ba	290	40
Al (%)	3.45	0.11	La	20.3	1.8
Si (%)	13.19	0.10	Ce	36	4
P	1430	290	Pr	3.9	0.3
S	15300	1100	Nd	15.5	1.7
Cl	32	12	Sm	2.7	0.3
K (%)	1.38	0.08	Eu	0.56	0.09
Ca (%)	5.99	0.12	Gd	2.0	0.4
Sc	4.6	0.7	Tb	0.36	0.04
Ti	1520	150	Dy	1.9	0.3
V	128	6	Ho	0.38	0.05
Cr	32	3	Er	1.11	0.14
Mn	267	34	Tm (ng/g)	170	30
Fe (%)	2.12	0.10	Yb	0.94	0.16
Co	11.8	1.5	Lu (ng/g)	140	30
Ni	29	5	Hf	1.39	0.14
Cu	66	9	Ta	0.42	0.12
Zn	74	9	W	2.57	0.06
Ga	11	2	Re	<10	-
Ge	1.6	-	Os	<22	-
As	67	5	Ir	<6.8	-
Se (ng/g)	3500	280	Pt (ng/g)	3.0	-
Rb	83	6	Au (ng/g)	8.9	2.1
Sr	420	30	Hg (ng/g)	313	-
Y	13.0	1.7	Tl (ng/g)	330	-
Zr	53	12	Pb	38	4
Nb	5.2	1.5	Bi (ng/g)	940	80
Mo	35.1	0.9	Th	4.78	0.21
Ru	<0.46	-	U	5.4	0.4
Rh (ng/g)	<0.1	-			

SGR-1 (cont.)

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
H ₂ O ⁻	0.45	-	CaO	8.38	0.17
CO ₂	11.58	1.10	TiO ₂	0.264	0.025
Na ₂ O	2.99	0.13	MnO	0.034	0.004
MgO	4.44	0.20	FeO	1.41	-
Al ₂ O ₃	6.52	0.21	Fe ₂ O ₃	1.46	-
SiO ₂	28.24	0.21	Cl	0.003	1.10
P ₂ O ₃	0.328	0.066	F	0.196	0.024
K ₂ O	1.66	0.10	S	1.53	0.11

Order Information:

SGR-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

SI-2

Dolomitic Limestone

Russian Federation Academy of Sciences (Russia)

Description:

This CRM is dolomitized limestone from the Upper Proterozoic rocks of the Timansky ridge, Komi Autonomous Republic. This stromatolitic limestone is partially dolomitized and marbled, contains admixtures of quartz, cherty, clayey and micaceous minerals. The rock has a laminated, spotted and banded structure, and pelitomorphic, in place granular texture. This material was prepared in 1985 and is also known as CRM No. 3193-85 and GPOS302.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Na ₂ O (%)	0.48	0.05	Fe ₂ O ₃ (%)	2.48	0.08
MgO (%)	6.04	0.16	Co	2.2	0.2
Al ₂ O ₃ (%)	1.87	0.07	Ni	7	2
SiO ₂ (%)	12.35	0.09	Cu	4	1
P ₂ O ₅ (%)	0.027	0.003	Zn	25	5
K ₂ O (%)	0.49	0.01	Ge	18	1
CaO (%)	38.48	0.41	Rb	15	1
TiO ₂ (%)	0.09	0.01	Sr	50	10
V	24	5	Zr	26	3
Cr	13	3	Ba	60	10
MnO (%)	0.28	0.02	Pb	16	2
FeO (%)	1.89	0.06	LOI (%)	37.46	0.08

Information values ($\mu\text{g/g}$ dry weight):

Component	Value
Be	10
B	10
Sc	2
Y	9
Nb	8
Cs	0.7
La	7
Yb	1
Lu	0.1
Th	2
U	1

SI-2 (cont.)

Mineral composition:

Mineral	Percent
Accessory minerals	2 - 4
Feldspar	35 - 45
Micas	2 - 6
Quartz	45 - 55

Granulometric composition:

Fraction size (μm)	Percent
+80	0.03
-80 + 60	0.28
-60 + 50	0.87
-50 + 40	2.27
-40	96.55

Order information:

SI-2 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Dolomitic limestone. CRM No. 3193-85 (SI-2). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SI-3

Feldspar-bearing Dolomite

Russian Federation Academy of Sciences (Russia)

Description:

This CRM is feldspar-bearing dolomite is sampled from the core material of the Upper Proterozoic metamorphic formations of the Timan ridge Komi Autonomous Republic. Macroscopically, these are pink, pink-grey with a brownish hue marbled rocks having a homogenous or fine-banded structure and medium-grained texture passing into porphyry- and heterogranoblastic one. This material was prepared in 1985 and is also known as CRM No. 3192-85 and GPOS303.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Na ₂ O (%)	1.39	0.05	Co	12	3
MgO (%)	12.85	0.22	Ni	17	4
Al ₂ O ₃ (%)	5.55	0.11	Cu	27	3
SiO ₂ (%)	19.81	0.09	Zn	21	4
P ₂ O ₅ (%)	0.063	0.002	Pb	58	3
K ₂ O (%)	2.74	0.04	Sr	46	4
CaO (%)	21.46	0.27	Zr	80	10
TiO ₂ (%)	0.29	0.02	Ba	410	60
Cr	30	4	Pb	10	2
MnO (%)	0.29	0.01	Th	16	3
FeO (%)	1.82	0.15	LOI (%)	31.87	80
Fe ₂ O ₃ (%) tot	3.19	0.15			

Information values ($\mu\text{g/g}$ dry weight):

Component	Value
Be	1.5
B	15
Sc	10
V	40
Y	20
La	13
Yb	2.5

Mineral composition:

Mineral	Percent
Aegirine	0.3
Albite	13.7
Calcite	0.6
Dolomite	53.8
Ferric oxides	1.0
Hydromicas	2.3
K-feldspar	21.6
Quartz	1.5
Rutile	0.4
Sericite	1.2

Granulometric composition:

Fraction size (µm)	Percent
+80	0.4
-80 + 60	3.9
-60 + 50	5.2
-50 + 40	4.7
-40	85.8

The rock contains accessory quantities sulphides, apatite, zircon, tourmaline, sphene, limonite, and adular.

Order information:

SI-3 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breithländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Feldspar-bearing dolomite. CRM No. 3192-85 (SI-3). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breithländer, Hamm, Germany.)

SKD-1

Quartz Diorite

State University of Irkutsk (Russia)

Description:

This material was prepared in 1991 and is also known as CRM No. 6103-91.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	30	4	Cu	39	6
Be	2.4	0.4	Zn	71	8
B	46	8	Ga	18	2
F (%)	0.071	0.008	Pb	83	9
Na ₂ O (%)	3.57	0.15	Sr (%)	0.041	0.005
MgO (%)	3.05	0.12	Y	21	4
Al ₂ O ₃ (%)	16.56	0.31	Zr	173	20
SiO ₂ (%)	60.45	0.25	Nb	12	2
P ₂ O ₅ (%)	0.17	0.01	Sn	4.3	0.8
K ₂ O (%)	2.98	0.11	Cs	2.9	0.5
CaO (%)	4.84	0.20	Ba (%)	0.072	0.012
Sc	15	2	La	27	5
TiO ₂ (%)	0.86	0.05	Ce	46	9
V	96	10	Nd	24	4
Cr	58	6	Eu	1.3	0.2
MnO (%)	0.086	0.005	Yb	2.1	0.4
FeO (%)	5.55	0.12	Lu	0.3	0.06
Fe ₂ O ₃ (%)	3.79	0.15	Pb	24	3
Co	17	2	Th	6.8	1.0
Ni	33	3	LOI (%)	1.59	0.07

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁺ (%)	1.6	Pr	4.7
H ₂ O ⁻	0.14	Gd	3.9
CO ₂ (%)	0.18	Tb	0.87
S (%)	0.013	Dy	4
Cl	110	Hb	0.6
Ge	1.4	Er	2
As	6	Tm	0.3
Mo	0.8	Hf	5
Ag	0.075	Ta	0.8
Sb	0.8	U	2

SKD-1 (cont.)

Order Information:

SKD-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breittländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1991?) Quartz diorite. CRM No. 6103-91 (SKD-1). Certificate. State University, Irkutsk, Russia. (Available from Breittländer, Hamm, Germany.)

SpS

Glass Sand

Institute of Mineral Raw Materials (Czech Republic)

Description:

The approximate composition of this material is 99.5% quartz and 0.4% kaolinite with trace levels of heavy minerals such as tourmaline, leucoxene, rutile, and others. The granulometric composition is: larger than 0.090 mm, 2.8%; 0.071 to 0.090 mm, 4.9%; 0.063 to 0.071 mm, 5.3%; 0.040 to 0.063 mm, 9.8%; 0.025 to 0.040 mm, 41.6%; and smaller than 0.025 mm, 35.6%. The material was prepared in 1968.

Attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Stand. dev. (%)	Component	Mean	Stand. dev. (%)
Li	5.3	0.8	TiO ₂ (%)	0.035	0.003
Na ₂ O (%)	0.045	0.005	Fe ₂ O ₃ (%)	0.037	0.002
MgO (%)	0.0071	0.0006	Co	0.48	0.08
Al ₂ O ₃ (%)	0.248	0.013	La	2.42	0.29
SiO ₂ (%)	99.32	0.07	Ce	6.0	1.0
K ₂ O (%)	0.058	0.006	Eu	0.066	0.011
CaO (%)	0.029	0.006	Th	1.04	0.13
Sc	0.27	0.03	LOI (%)	0.167	0.016

Non-attested composition ($\mu\text{g/g}$ dry weight unless noted):

Component	Mean	Component	Mean	Component	Mean
B	7.3	Sr	3.8	Nd	2.75
P	24.7	Y	7	Sm	0.60
V	1.2	Zr	95	Tb	0.10
Cr	0.95	Nb	0.8	Yb	0.21
Mn	5.8	Ag	<1	Lu	0.052
Ni	2.8	Cd	3.5	Hf	1.7
Cu	9	Sn	4	Ta	0.108
Zn	73	Sb	0.2	W	0.2
Ga	1.3	Cs	0.11	Pb	6.4
Pb	2.3	Ba	29	U	0.43

Order Information:

SpS can be purchased for DM295 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

Reference:

Institute of Mineral Raw Materials (1982?) Glass sand SpS. Certificate. ST SEV 3534-82. Institute of Mineral Raw Materials, Kutná Hora, Czech Republic. (Available from Breitländer, Hamm, Germany.)

SRM 1c

Argillaceous Limestone

National Institute of Standards and Technology (USA)

Description:

The material was provided by Lone Star Industries, Texas. It was ground, sieved and blended at NIST.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Na ₂ O	0.02	0.01	CaO	50.3	0.3
MgO	0.42	0.04	TiO ₂	0.07	0.01
Al ₂ O ₃	1.30	0.03	MnO	0.025	0.005
SiO ₂	6.84	0.08	Fe ₂ O ₃	0.55	0.03
P ₂ O ₅	0.04	0.01	SrO	0.030	0.005
K ₂ O	0.28	0.01			

Order Information:

SRM 1c can be purchased for US\$108 per unit (50 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1990) SRM 1c. Argillaceous limestone. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 69b

Bauxite (Arkansas)

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder with a nominal particle size of <0.08 mm, and is intended for use primarily in evaluating chemical and instrumental methods of analysis. It is 30% kaolinite, 60% gibbsite and 10% siderite.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
MgO	0.085	0.008	TiO ₂	1.90	0.05
Al ₂ O ₃	48.8	0.2	V ₂ O ₅	0.028	0.003
SiO ₂	13.43	0.10	Cr ₂ O ₃	0.011	0.002
P ₂ O ₅	0.118	0.004	MnO	0.110	0.005
SO ₃	0.551	0.006	Fe ₂ O ₃	7.14	0.12
K ₂ O	0.068	0.009	ZrO	0.0035	0.0005
CaO	0.13	0.02	ZrO ₂	0.29	0.07

Order Information:

SRM 69b can be purchased for US\$125 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 69b. Bauxite (Arkansas). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 81a

Glass Sand

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder, 95% of the particles are $< 106 \mu\text{m}$.

Recommended concentrations (percent dry weight unless noted):

Component	Value	Range
Al_2O_3	0.66	0.62 - 0.69
TiO_2	0.12	0.10 - 0.14
Cr_2O_3 ($\mu\text{g/g}$)	46	33 - 58
Fe_2O_3	0.082	0.075 - 0.089
ZrO_2	0.034	0.025 - 0.042

Order Information:

SRM 81a can be purchased for US\$163 per unit (75 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1978) SRM 81a. Glass sand. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 88b

Dolomitic Limestone

National Institute of Standards and Technology (USA)

Description:

SRM 88b is a powdered dolomitic limestone that has been crushed and passed through a No. 60 sieve (nominal sieve opening of 250 μm). This material was collected near Skokie, Illinois, USA.

Certified concentrations (percent dry weight):

Oxide	Value	Uncertainty (\pm)	Oxide	Value	Uncertainty (\pm)
CO_2	46.37	0.12	K_2O	0.1030	0.0024
Na_2O	0.0290	0.0007	CaO	29.95	0.05
MgO	21.03	0.07	MnO	0.0160	0.0012
Al_2O_3	0.336	0.013	Fe_2O_3	0.277	0.002
SiO_2	1.13	0.02	SrO	0.0076	0.0003
P_2O_5	0.0044	0.0003			

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Oxide	Value	Oxide	Value
Sc_2O_3	0.56	CeO_2	4.7
TiO_2 (%)	0.016	Eu_2O_3	0.15
Cr_2O	3.4	HfO_2	0.16
CoO	1.3	ThO_2	0.35
Cs_2O	0.17		

Order Information:

SRM 88b can be purchased for US\$190 per unit (75-g bottle). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1994) SRM 88b. Dolomitic limestone. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 97b

Flint Clay

National Institute of Standards and Technology (USA)

Description:

SRM 97b is a finely powdered flint clay obtained from a stock pile near the Harbison-Walker Refractories Co. Mine on Anderson Creek, Pike Township, Clearfield County, Pennsylvania, USA. Approximately 220 kg of flint clay were air dried and processed by the same method used to prepare US Geological Survey rock standards. After processing, the material was delivered to NIST where it was again mixed and bottled.

Certified concentrations (percent dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Li	0.055	0.001	Ca	0.0249	0.0026
Na	0.0492	0.0023	Ti	1.43	0.04
Mg	0.113	0.002	Cr	0.0227	0.0012
Al	20.76	0.15	Mn	0.0047	0.0005
Si	19.81	0.04	Fe	0.831	0.008
K	0.513	0.023	Sr	0.0084	0.0002

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value
P (%)	0.02	Cs	3.4
Sc	22	Ba (%)	0.018
Co	3.8	Sb	2.2
Zn	87	Eu	0.84
Pb	33	Hf	13
Zr (%)	0.05	Th	36

Order Information:

SRM 97b can be purchased for US\$249 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1988) SRM 97b. Flint clay. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 98b

Plastic Clay

National Institute of Standards and Technology (USA)

Description:

SRM 98b is a finely powdered clay obtained from the underclay of the Clarion coal bed at the Harbison-Walker Refractories Co. plant at Clearfield, Clearfield County, Pennsylvania, USA. Approximately 220 kg of plastic clay were air dried and processed by the same method used to prepare US Geological Survey rock standards. After processing, the material was delivered to NIST where it was again mixed and bottled.

Certified concentrations (percent dry weight):

Element	Value	Uncertainty (\pm)	Element	Value	Uncertainty (\pm)
Li	0.0215	0.0003	Ca	0.0759	0.0035
Na	0.1496	0.0066	Ti	0.809	0.012
Mg	0.358	0.012	Cr	0.0119	0.0005
Al	14.30	0.20	Mn	0.0116	0.0005
Si	26.65	0.16	Fe	1.18	0.01
K	2.81	0.07	Sr	0.0189	0.0008

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value
P (%)	0.03	Sb	1.6
Sc	22	Cs	16.5
Co	16.3	Ba (%)	0.07
Zn (%)	0.011	Eu	1.3
Rb (%)	0.018	Hf	7.2
Zr (%)	0.022	Th	21

Order Information:

SRM 98b can be purchased for US\$249 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1988) SRM 98b. Plastic clay. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 120c

Florida Phosphate Rock

National Institute of Standards and Technology (USA)

Description:

The material for this SRM was ground and blended. Approximately 70% passed through a 75 μm (200 mesh) screen). Method dependent concentrations are also reported using the procedures of the Association of Florida Phosphate Chemists.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Na_2O	0.52	0.02	V_2O_3	0.016	0.002
Al_2O_3	1.30	0.04	MnO	0.027	0.002
K_2O	0.147	0.004	Fe_2O_3	1.08	0.03
TiO_2	0.103	0.006	U_3O_8	0.0135	0.0002

Noncertified concentrations (percent):

Component	Value	Component	Value
S (total)	0.37	As_2O_3	0.0009
Cr_2O_3	0.01	SrO	0.1
CoO	0.001	PbO	0.003
NiO	0.004	MoO_3	0.002
CuO	0.0016	Eu_2O_3	0.0005
ZrO	0.009		

Order information:

SRM 120c can be purchased for US\$151 (90 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1988) SRM 120c. Florida phosphate rock. Certificate of Analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 278

Obsidian Rock

National Institute of Standards and Technology (USA)

Description:

Obsidian rock from Clear Lake, Newberry Crater, Oregon, was crushed, ground, sieved to <200 mesh, and mixed in a cone blender to ensure homogeneity. SRM 278, a natural glass, is hygroscopic and contains water that cannot be driven off by drying at low temperatures.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Na ₂ O (%)	4.84	0.05	Fe ₂ O ₃ (%)	2.04	0.02
P ₂ O ₅ (%)	0.036	0.003	Ni	3.6	0.3
Al ₂ O ₃ (%)	14.15	0.15	Cu	5.9	0.2
SiO ₂ (%)	73.05	0.13	Pb	127.5	0.3
K ₂ O (%)	4.16	0.02	Sr	63.5	0.1
CaO (%)	0.983	0.002	Tl	0.54	0.04
TiO ₂ (%)	0.245	0.007	Pb	16.4	16.4
MnO (%)	0.052	0.002	Th	12.4	0.3
FeO (%)	1.36	0.02	U	4.58	0.04

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
B	25	Ba	1140
C (%)	0.05	Ce	62.2
CO ₂ (%)	0.01	Eu	0.84
F (%)	0.05	Sm	5.7
MgO (%)	0.23	Gd	5.3
Sc	5.1	Tb	1.0
Cr	6.1	Yb	4.5
Co	1.5	Lu	0.73
Zn	55	Hf	8.4
Sb	1.5	Ta	1.2
Cs	5.5		

Order information:

SRM 278 can be purchased for US\$209 (35 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1992) Certificate, SRM 278, Obsidian rock. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 600

Bauxite (Australian-Darling Range)

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder with a nominal particle size of <0.08 mm, and is intended for use primarily in evaluating chemical and instrumental methods of analysis.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Na ₂ O	0.022	0.007	TiO ₂	1.31	0.04
MgO	0.05	0.01	V ₂ O ₅	0.060	0.007
Al ₂ O ₃	40.0	0.4	Cr ₂ O ₃	0.024	0.004
SiO ₂	20.3	0.4	MnO	0.013	0.004
P ₂ O ₅	0.039	0.007	Fe ₂ O ₃	17.0	0.3
SO ₃	0.155	0.006	ZrO	0.003	0.002
K ₂ O	0.23	0.02	ZrO ₂	0.060	0.009
CaO	0.22	0.02			

Order Information:

SRM 600 can be purchased for US\$125 per unit (90 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 600. Bauxite (Australian-Darling Range). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 670

Rutile

National Institute of Standards and Technology (USA)

Description:

This SRM was sieved and blended at NIST.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)
SiO ₂	0.51	0.03
TiO ₂	96.16	0.12
V ₂ O ₅	0.66	0.05
Cr ₂ O ₃	0.23	0.02
Fe ₂ O ₃	0.86	0.05
ZrO ₂	0.84	0.05

Order Information:

SRM 670 can be purchased for US\$131 per unit (90 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 670. Rutile. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 688

Basalt Rock

National Institute of Standards and Technology (USA)

Description:

SRM 278 is a finely powdered basalt rock obtained from a Cenozoic basalt flow near Jackpot, Nevada, USA. Approximately 600 lbs. of basalt rock were crushed, ground and sieved to <200 mesh. The material was mixed in a cone blender to ensure homogeneity.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
Na ₂ O (%)	2.15	0.03	MnO (%)	0.167	0.002
Al ₂ O ₃ (%)	17.36	0.09	Fe ₂ O ₃ (%)	10.35	0.04
SiO ₂ (%)	48.4	0.1	Rb	1.91	0.01
P ₂ O ₅ (%)	0.134	0.003	Sr	169.2	0.7
K ₂ O (%)	0.187	0.008	Pb	3.3	0.2
TiO ₂ (%)	1.17	0.01	Th	0.33	0.02
Cr	332	9			

Noncertified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
F (%)	0.02	Ba	200
CO ₂ (%)	0.05	Ce	13.3
MgO (%)	8.4	Sm	2.79
CaO (%)	12.17	Eu	1.07
Sc	38.1	Tb	0.448
V	250	Yb	2.09
Co	49.7	Lu	0.34
Ni	150	Hf	1.6
Cu	96	U	0.37
Zn	58.0		

Order information:

SRM 688 can be purchased for US\$226 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1981) SRM 688. Basalt rock. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 694

Western Phosphate Rock

National Institute of Standards and Technology (USA)

Description:

The material for SRM 694 is from Dry Valley Ridge, southwestern Idaho, USA. The material was screened at NIST and the portion passing through a 150 μm sieve was retained, blended and bottled.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
F	3.2	0.1	CaO	43.6	0.4
Na ₂ O	0.86	0.04	V ₂ O ₅	0.31	0.07
MgO	0.33	0.02	MnO	0.0116	0.0012
Al ₂ O ₃	1.8	0.1	Fe ₂ O ₃	0.79	0.06
SiO ₂	11.2	0.4	CdO	0.015	0.003
P ₂ O ₅	30.2	0.1	U	0.01414	0.00006
K ₂ O	0.51	0.02			

Noncertified concentrations ($\mu\text{g/g}$):

Component	Value
TiO ₂	0.11
Cr ₂ O ₃	0.10
ZrO	0.19

Order information:

SRM 694 can be purchased for US\$127 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1993) SRM 694. Western phosphate rock. Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 696

Bauxite (Surinam)

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder with a nominal particle size of <0.08 mm, and is intended for use primarily in evaluating chemical and instrumental methods of analysis. It is 5% kaolinite, 80% gibbsite, 10% pyrite and 5% anatase.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
MgO	0.012	0.003	TiO ₂	2.64	0.05
Al ₂ O ₃	54.5	0.3	V ₂ O ₅	0.072	0.006
SiO ₂	3.79	0.10	Cr ₂ O ₃	0.047	0.003
P ₂ O ₅	0.050	0.006	MnO	0.004	0.001
SO ₃	0.150	0.002	Fe ₂ O ₃	8.70	0.10
K ₂ O	0.009	0.003	ZnO	0.0014	0.0007
CaO	0.018	0.002	ZrO ₂	0.14	0.02

Order Information:

SRM 696 can be purchased for US\$147 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 696. Bauxite (Surinam). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 697

Bauxite (Dominican)

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder with a nominal particle size of <0.08 mm, and is intended for use primarily in evaluating chemical and instrumental methods of analysis. It is 15% kaolinite, 50% gibbsite, 10% boehmite, 20% hematite and 5% anatase.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
MgO	0.18	0.02	TiO ₂	2.52	0.05
Al ₂ O ₃	45.8	0.2	V ₂ O ₅	0.063	0.005
SiO ₂	6.81	0.07	Cr ₂ O ₃	0.100	0.005
P ₂ O ₅	0.97	0.06	MnO	0.41	0.03
SO ₃	0.0770	0.0018	Fe ₂ O ₃	20.0	0.2
K ₂ O	0.062	0.007	ZnO	0.037	0.003
CaO	0.71	0.03	ZrO ₂	0.065	0.007

Order Information:

SRM 697 can be purchased for US\$147 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 697. Bauxite (Dominican). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SRM 698

Bauxite (Jamaican)

National Institute of Standards and Technology (USA)

Description:

This SRM is a fine powder with a nominal particle size of <0.08 mm, and is intended for use primarily in evaluating chemical and instrumental methods of analysis. It is 75% gibbsite, 20% hematite and 5% anatase.

Certified concentrations (percent):

Component	Value	Uncertainty (\pm)	Component	Value	Uncertainty (\pm)
MgO	0.058	0.008	TiO ₂	2.38	0.07
Al ₂ O ₃	48.2	0.4	V ₂ O ₅	0.064	0.005
SiO ₂	0.69	0.03	Cr ₂ O ₃	0.080	0.006
P ₂ O ₅	0.37	0.01	MnO	0.38	0.03
SO ₃	0.143	0.004	Fe ₂ O ₃	19.6	0.2
K ₂ O	0.010	0.002	ZnO	0.029	0.002
CaO	0.62	0.02	ZrO ₂	0.061	0.009

Order Information:

SRM 698 can be purchased for US\$147 per unit (60 g). Price subject to change without notice. Please contact NIST.

Reference:

National Institute of Standards and Technology (1991) SRM 698. Bauxite (Jamaican). Certificate of analysis. National Institute of Standards and Technology, Gaithersburg, MD, USA.

SSL-1

Metamorphic Schist

Russian Federation Academy of Sciences (Russia)

Description:

The metamorphic schist for this CRM was sampled from the Upper Proterozoic outcrop of the Timan Ridge, Komi Autonomous Republic. This is quart-chlorite-sericite schist with thread-like intercalations of coaly-clayey composition, finebedded, strongly plicated. It has a fine-banded, colitic structure and granolepidoblastic texture. This material was prepared in 1985 and is also known as CRM No. 3191-85.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Be	3.5	0.7	Fe ₂ O ₃ (%)	7.6	0.1
B	100	20	Co	27	4
Na ₂ O (%)	0.08	0.01	Ni	45	6
MgO (%)	2.52	0.04	Cu	46	8
Al ₂ O ₃ (%)	16.71	0.20	Zn	100	20
SiO ₂ (%)	63.40	0.23	Pb	150	10
P ₂ O ₅ (%)	0.030	0.004	Sr	39	5
K ₂ O (%)	3.56	0.03	Y	48	6
CaO (%)	0.09	0.02	Zr	230	10
Sc	22	2	Nb	16	1
TiO ₂ (%)	1.01	0.04	Ba	950	40
V	100	10	Ce	90	20
Cr	70	10	Yb	5	1
MnO (%)	0.13	0.01	Pb	15	1
FeO (%)	4.65	0.17	LOI (%)	4.54	0.11

Information values ($\mu\text{g/g}$ dry weight):

Component	Value
Ga	15
Ge	2
Mo	1.6
Sn	4
Cs	7
Lu	0.6
Th	12
U	2

SSL-1 (cont.)

Mineral composition:

Mineral	Percent
Albite	0.15
Ankerite	0.7
Biotite	14.8
Chlorite	26.8
Coaly substance	3.7
Epidote-zoisite	0.15
Ferric hydroxides	0.4
Quartz-feldspathic aggregate	23.4
Rutile	0.9
Sericite-muscovite	28.6

Granulometric composition:

Fraction size (μm)	Percent
+80	0.5
-60 + 50	3.2
-50 + 40	6.8
-40	4.6

(As in certificate. Values seem to be missing.)

Sulphides and magnetite in accessory amounts.

Order information:

SSL-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1985?) Metamorphic schist. CRM No. 3191-85 (SSL-1). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

SSV-1

Svlatonssite

Russian Federation Academy of Sciences (Russia)

Description:

This material was prepared in 1991 and is also known as CRM No. 6104-91.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	10.5	1.5	Fe_2O_3 (%)	5.41	0.11
Be	1.9	0.3	Co	8	1
Na_2O (%)	4.51	0.22	Ni	8.4	1.5
MgO (%)	1.25	0.07	Cu	5	1
Al_2O_3 (%)	16.68	0.25	Zn	109	15
SiO_2 (%)	57.86	0.29	Ga	17	2
P_2O_5 (%)	0.39	0.02	Hf	56	9
K_2O (%)	4.77	0.19	Sr (%)	0.52	0.04
CaO (%)	6.94	0.22	Zr	185	20
Sc	4.0	0.7	Nb	20	4
TiO_2 (%)	0.78	0.04	Mo	1.1	0.2
V	79	11	Ba	0.69	0.07
Cr	16	2	Ce	219	34
MnO (%)	0.14	0.01	Pb	21	4
FeO (%)	2.51	0.09			

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H_2O^- (%)	0.05	Gd	10
H_2O^+ (%)	0.28	Tb	1.7
B	7	Dy	6.9
CO_2 (%)	0.20	Ho	1
S (%)	0.017	Er	2.5
Ga	1.2	Tm	0.45
As	12	Ta	1.8
Ag	0.02	Th	12
Cs	1	U	2
Pr	23	LOI (%)	0.38

Order information:

SSV-1 can be purchased for DM375 per unit (100 g). Price subject to change without notice. Please contact Breiitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1991?) Sviatonssite. CRM No. 6104-91 (SSV-1). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

ST-1a

Trap

Russian Federation Academy of Sciences (Russia)

Description:

This sample was obtained from a large collection of private samples and sampled from bedded intrusions of the Siberian platform. These are mainly fine- and average-grained dolerites and gabbrodolerites with characteristic ophitic structures. Macroscopically, these are dense, dark-grey rocks. This material was issued in 1984 and is also known as CRM No. 519-84n.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
H ₂ O ⁺ (%)	0.97	0.14	Ge	1.6	0.4
Li	14	2	Rb	16	2
Be	0.9	0.1	Sr	270	30
F	250	50	Y	34	7
Na ₂ O (%)	2.49	0.03	Zr	130	10
MgO (%)	5.74	0.07	Nb	8	1
Al ₂ O ₃ (%)	14.23	0.09	Mo	1.7	0.4
SiO ₂ (%)	49.1	0.1	Sn	3.5	0.9
P ₂ O ₅ (%)	0.21	0.01	Cs	0.9	0.1
S (%)	0.04	0.01	Ba	230	60
K ₂ O (%)	0.70	0.01	La	14	2
CaO (%)	10.20	0.11	Ce	26	7
Sc	43	5	Pr	2.7	0.6
TiO ₂ (%)	1.85	0.03	Nd	15	5
V	320	20	Sm	5	2
Cr	140	10	Eu	2.3	0.6
MnO (%)	0.21	0.01	Yb	3.8	0.8
FeO (%)	10.26	0.11	Lu	0.5	0.1
Fe ₂ O ₃ (%)	15.22	0.14	Ta	1.2	0.4
Co	46	5	W	0.7	0.1
Ni	90	6	Pb	5	1
Cu	220	20	Th	2.6	0.8
Zn	150	10	U	0.8	0.2
Ga	16	2	Trace oxides (%)	0.014	0.002

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
B	7	Te	1.5
C (%)	0.06	Au	0.05
Cl	430	Gd	5
As	1.5	Dy	5
Ag	0.1	Tb	1
Br	4	Hb	1.3
Cd	0.1	Tm	0.7
Sb	1		

Fraction size (μm)	Percent	Fraction size (μm)	Percent
Olivine	2 - 18	- 80 + 63	
Ilmenite	2 - 4	- 63 + 50	0.6
Monoclinic pyroxene	10 - 45	- 50 + 40	2.0
Plagioclase	45 - 55	- 40	97.4
Titanomagnetite	3 - 8		
Volcanic glass, secondary and accessory minerals	0 - 8		

Order Information:

Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1988?) Trap. CRM No. 519-84n (ST-1a). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

ST-2

Trap

Russian Federation Academy of Sciences (Russia)

Description:

This trap sample was collected from a quarry from the bedded body about 100 m thick near the town of Tulun, Irkutsk. Material was sampled from the middle part of sill and consists of common differentiates of trappan magma, i.e., dolerites with ophitic structure. Macroscopically, these are dense drak-grey rocks. This material was issued in 1984 and is also known as CRM No. 519-88n.

Certified concentrations ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Abs. error	Component	Value	Abs. error
Li	8.6	1.2	Cu	180	17
Be	0.8	0.1	Zn	112	11
Na ₂ O (%)	2.32	0.09	Ga	17	2
MgO (%)	7.51	0.17	Ge	1.5	0.2
Al ₂ O ₃ (%)	14.63	0.17	Rb	11	2
SiO ₂ (%)	47.99	0.19	Sr	197	16
P ₂ O ₅ (%)	0.17	0.01	Y	29	3
K ₂ O (%)	0.46	0.02	Zr	125	13
CaO (%)	0.42	0.14	Nb	6	1
Sc	41	6	Ba (%)	0.0227	0.0023
TiO ₂ (%)	1.59	0.05	La	8	1
V	315	26	Ce	22	3
Cr	213	11	Sm	4	0.5
MnO (%)	0.21	0.01	Eu	1.4	0.2
FeO (%)	10.33	0.14	Yb	3.3	0.4
Fe ₂ O ₃ (%)	14.62	0.14	Lu	0.44	0.07
Co	52	7	U	0.45	0.07
Ni	126	13			

Information values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁺ (%)	0.88	Tb	0.8
B	3.8	Dy	5.5
F (%)	0.021	Hf	2.9
Mo	0.93	Ta	3.5
Ag	0.05	Au	0.0026
Sn	2	Pb	2
Cs	9	LOI (%)	0.42
Nd	13		

ST-2 (cont.)

Fraction size (μm)	Percent	Fraction size (μm)	Percent
Olivine	12.94 ± 1.20	>80	0.006
Ore minerals	3.47 ± 0.37	-80 + 71	0.024
Mesostasis	4.88 ± 0.65	-71 + 63	0.04
Monoclinic pyroxene	33.88 ± 1.93	-63 + 50	1.13
Plagioclase	44.58 ± 1.92	-50 + 40	3.76
Granulometric composition:		-40	95.04

Order information:

Please contact Breitländer.

References:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

Geochemistry Institute (1988?) Trap. CRM No. 519-88n (ST-2). Certificate. Siberian Branch, Geochemistry Institute, Russian Federation Academy of Sciences, Irkutsk, Russia. (Available from Breitländer, Hamm, Germany.)

STM-1

Nepheline Syenite

US Geological Survey (USA)

Description:

The sample of peralkaline nepheline syenite was collected from a sill that underlies Table Mountain (44° 28.6' N, 123° 50.2' W) in the Oregon Coast Range, USA. A complete mineralogical description of this material can be found in Snively *et al.* (1976). Values for elemental concentrations have been calculated by Abbey (1982, 1983), Gladney and Goode (1981) and Gladney and Roelandts (1988) using the results of various analysts. Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations (µg/g dry weight unless noted):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
Li	32	8	Nb	268	12
Be	9.6	0.6	Mo	5.2	0.9
B	6.4	1.7	Ru	<0.46	-
C	70	40	Rh (ng/g)	<0.1	-
F	910	50	Pd (ng/g)	0.4	-
Na (%)	6.63	0.15	Ag (ng/g)	79	8
Mg (%)	0.061	0.012	Cd (ng/g)	270	60
Al (%)	9.73	0.12	In (ng/g)	120	-
Si (%)	27.85	0.23	Sn	6.8	1.2
P	690	60	Sb	1.66	0.15
S	43	20	Te (ng/g)	6.0	-
Cl	460	40	Cs	1.54	0.08
K (%)	3.55	0.06	Ba	560	60
Ca (%)	0.780	0.042	La	150	6
Sc	0.61	0.07	Ce	259	18
Ti	810	70	Pr	19.0	1.4
V	8.7	5.2	Nd	79	7
Cr	4.3	2.6	Sm	12.6	1.0
Mn	1700	120	Eu	3.6	0.3
Fe (%)	3.65	0.07	Gd	9.5	0.8
Co	0.90	0.15	Tb	1.55	0.16
Ni	3.0	1.6	Dy	8.1	0.5
Cu	4.6	2.0	Hb	1.9	0.4
Zn	235	22	Er	4.2	0.4
Ga	36	5	Tm (ng/g)	690	160
Ge	1.38	-	Yb	4.4	0.4
As	4.6	0.6	Lu (ng/g)	600	100
Se (ng/g)	7.7	2.0	Hf	28	2
Br	2.3	1.5	Ta	18.6	1.2
Pb	118	6	W	3.6	0.4
Sr	700	30	Re	<10	-
Y	46	5	Os	<22	-
Zr	1210	120	Ir	<6.8	-

STM-1 (cont.)

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Pt (ng/g)	<1	-	Pb	17.7	1.8
Au (ng/g)	0.40	-	Bi (ng/g)	130	30
Tl (ng/g)	260	50	Th	31	3
Hg (ng/g)	15.3	-	U	9.06	0.13

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
H ₂ O ⁺	1.50	0.11	K ₂ O	4.28	0.07
H ₂ O ⁻	0.19	0.04	CaO	1.09	0.06
CO ₂	0.026	0.015	TiO ₂	0.135	0.012
Na ₂ O	8.94	0.20	MnO	0.220	0.015
MgO	0.101	0.020	FeO	2.09	0.03
Al ₂ O ₃	18.39	0.23	Fe ₂ O ₃	2.87	0.02
SiO ₂	59.64	0.49	Cl	0.046	0.004
P ₂ O ₅	0.158	0.014	F	0.091	0.005
			S	0.004	0.002

Order Information:

STM-1 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1982) An evaluation of USGS III. Geostand. Newsletter, 6(1):47-76.

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Gladney, E. S., and W. E. Goode (1981) Elemental concentrations in eight new United States Geological Survey rock standards: a review. Geostand. Newsletter, 5(1):31-64.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BHVO-1, MAG-1, QLO-1, RGM-1, SCo-1, SDC-1, SGR-1 and STM-1. Geostand. Newsletter, 12(2):253-362.

SY-3

Syenite Rock

Canada Centre for Mineral and Energy Technology (Canada)

Description:

SY-3 is a batch syenite from the same source as SY-2 that was ground autogeneously with lumps of a concentrate containing uranite, allanite and betafite to increase the concentrations of U, Th and the rare earths. SY-2 was collected in the Bancroft area of eastern Ontario, Canada. ENRICHED IN RADIOACTIVE MINERALS?

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value
H ₂ O ⁺ (%)	0.42	P ₂ O ₅ (%)	0.54
CO ₂ (%)	0.38	K ₂ O (%)	4.2
F (%)	0.66	CaO (%)	8.26
Na ₂ O (%)	4.15	TiO ₂ (%)	0.15
MgO (%)	2.67	MnO (%)	0.32
Al ₂ O ₃ (%)	11.8	FeO (%)	3.58
SiO ₂ (%)	59.68	Fe ₂ O ₃ (%)	2.44
S (%)	0.05		

Order Information:

These materials can be purchased for Canadian \$105 per unit (100 g). Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

SY-4

Diorite Gneiss

Canada Centre for Mineral and Energy Technology (Canada)

Description:

SY-4 is a diorite gneiss material intended as a replacement for SY-2. In an effort to closely match the composition of SY-2, CANMET sampled 12 sites in Bancroft, Ontario, and the sample for this material was collected at an outcrop of the Rosenthal-Reid Lake Belt in Brudenell Township, Renfrew County, Ontario, Canada. The material was dried, cleaned, broken, crushed and ground to 74 μm (200 mesh). The powdered material was blended and bottled in 100-g lots. The powdered material was studied using x-ray diffraction and scanning electron microprobe analysis and found to be classed as diorite gneiss. It contains major amounts of oligoclase and scapolite, and minor amounts of biotite, calcite and analcime, and trace amounts of magnetite and apatite. Eighty-nine university, commercial, and government laboratories worldwide participated in an interlaboratory certification program that yielded recommended values for 51 constituents and provisional values for 14 others.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty	Component	Value	Uncertainty
Li	37	2	Sr	1191	12
Be	2.6	0.1	Y	119	2
CO ₂ (%)	3.5	0.1	Zr	517	16
Na ₂ O (%)	7.10	0.05	Nb	13	1
MgO (%)	0.54	0.01	Cs	1.5	0.1
Al ₂ O ₃ (%)	20.69	0.08	Ba	340	5
SiO ₂ (%)	49.9	0.1	La	58	1
P ₂ O ₅ (%)	0.131	0.004	Ce	122	2
K ₂ O (%)	1.66	0.02	Pr	15.0	0.3
CaO (%)	8.05	0.04	Nd	57	1
Sc	1.1	0.1	Sm	12.7	0.4
TiO ₂ (%)	0.287	0.003	Eu	2.00	0.04
V	8	1.6	Gd	14.0	0.5
Cr	12	1	Tb	2.6	0.1
Mn	819	24	Dy	18.2	0.6
MnO (%)	0.108	0.001	Hb	4.3	0.1
Fe (%)	4.2	0.1	Er	14.2	0.5
FeO (%)	2.86	0.09	Tm	2.3	0.1
Fe ₂ O ₃ (%)	6.21	0.03	Yb	14.8	0.4
Co	2.8	0.2	Lu	2.1	0.1
Ni	9	1	Hf	10.6	0.4
Cu	7	1	Th	1.4	0.2
Zn	93	2	Ta	0.9	0.1
Ga	35	1	Pb	10	1
			U	0.8	0.1

Provisional values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Uncertainty	Component	Value	Uncertainty
H ₂ O ⁺ (%)	1.0	0.3	Mg (%)	0.30	0.02
H ₂ O ⁻ (%)	0.15	0.05	Na (%)	5.3	0.2
Al (%)	11	1	S (%)	0.015	0.004
C (%)	1.0	0.1	Ag	0.6	0.16
Ca (%)	5.8	0.3	Br	217	14
F (%)	0.06	0.01	P	532	38
K (%)	1.41	0.03	Sn	7.1	0.6

Information values range ($\mu\text{g/g}$ dry weight unless noted):

Component	Value range	Component	Value range
Cl (%)	0.3 - 0.6	In	0.04 - 0.1
SO ₃ (%)	0.01 - 0.08	Mo	0.2 - 3
As	0.1 - 2	Sb	0.01 - 0.3
B	13 - 18	Se	0.01 - 4
Bi	0.1 - 0.3	Ti	1500 - 1750
Cd	0.1 - 2	Tl	0.2 - 0.5
Ge	1 - 4	W	0.2 - 15
Hg	10 - 14		

Order information:

These materials can be purchased for Canadian \$100 per unit (100 g). Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

Canada Centre for Mineral and Energy Technology (1995) SY-4. Diorite gneiss reference material. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada.

TDB-1

Diabase Rock PGE Reference Material

Canada Centre for Mineral and Energy Technology (Canada)

Description:

TDB-1 was obtained from Tremblay Lake, Saskatchewan, Canada. This diabase rock is composed of a siliceous matrix containing numerous small masses, aggregates and discrete grains of titaniferous magnetite and ilmenite, intimately associated with ferroan titanite. Several small grains of chalcopyrite and bornite are associated with the oxide aggregates. Some of the bornite grains are partly replaced by a thin later of covellite. The siliceous matrix consists largely of plagioclase feldspar and pyroxene with minor amounts of mica and quartz. The raw material was dried, comminuted and sieved to pass a 74 μm sieve. Thirty-three universities, commercial, and government laboratories worldwide participated in the intercalibration certification program for this material.

Certified values (ng/g dry weight):

Component	Value	Uncertainty (\pm)
Pd	22.4	1.4
Pt	5.8	1.1
Au	6.3	1.0

Provisional value (ng/g dry weight):

Component	Value
Rh	0.7
Ir	0.15

Information value (ng/g dry weight):

Ru	0.3
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Approximate composition (percent dry weight):

Component	Value	Component	Value
Na ₂ O	2.2	K ₂ O	0.89
MgO	5.9	CaO	9.6
Al ₂ O ₃	13.6	TiO ₂	2.3
SiO ₂	50.2	MnO	0.20
P ₂ O ₅	0.23	Fe ₂ O ₃	14.4
S (total)	0.03	LOI	0.3

Order information:

This material can be purchased for Canadian \$415 per unit (400 g). Price subject to change without notice. Please contact CANMET.

Reference:

Centre for Mineral and Energy Technology (1994) TDB-1. Diabase rock PGE Reference Material. New CCRMP Material announcement sheet. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Ontario, Canada.

UB-N

Serpentine

Association Nationale de la Recherche Technique (France)

Description:

The material for this CRM was collected from the col des Bagenelles, Vosges, France.

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
H ₂ O ⁺ (%)	10.84	Cr	2300	La	0.35
H ₂ O ⁻ (%)	1.26	MnO (%)	0.12	Ce	0.8
Li	27	FeO (%)	2.68	Pr	0.12
B	140	Fe ₂ O ₃ (%)	5.36	Nd	0.6
CO ₂ (%)	0.39	Co	100	Sm	0.2
Na ₂ O (%)	0.10	Ni	2000	Eu	0.08
MgO (%)	35.21	Cu	28	Gd	0.3
Al ₂ O ₃ (%)	2.90	Zn	85	Tb	0.06
SiO ₂ (%)	39.43	Ga	3	Dy	0.38
P ₂ O ₅ (%)	0.04	As	10	Ho	0.09
Cl	800	Pb	4	Er	0.28
K ₂ O (%)	0.02	Sr	9	Tm	0.045
CaO (%)	1.20	Y	2.5	Yb	0.28
V	75	Zr	4	Lu	0.045
TiO ₂ (%)	0.11	Cs	10	Pb	13
		Ba	27		

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Element	Value	Element	Value	Element	Value
Be	0.2	Mo	0.55	Tl	0.06
F	95	In	0.015	Bi	0.1
S	200	Sb	0.3	Th	0.07
Sc	13	Hf	0.1	U	0.07
Ga	0.85	Ta	0.02	LOI (%)	12.06
Nb	0.05	W	20		

Order information:

UB-N is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. UB-N is packaged in 30-g units.

Reference:

Govindaraju, K. (1994) 1994 compilation of working values and sample description for 383 geostandards. Geostands. Newsletter, 18(Special issue):1-158.

UM-2 and UM-4

Sulphide-bearing Ultramafic Rocks

Canada Centre for Mineral and Energy Technology (Canada)

Description:

UM-2 and UM-4 are from the Werner Lake - Gordon Lake district of northwestern Ontario. These rock samples are intended as reference materials for the determination of ascorbic acid/hydrogen peroxide-soluble copper, nickel, and cobalt in ultramafic rocks to evaluate their ore potential. Details of the mineralogy of UM-2 and UM-4 are given in Geological Survey of Canada Paper 71-35, "Three geochemical standards of sulphide-bearing ultramafic rock: UM-1, UM-2, and UM-4". The following table lists the major and minor elements and are for information purposes only.

Information values ($\mu\text{g/g}$ unless noted):

GSC values for Cu, Ni and Co by ascorbic acid/hydrogen peroxide method (percent dry weight):

Element	UM-2	UM-4
Cu	0.095	0.054
Ni	0.29	0.19
Co	0.012	0.007

Approximate chemical composition of UM-2 and UM-4 (percent dry weight):

Element	UM-2	UM-4	Element	UM-2	UM-4
H ₂ O	6.27	4.86	K ₂ O	0.11	0.18
CO ₂	0.1	0.26	CaO	4.68	6.27
Na ₂ O	0.32	0.45	TiO ₂	0.24	0.35
MgO	25.45	22.5	Cr ₂ O ₃	1.51	2.59
Al ₂ O ₃	7.23	8.98	MnO	0.08	0.15
SiO ₂	39.2	39.35	Total Fe as FeO	12.95	12.8
P ₂ O ₅	0.02	0.02	ZnO	0.004	0.008
S	0.94	0.44			

Order information:

These materials can be purchased for Canadian \$75 per unit (100 g). Price subject to change without notice. Please contact CANMET.

Reference:

Bowman, W. S. (1994) Catalogue of certified reference materials. CCRMP 94-1E. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Canada. 74 pp.

W-2

Diabase

US Geological Survey (USA)

Description:

Eight hundred pounds of material was collected from Bull Run Quarry, near Centreville, VA, USA, at the same site that the earlier W-1 reference material was obtained and processed for this standard (Flanagan, 1984). The complete petrology of the material can be found in Chayes (1951). Original concentration values for various elements was initially provided by Flanagan (1984). Values for elemental concentrations using the results of various analysts have been calculated by Abbey (1983), Gladney *et al.* (1983), Flanagan (1986) and Gladney and Roelandts (1988). Those calculated by Gladney and Roelandts (1988) are listed below.

Best available concentrations ($\mu\text{g/g}$ dry weight unless noted):

Element	Mean	Uncertainty (\pm)	Element	Mean	Uncertainty (\pm)
Li	9.3	0.7	Nb	7.9	1.4
Be	1.3	0.2	Mo	0.6	0.4
B	12.0	1.30	Pd (ng/g)	11	-
C	151	80	Ag (ng/g)	46	-
F	205	39	Cd (ng/g)	104	27
Na (%)	1.59	0.09	Sb	0.79	0.17
Mg (%)	3.84	0.11	Te (ng/g)	2.1	-
Al (%)	8.12	0.12	Cs	0.99	0.08
Si (%)	24.49	0.30	Ba	182	23
P	570	70	La	11.4	1.8
S	79	28	Ce	24	2
Cl	190	40	Pr	5.9	5.2
K	5200	210	Nd	14	5
Ca (%)	7.77	0.21	Sm	3.25	0.23
Sc	35	3	Eu	1.10	0.08
Ti	6350	180	Gd	3.6	0.5
V	262	14	Tb (ng/g)	630	120
Cr	93	6	Dy	3.8	0.4
Mn	1260	70	Ho (ng/g)	760	90
Fe (%)	7.51	0.16	Er	2.5	0.6
Co	44	6	Tm (ng/g)	380	70
Ni	70	8	Yb	2.05	0.12
Cu	103	12	Lu (ng/g)	330	70
Zn	77	5	Hf	2.56	0.14
Ga	20	3	Ta (ng/g)	500	70
Ge	1.04	-	W (ng/g)	263	-
As	1.24	0.36	Au (ng/g)	1.2	-
Se (ng/g)	102	-	Hg (ng/g)	7.9	-
Br	<2	-	Tl (ng/g)	200	-
Rb	20	3	Pb	9.3	3.1
Sr	194	17	Bi (ng/g)	30	-
Y	24	3	Th	2.2	0.4
Zr	94	9	U (ng/g)	530	80

Major and minor oxide concentrations (%):

Element	Mean	Uncertainty (±)	Element	Mean	Uncertainty (±)
H ₂ O ⁺	0.55	0.04	K ₂ O	0.627	0.025
H ₂ O ⁻	0.23	0.05	CaO	10.87	0.29
Na ₂ O	2.14	0.12	TiO ₂	1.06	0.03
MgO	6.37	0.18	MnO	0.163	0.009
Al ₂ O ₃	15.35	0.23	FeO	8.31	0.09
SiO ₂	52.44	0.64	Fe ₂ O ₃	1.52	0.14
P ₂ O ₅	0.131	0.016	CO ₂	0.055	0.029

Order Information:

W-2 is available for US\$65 per bottle. Please contact USGS.

References:

Abbey, S. (1983) Studies in "standard samples" of silicate rocks and minerals 1969-1982. Paper 83-15, 114 pp. Geological Survey of Canada, Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec, Canada.

Chayes, F. (1951) Modal analyses of the granite and diabase test rocks. U.S. Geol. Survey Prof. Bull. 980:59-68. U.S. Geological Survey, Reston, VA, USA.

Flanagan, F. J. (1984) Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. U.S. Geol. Survey Prof. Bull. 1623:1-12. U.S. Geological Survey, Reston, VA, USA.

Flanagan, F. J. (1986) Additions and corrections for USGS Bulletin 1623, Three USGS mafic rock reference samples, W-2, DNC-1, and BIR-1. Open file report 86-220. U.S. Geological Survey, Reston, VA, USA.

Gladney, E. S., and I. Roelandts (1988) 1987 Compilation of elemental concentration data for USGS BIR-1, DNC-1 and W-2. Geostand. Newsletter, 12(1):63-118.

Gladney, E. S., C. E. Burns, and I. Roelandts (1983) 1982 Compilation of elemental concentrations in eleven United States Geological Survey rock standards. Geostands. Newsletter, 7(1):3-226.

Snively, P. D., N. S. MacLeod, F. J. Flanagan, S. Berman, H. G. Neiman, and H. Bastron (1976) Nepheline syenite, STM-1, from Table Mountain, Oregon. In: F. J. Flanagan (ed.), Description and analyses of eight new USGS rock standards, USGS Prof. paper 840, p. 7-10. US Government Printing Office, Washington, DC.

WGB-1

Gabbro Rock PGE Material

Canada Centre for Mineral and Energy Technology (Canada)

Description:

MGB-1 was obtained from the Wellgreen Complex, Yukon Territory, Canada. The mineralogy of this material consists of plagioclase feldspar, pyroxene, chlorite, prehnite and calcite. Sulphide mineralization is sparse and includes chalcopyrite, pyrrhotite, pentlandite and galena. Other minerals identified include titanite, ilmenite and rutile. Thirty-three universities, commercial, and government laboratories worldwide participated in the intercalibration certification program for this material.

Certified values (ng/g dry weight):

Component	Value	Uncertainty (\pm)
Pd	13.9	2.1
Pt	6.1	1.6
Au	2.9	1.1

Provisional value (ng/g dry weight):

Component	Value
Rh	0.32
Ir	0.33

Information value (ng/g dry weight):

Ru	0.3
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Approximate composition (percent dry weight):

Component	Value	Component	Value
Na ₂ O	2.1	K ₂ O	0.9
MgO	9.4	CaO	16.1
Al ₂ O ₃	11.0	TiO ₂	0.9
SiO ₂	49	MnO	0.1
P ₂ O ₅	0.09	Fe ₂ O ₃	6.7
S	0.02	LOI	3.7

Order information:

This material can be purchased for Canadian \$350 per unit (400 g). Price subject to change without notice. Please contact CANMET.

Reference:

Centre for Mineral and Energy Technology (1994) WGB-1. Gabbro rock PGE Reference Material. New CCRMP Material announcement sheet. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Ontario, Canada.

WMG-1

Mineralized Gabbro PGE Reference Material

Canada Centre for Mineral and Energy Technology (Canada)

Description:

WMG-1 was obtained from the Wellgreen Complex, Yukon Territory, Canada. The mineralogy of this material consists largely of pyroxene with prehnite, amphibole, chlorite, and accessory magnetite, ilmenite, and titanite, and calcite. Mineralization consists chiefly of chalcopyrite, pyrrhotite, pentlandite, violarite, and altaite. The raw material was dried, comminuted and sieved to pass a 74 μm sieve. Thirty-three universities, commercial, and government laboratories worldwide participated in the intercalibration certification program for this material.

Certified values (ng/g dry weight):

Component	Value	Uncertainty (\pm)
Ru	35	5
Rh	26	2
Pd	382	13
Ir	46	4
Pt	731	35
Au	110	11

Provisional value (ng/g dry weight):

Component	Value
Os	24

Approximate composition (percent dry weight):

Component	Value	Component	Value
Na ₂ O	0.2	K ₂ O	0.1
MgO	11.5	CaO	15.0
Al ₂ O ₃	8.6	TiO ₂	0.7
SiO ₂	41	MnO	0.2
S	3.5	Fe ₂ O ₃	17.0
P ₂ O ₅	0.1	LOI	4.5

Order information:

This material can be purchased for Canadian \$350 per unit (400 g). Price subject to change without notice. Please contact CANMET.

Reference:

Centre for Mineral and Energy Technology (1994) WMG-1. Mineralized Gabbro PGE Reference Material. New CCRMP Material announcement sheet. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Ontario, Canada.

WMS-1

Massive Sulphide PGE Reference Material

Canada Centre for Mineral and Energy Technology (Canada)

Description:

WMS-1 was obtained from the Wellgreen Complex, Yukon Territory, Canada. This material is composed largely of sulphides rather than silicates. The sulphides in WMS-1 are massive in form, intimately associated with one another and composed of pyrrhotite with smaller quantities of pentlandite, chalcopyrite, minor sphalerite, and galena. The massive sulphides contain inclusions of magnetite, many of which are severely fractured and veined with silicates. Other minerals identified include electrum as an inclusion in chalcopyrite, and one inclusion of altaite, as well as an inclusion of antimonial temagamite in pyrrhotite. Silicates form a much smaller portion of the material and include an iron aluminum silicate, chlorite, mica and quartz. The raw material was dried, comminuted and sieved to pass a 74 µm sieve. Thirty-three universities, commercial, and government laboratories worldwide participated in the intercalibration certification program for this material.

Certified values (ng/g dry weight): Provisional value (ng/g dry weight):

Element	Value	Uncertainty (±)	Element	Value
Ru	99	16	Os	119
Rh	225	16		
Pd	1185	44		
Ir	235	25		
Pt	1741	142		
Au	279	33		

Approximate composition (percent dry weight):

Component	Value	Component	Value
MgO	0.2	MnO	0.1
Al ₂ O ₃	1.1	Fe	51
SiO ₂	4.5	Co	0.2
S	32	Ni	3.7
K ₂ O	0.08	Cu	1.3
CaO	1.6	LOI	11.3
TiO ₂	0.07		

Order information:

This material can be purchased for Canadian \$175 per unit (200 g). Price subject to change without notice. Please contact CANMET.

Reference:

Centre for Mineral and Energy Technology (1994) WMS-1. Massive sulphide PGE Reference Material. New CCRMP Material announcement sheet. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Ontario, Canada.

WPR-1

Altered Peridotite PGE Reference Material

Canada Centre for Mineral and Energy Technology (Canada)

Description:

WMS-1 was obtained from the Wellgreen Complex, Yukon Territory, Canada. This altered peridotite contains essentially antigorite with small amounts of chlorite and accessory magnetite and chromite. The peridotite contains pyrrhotite, pentlandite, and chalcopyrite, all either enclosed, penetrated, or intergrown with magnetite. Violarite occurs as inclusions in the pyrrhotite. Tellurides were observed which have been tentatively identified as PGE complexes. The raw material was dried, comminuted and sieved to pass a 74 μm sieve. Thirty-three universities, commercial, and government laboratories worldwide participated in the intercalibration certification program for this material.

Certified values (ng/g dry weight):

Component	Value	Uncertainty (\pm)
Ru	22	4
Rh	13.4	0.9
Pd	235	9
Ir	13.5	1.8
Pt	285	12
Au	42	3

Provisional value (ng/g dry weight):

Component	Value
Os	13

Approximate composition (percent dry weight):

Component	Value	Component	Value
MgO	31	K ₂ O	0.1
Al ₂ O ₃	3.1	CaO	2.0
SiO ₂	37	TiO ₂	0.3
P ₂ O ₅	0.03	MnO	0.2
S	0.9	LOI	10.4

Order information:

This material can be purchased for Canadian \$350 per unit (400 g). Price subject to change without notice. Please contact CANMET.

Reference:

Centre for Mineral and Energy Technology (1994) WPR-1. Altered peridotite PGE Reference Material. New CCRMP Material announcement sheet. Canada Centre for Mineral and Energy Technology, Ottawa, Ontario, Ontario, Canada.

WS-E

Dolerite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

Dolerite WS-E was collected from the Great Whin Sill, a dolerite intrusion in northern England. WS-E consists of plagioclase, orthopyroxene and opaque oxides. Randomly orientated laths of plagioclase dominate. Clinopyroxene occurs as polycrystalline aggregates up to 1.2 mm across. Orthopyroxene occurs as elongated prisms up to 1 mm long. There are large poikilitic masses of opaque oxides up to 1 mm across as well as small amounts of brown amphibole and green chlorite. Details of the collection, preparation and calculation of certified, recommended, provisional, and proposed values can be found in Govindaraju *et al.*, (1994).

Certified value ($\mu\text{g/g}$ dry weight):

Component	Value
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Eu	2.25
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Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value				
		MnO (%)	0.17	Pr	7.8
H ₂ O ⁺ (%)	1.30	FeO (%)	8.40	Nd	33
H ₂ O ⁻ (%)	0.66	Co	44	Sm	8.8
Li	13.6	Ni	55	Gd	7.2
Be	1.14	Cu	65	Tb	1.1
CO ₂ (%)	0.12	Zn	117	Dy	6
Na ₂ O (%)	2.47	Ga	23	Ho	1.2
MgO (%)	5.55	Pb	25	Er	3
Al ₂ O ₃ (%)	13.78	Sr	410	Tm	0.43
SiO ₂ (%)	50.70	Y	30.4	Yb	2.5
P ₂ O ₅ (%)	0.30	Zr	195	Lu	0.37
K ₂ O (%)	1.00	Nb	18	Hf	5.3
CaO (%)	8.95	Mo	3.7	Th	3
Sc	28	Sn	18	Ta	1.16
TiO ₂ (%)	2.40	Cs	0.5	Tl	0.16
V	340	Ba	338	Pb	13.8
Cr	99	La	27	LOI (%)	0.85
Component	Value	Ce	61		
		Component	Value		

WS-E (cont.)

Provisional values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
Ba	1.14
Fe_2O_3 (%)	3.82
W	0.5
Ta	1.16
U	0.65

Proposed values ($\mu\text{g/g}$ dry weight):

F	540
S	500
Cd	0.2
Sb	0.08

Order Information:

WS-E is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. WS-E is packaged in 40-g units.

Reference:

Govindaraju, K., P. J. Potts, P. C. Webb, and J. S. Watson (1994) 1994 report on Whin Sill dolerite WS-E from England and Pitscurrie microgabbro PM-S from Scotland: assessment by one hundred and four international laboratories. Geostand. Newsletter, 18(2):211-300.

ZW-C

Zinnwaldite

International Working Group "Analytical Standards of Minerals, Ores, and Rocks" (France)

Description:

The Zinnwaldite was prepared by the Czech Geological Survey from the classical tin-tungsten deposit of Cinovec (Zinnwald), Czech Republic. The ore deposit is situated in northern Bohemia about 11 km from Teplice, near the border with Germany. The deposit is in the ancient tin mining region of the Krusne hory and is presently mined on a limited scale for Sn and W ores of the greisen type. The deposit is partially associated with a granite outcrop within the Teplice rhyolite (quartz porphyry). The granite body represents a small intrusion of Variscan age consisting of albitized zinnwaldite granite at the top, and of protolithionite granite at the bottom. The ore deposit is formed by a system of flat and steep ore veins developed inside the granite extending for a short distance into rhyolite. Most of the low grade ore is, however, associated with irregular greisen bodies accompanying ore veins or occurring independently within the granite. The veins as well as greisen consist of quartz, zinnwaldite (Li-Fe mica), topaz, potash feldspar, fluorite, cassiterite, wolframite, scheelite, and subordinate sulfides such as sphalerite, galena, and chalcopyrite. The material used for ZM-C is approximately 77% zinnwaldite and 22% quartz. The material was dried, pulverized, and bottled. Ninety two laboratories worldwide participated in the analysis of ZW-C. Details of the collection, preparation and calculation of recommended and proposed values can be found in Govindaraju *et al.* (1994).

Recommended values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value	Component	Value	Component	Value
H ₂ O ⁺ (%)	1.46	Co	2	La	30
H ₂ O ⁻ (%)	0.42	Ni	11	Ce	97
Li	24300	Cu	39	Pr	9.5
LiO ₂ (%)	2.43	Zn	1050	Nd	25
Be	35	ZnO (%)	0.13	Sm	6.6
F (%)	5.45	Ga	99	Eu	0.04
Na ₂ O (%)	0.33	As	31	Gd	4.7
MgO (%)	0.16	Pb	8500	Tb	1.2
Al ₂ O ₃ (%)	18.45	RbO ₂ (%)	0.93	Dy	9.2
SiO ₂ (%)	54.00	Sr	17	Hb	2
P ₂ O ₅ (%)	0.025	Y	33	Er	6.7
K ₂ O (%)	7.72	Zr	82	Tm	1.6
CaO (%)	0.37	Nb	198	Yb	14
Sc	42	Mo	4.3	Lu	2.2
TiO ₂ (%)	0.05	Cd	1.5	Hf	9.7
V	6	Sn	1300	Th	43
Cr	56	SnO ₂ (%)	0.165	Ta	82
MnO (%)	0.97	Sb	4.2	W	320
FeO (%)	7.34	Cs	260	Tl	34
Fe ₂ O ₃ (%)	1.30	CsO ₂ (%)	0.028	Pb	80
		Ba	52	Bi	15
				U	20

Proposed values ($\mu\text{g/g}$ dry weight unless noted):

Component	Value
CO ₂ (%)	0.24
S	300
Cl	30
LOI (%)	2.3

Order information:

ZW-C is available to members of the International Working Group "Analytical Standards of Minerals, Ores, and Rocks". Membership in the Working Group is US\$125. Please contact K. Govindaraju at Geostandards. Membership dues subject to change without notice. ZW-C is packaged in 30-g units.

Reference:

Govindaraju, K., I. Rubeska, and T. Paukert (1994) 1994 report on Zinnwaldite ZW-C analyzed by ninety two GIT-IWG member-laboratories. Geostand. Newsletter, 18(1):1-42.