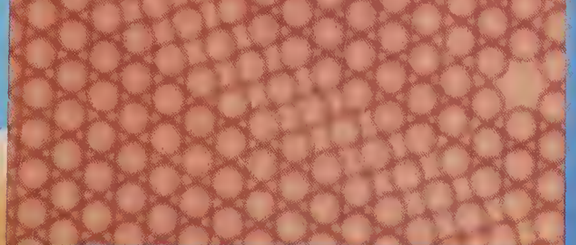
NBS Special Publication 260

NBS Standard Reference Materials Catalog 1986–87

U.S. Department of Commerce
National Bureau of Standards



TO ORDER
PHONE 301/921-2045

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Gaithersburg, Maryland 20899

Dear Colleague:

I hope that you find this new Standard Reference Materials Catalog to be the best edition we have issued. We have tried to make it user oriented to help you find the materials you need both quickly and easily. We think, and hope you will agree, that the revised alphabetical index is a major improvement over earlier editions.

Because finding the right SRM out of almost 1,000 can be difficult, I would like to suggest the following approach:

1. Start with the Contents,
2. Flip though the Catalog to see its organization,
3. Browse through the Alphabetical Index.

Most of the materials are classified by matrix (such as steel) or by use (such as clinical chemistry). However, with such diverse offerings, the categories are not mutually exclusive, and you may find some materials of interest to you in any part of the Catalog.

The 1984–1985 Catalog went to about 45,000 people. At least 60,000 copies of this one will be distributed. I think this indicates an increasing interest in quality measurements. We are happy to be part of this tradition and welcome you to the growing family of SRM users.

Sincerely,

Stanley D. Rasberry

Stanley D. Rasberry

P.S. Please do not hesitate to call us if you have any questions about the SRM's described, their availability, or if you cannot find what you need. We would be happy to have your suggestions for improved service and new SRM's (see Guide for Requesting the Development of New SRM's).

NBS Special Publication 260

NBS Standard Reference Materials Catalog 1986–87

R. W. Seward, Editor

Office of Standard Reference Materials
National Bureau of Standards
Gaithersburg, MD 20899

CAUTION: The values shown in the catalog are nominal values only. Users should consult the certificate issued with an SRM for the certified values.

U.S. Department of Commerce
Malcolm Baldrige, Secretary

National Bureau of Standards
Ernest Ambler, Director

Issued June 1986

National Bureau of Standards
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National Bureau of Standards
Standard Reference Materials 1986–87 Catalog

This catalog describes the Standard Reference Materials (SRM's) currently available from the National Bureau of Standards (NBS), lists those in preparation, and provides ordering information. The descriptions provide nominal values for these SRM's. Certified values are provided in the certificates that accompany each SRM. Price Lists for SRM's are issued as separate supplements to this catalog and include new SRM's as they are issued.

Key Words: analysis, calibration, characterization, composition, concentration, materials, measurement, property, quality assurance, quality control, reference materials, Standard Reference Materials, standardization.

Program Information

The National Bureau of Standards (NBS) offers for sale over 900 different materials through its Office of Standard Reference Materials. These materials are primarily Standard Reference Materials (SRM's) certified for their chemical composition, chemical property, or physical property, but include other reference materials. All materials bear distinguishing names and numbers by which they are permanently identified. Thus, each material bearing a given description is identical (within the specified limits) to every other sample bearing the same designation—with the exception of individually certified items, which are further identified by serial number.

Definitions

From "Terms and definitions used in connection with reference materials," ISO Guide 30–1981 (E):

1. "Reference Material (RM): A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials."

2. "Certified Reference Material (CRM): A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body."

NBS Standard Reference Materials (SRM's): Certified reference materials issued by NBS. These are well-characterized materials produced in quantity to improve measurement science. SRM's are certified for specific chemical or physical properties, and are issued by NBS with certificates that report the results of the characterization and indicate the intended use of the material. They are prepared and used for three main purposes:

(1) To help develop accurate methods of analysis (reference methods);
(2) To calibrate measurement systems used to:
  (a) facilitate exchange of goods,
  (b) institute quality control,
  (c) determine performance characteristics, or
  (d) measure a property at the state-of-the-art limit; and
(3) To assure the long-term adequacy and integrity of measurement quality assurance programs.

NBS certified values are obtained by one of three routes of measurement:

(1) A previously validated reference method,
(2) Two or more independent, reliable measurement methods, or
(3) A network of cooperating laboratories, technically competent and thoroughly knowledgeable with the material being tested.

These measurement routes are described in "The Role of Standard Reference Materials in Measurement Systems," NBS Monograph 148, 54 pages (Jan 1975).

Reference Materials (RM's) listed in this catalog are sold by, but not certified by, NBS. They meet the ISO definition for RM's, and many meet the definition for CRM's. The documentation issued with these materials is either a:

(1) "Report of Investigation," the sole authority of which is the author of the report. RM's are intended to further scientific or technical research on that particular material. The principle consideration in issuing an RM is to provide a homogeneous material so that investigators in different laboratories are assured that they are investigating the same material.

(2) "Certificate," issued by the certifying agency (other than NBS), e.g., other national laboratories, other government agencies, other standardizing bodies, or other non-profit organizations. When deemed to be in the public interest and when alternate means of national distribution do not exist, NBS acts as the distributor for such materials. This service is available to organizations that qualify and have the reference materials that would help meet national measurement needs.

Project managers Ray McKenzie (left) and Bob Alvarez (right) discuss program plans with Stan Rasberry, chief of the Office of Standard Reference Materials (center).

SRM Catalog

New catalogs of NBS Standard Reference Materials are published approximately every two years, listing materials available and materials in preparation, and deleting discontinued materials. Catalog supplements (Price Lists) are issued simultaneously with new catalogs and approximately every six months to keep the catalog current between editions. These supplements list current prices, and reflect any changes in material availability—listing new and renewed materials and dropping discontinued ones.

The numerical values given in this catalog to describe the materials' properties are NOMINAL values only and are to be used only as guides in selecting SRM's. They are NOT TO BE USED in place of the values given on the certificate issued with the materials.

Two indices are provided for user convenience. The first is an alphabetical index that lists categories of materials, elements, and names of materials. The second is a numerical index that lists the numbers, names, and certificate dates of the materials in the catalog.

Preparation and Availability of Standard Reference Materials

New and renewal SRM's are being prepared continually. These SRM's are included in the next edition of the catalog and its supplements. Prospective users that have requested that their names be added to the SRM mail list are notified as these new items become available. To have your name placed on this mail list, please write to the address given below.

Renewal SRM's are intended to be completed before the supply of an existing SRM is exhausted. This is not always possible and an SRM may be out-of-stock for a time. When this occurs, those ordering the material are so notified and possible substitutes (if any) are suggested. When a renewal is issued, customers who have ordered the previous lot are promptly notified of the price and availability of the renewal. If little demand exists or if an alternate source of supply becomes available, production of an SRM may be discontinued permanently.

Renewal SRM's are not identical to the preceeding lot; however, they meet the same specifications and can be used for the same purpose. For example, the first 0.1 percent carbon Bessemer steel was prepared in 1909 (Standard Sample No. 8). Since then a number of renewals, 8a, 8b, 8c, etc., were prepared. The current SRM 8j, Bessemer Steel (Simulated), 0.1% C, represents the eleventh lot of the material. Each lot differs somewhat in detailed analysis, thus the use of the specific certificate for that lot is essential.

Guide for Requesting Development of Standard Reference Materials

The National Bureau of Standards has the function to develop, produce, and distribute Standard Reference Materials (SRM's) that provide a basis for comparison of measurements on materials, and that aid in the control of production processes. To perform this function, the Office of Standard Reference Materials evaluates the requirements of science, industry, and government for carefully characterized reference materials, and directs their production and distribution.

Production manager Tom Gills, deputy chief Bill Reed, and project manager Dick Seward review SRM production costs.

NBS currently has over 900 SRM's available, about 100 new ones in preparation, and requests for the production of many others.

To be an SRM, a candidate material must meet one or more of these criteria:

1. It would permit users to attain more accurate measurements.
2. Its production elsewhere would not be economically or technically feasible.
3. It would be an industry-wide standard for commerce from a neutral source not otherwise available.
4. Its production by NBS would provide continued availability of a well-characterized material important to science, industry, or government.

NBS has recognized and responded to requests to enlarge the scope of the SRM program to include all types of well-characterized materials for use in calibrating measurement systems, or for producing scientific data that can be referred to a common base. However, the requests for new SRM's greatly exceed the Bureau's capacity to produce and certify such materials. Consequently, requests for new SRM's of limited use, or for which the need is not very great, are deferred in favor of requests that clearly show a critical need. To determine which requests receive top priority, NBS needs and uses information supplied by industry and such interested organizations as the American National Standards Institute, American Nuclear Society, American Petroleum Institute, American Society for Testing and Materials, etc.

Accordingly, while NBS welcomes all requests for developing new SRM's, both NBS and industry would be helped if such requests provide information that permit objective assessment of the urgency and importance of the proposed new reference materials.

Requests for the development of new Standard Reference Materials should provide information such as listed below.

1. Short title of the proposed SRM.
2. Purpose for which the SRM would be used.

Lee Klein manages the sales and marketing program, as well as the SRM data processing system.

3. Reasons why the SRM is needed.

4. Special characteristics and requirements for the material. Include additional requirements and reasons if more than one SRM is necessary for standardization in this area.

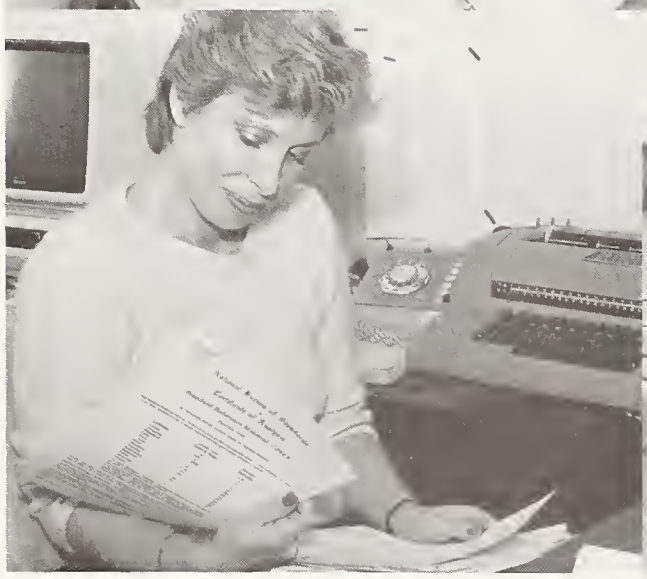
5. An estimate of the probable present and future (6–10 year) demand for such an SRM in your operations and elsewhere. (National and international estimates are useful.)

6. Whether such an SRM, or a similar one, could be produced or obtained from a source other than NBS; and if so, justify its preparation by NBS.

7. Miscellaneous pertinent information to aid justification for the SRM, such as: (a) an estimate of the potential range of application, monetary significance of the measurement affected, scientific and technological significance including, when feasible, estimates of the impact upon industrial productivity, growth, quality assurance or control, and (b) supporting letters from industry leaders, trade organizations, interested committees, and others.

All such requests should be addressed to:

Office of Standard Reference Materials
ATTN: SRM Development
Room B311 Chemistry Building
National Bureau of Standards
Gaithersburg, MD 20899



Dolly Downs (top), Fran Klein (left), and Patty Brletic prepare certificates and other documentation for SRM's.

Ordering Standard Reference Materials

General

Purchase orders for all SRM's, except Special Nuclear Materials, should be addressed to:

Office of Standard Reference Materials
Room B311 Chemistry Building
National Bureau of Standards
Gaithersburg, MD 20899
Telephone: (301) 921-2045
Telex: TRT 197674NBS UT

Purchase orders for Special Nuclear Materials only should be addressed to:

NBS Special Nuclear Standard Reference Materials
U.S. Department of Energy
New Brunswick Laboratory, D-350
9800 South Cass Avenue
Argonne, IL 60439
Telephone: (312) 972-2485
FTS 972-2485

All orders should give the number of units, catalog number, and name of the material requested. For example: "1 each, SRM 79a, Fluorspar (Customs Grade)." The materials described in this catalog are sold only in the units listed or multiples thereof.

Acceptance of an order does not imply acceptance of any provisions set forth in the order contrary to the policy, practice, or regulations of the National Bureau of Standards or the U.S. Government.

In general, orders received for "out-of-stock" material will be filled with the renewal material, if available; otherwise they will be cancelled. Customers are notified when an order is cancelled; and their names are placed on a notification list. This list is used when a renewal material is issued to notify customers

Telephone orders are shipped within three days. Jocelyn Washington, Beth Thomas, and Dana O'Driscoll have direct access to the computer for current sales information and order entry.

of the price and availability of the item. Customers so notified are requested to submit a new order if they still want the item.

For some individually certified SRM's, production lots are small and may entail frequent stock outages. In these cases, the notification list is used to fill orders on a "first come, first served" basis. NOTE: For such SRM's, customers are notified that the SRM is again available and are requested to confirm their original purchase orders.

Terms

Prices quoted are in U. S. dollars ($), and are published in the catalog supplements (price lists). When price lists are issued, they are sent to persons or organizations on the SRM mail list. These prices are subject to change without notice and orders will be billed for the prices in effect at the time of shipment. No discounts are given on purchases of SRM's or RM's.

Remittances of the purchase price need not accompany the purchase order. Payment of invoices is expected within 30 days of the receipt of the invoice. Payment on foreign orders may be made by any of the following:

a. Banker's draft against U.S.A. bank,
b. Bank to bank transfer to U.S.A. bank,
c. Cash against documents,
d. Sight draft,
e. International money order, or
f. UNESCO coupons.

Letters of credit: If a letter of credit or any method of payment other than those listed above is to be used, the services of an agent in the United States must be secured to act in your behalf. Your agent would purchase the material and our invoice would indicate that the agent is the purchaser. The material would be shipped to your agent, who would tranship in accordance with your instructions.

Late Charges

Unless otherwise notified, payment is due within 30 days of shipment of the order to the customer. U.S. Treasury regulations require that late charges be assessed for each 30-day period, or portion thereof, that the payment is overdue.

Proforma Invoice (Price Quotation)

Proforma service will be provided only to those requiring such service.

Domestic Shipments

Shipments of material (except for certain restricted categories and refrigerated items) intended for the United States and Canada are normally shipped prepaid, providing the parcel does not exceed the weight limitations prescribed by postal laws and regulations. Refrigerated items are shipped collect via air express.

Foreign Shipments

The regulations of various nations covering the importation of SRM's differ widely; any attempt to list all possible variations would be impractical. Therefore, where shipping practices outlined below do not apply, purchasers will be informed of the best method of shipment for their countries.

Most foreign orders will be shipped by prepaid International Air Parcel Post. Exceptions are those items in restricted categories, those items requiring refrigeration, and shipments exceeding parcel post weight limits. These exceptions will be shipped FOB Gaithersburg, MD, unless an agent (shipping or brokerage firm) located in the United States is used. When an agent is required, the purchaser will be notified and will be requested to obtain the services of one and inform us of the agent's name and address. In such cases, the material will be packed for overseas shipment and will be forwarded to the agent FOB Gaithersburg, MD.

Documentation

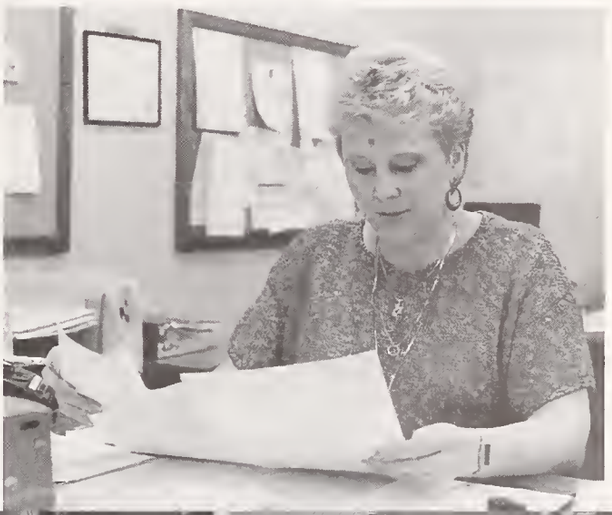
The documents we furnish are:

a. Two commercial invoices,
b. Two sight drafts,
c. Two packing slips, and
d. An air waybill for air shipments.

(All documents are printed in English.)

If documents other than those listed above are required, the services of an agent in the United States will be needed to purchase and ship the material.

NOTE: Orders and inquiries submitted in English will be processed more rapidly than those requiring translation.



Top: Phyllis Wagner prepares hazardous-material documentation for SRM's before materials can be shipped. Below from left: Carlton Fisher, Roger Brown, and Gary Proulx pack and ship some 40,000 SRM's each year.

Certified Reference Materials From Other Sources

Certified reference materials (CRM's) are available from many sources. The International Organization for Standardization (ISO), through its Council Committee on Reference Materials (REMCO), has prepared an international Directory of Certified Reference Materials. Inquiries may be directed to:

Dr. M. Parkany
Secretary for REMCO
International Organization for Standardization
1, Rue de Varembe
Case Postale 56
1211 Geneva 20
Switzerland

The International Union of Pure and Applied Chemistry (IUPAC), through its Commission on Physicochemical Measurements and Standards, issues a catalog of CRM's that are useful for the realization of physicochemical properties. It also has prepared a number of related documents. The current IUPAC edition is: "Physicochemical Measurements: Catalogue of Reference Materials from National Laboratories," Revised 1976, Pure & Appl. Chem., **48**, 503–414 (1976).

Donna Fredericks, systems analyst, keeps the SRM computer programs working properly for sales and inventory control.

Other Services of the National Bureau of Standards

Some of the other services offered by NBS that may be of interest to SRM users are briefly described below.

Calibration and Related Measurement Services

The measurement services of NBS include the calibration of standards, test of instruments, and certain interlaboratory testing programs. These services are described in NBS Special Publication 250, National Bureau of Standards Calibration Services User Guide, 1986–88 ed. [Available from the Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.]

An abbreviated list of the services offered through this program appears under Additional Information. These services are performed at either the NBS Washington laboratories (Gaithersburg, Md.) or those in Boulder, Colo. For additional information on available measurement services, consult Special Publication 250 or write to:

Office of Physical Measurement Services
Room B362 Physics Building
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921–2805

Requests for measurement services available in Boulder should be addressed to:

Measurement Services Clerk
National Bureau of Standards
Boulder, CO 80303

Telephone: (303) 497–3753

Office of Weights and Measures

The NBS Office of Weights and Measures operates a Type Evaluation Program which provides for an evaluation of (1) prototype weighing and measuring devices to determine compliance with the requirements of NBS Handbook 44, "Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices," (2) standards to determine compliance with the requirements of NBS Handbook 105–1, 105–2, 105–3, "Specifications and Tolerances for Reference Standard and Field Standard Weights and Measures." This program may be used by manufacturers and weights and measures officials in determining the acceptability of devices for commercial use or the suitability of reference and field standards. For information on programs of NBS and the States, write or telephone:

Office of Weights and Measures
Room A617 Administration Building
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921–2401

Proficiency Sample Programs

General information on the Proficiency Sample Programs may be obtained from:

Materials Reference Laboratories
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921–3481

Information is available on the following programs:

Proficiency Sample Programs for Hydraulic Cements and Portland Cement Concrete
Proficiency Sample Programs for Soils, Aggregates, and Bituminous Materials
Inspection of Cement and Concrete Testing Laboratories
Inspection of Soils and Bituminous Testing Laboratories

Structural Engineering—High Capacity Testing Machine

The research and testing facilities for structural engineering include a 53-MN (12 million-lbf) capacity universal testing machine believed to be the largest in the world. A significant addition to the nation's facilities for research and testing in the field of large structures, this unique machine is available to do work for the entire technological community upon consideration of requests on a case-by-case basis. This hydraulically operated machine is a vertical, four screw type with the main fixed paten flush with the floor. It is capable of applying 53 MN (12,000,000 lbf) in compression to test specimens up to 17 m (58 ft) in height and 27 MN (6,000,000 lbf) in tension to specimens up to 16 m (53 ft) in length. To extend the versatility of the machine, the reinforced concrete foundation incorporates a floor tie-down system which can accommodate test specimens for transverse loading up to 27 m (90 ft) in length. Calibration of all load ranges indicates that they exhibit errors generally no greater than 0.5 percent of the applied load. For more information, write or telephone:

Structural Engineering Program
Room B168 Building Research
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921-3471

Accreditation of Testing Laboratories

General information about the National Voluntary Laboratory Accreditation Program (NVLAP) or application packages may be obtained from:

Manager, Laboratory Accreditation
Room A531 Administration Building
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921-3431

Information is available for the following specific testing areas:

Program for Thermal Insulation Materials
Program for Freshly Mixed Concrete
Program for Carpet
Program for Solid Fuel Room Heaters
Program for Personnel Dosimeters Processors
Program for Commercial Products (Paint, Paper, Mattresses)
Program for Seals and Sealants
Program for Photographic Film
Program for Electromagnetic Compatibility and Telecommunication Equipment
Acoustical Testing Services

National Center for Standards and Certification Information

The National Center for Standards and Certification Information (NCSCI) contains title information or full texts for more than 240,000 engineering or related standards issued by U.S. technical societies, professional organizations, and trade associations; State purchasing offices; U.S. Federal Government agencies; and major foreign national and international standardizing bodies. NCSCI publishes general and specific indices of standards. Information services which are free consist of searching Key-Word-In-Context (KWIC) Indices to determine whether any published standards, specifications, codes, test methods, or recommended practices exist for a given item or product. Inquiries should be directed to:

National Center for Standards and Certification Information
Room B166 Technology Building
National Bureau of Standards
Gaithersburg, MD 20899

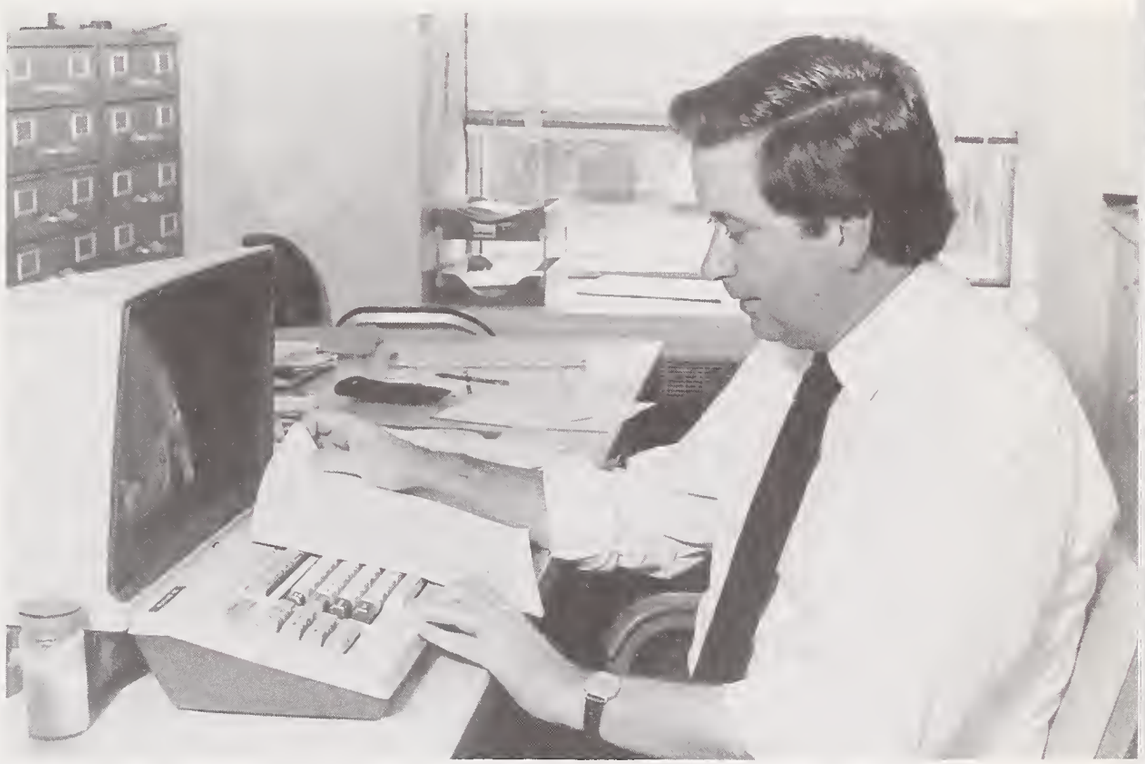
Telephone: (301) 921–2587

National Standard Reference Data System

The National Standard Reference Data System (NSRDS) is a nationwide program established to compile and critically evaluate quantitative physical science data and assure its availability to the technical community. The program publishes compilations of critically evaluated data, critical reviews of experimental techniques, and bibliographies. A complete list of NSRDS publications is available from the Office of Standard Reference Data (OSRD). OSRD responds to queries within the scope of the program by providing references, referrals, documentation, or data, as available. Inquiries or requests for information should be directed to:

Office of Standard Reference Data
Room A323 Physics Building
National Bureau of Standards
Gaithersburg, MD 20899

Telephone: (301) 921–2228



Maintaining stock levels and scheduling packaging activities keep Paul Lundberg busy.

Metal chips for chemical analysis are produced from large billets, ground, sieved, and blended to form homogeneous lots of metals for certification as SRM's.

Chemical Composition

Ferrous Alloys

Steels (Chip Form)

These SRM's are for checking chemical methods of analysis. They consist of steel alloys selected to provide a wide range of analytical values for elements. They are furnished in 150-gram units (unless otherwise noted) as chips usually sized between 0.4 to 1.2 mm, prepared from selected portions of commercial ingots.

Plain Carbon Steels

SRM	Type	Chemical Composition (Nominal Weight Percent)					
		C	Mn	P	S		Si
					Grav	Comb	
8j	Bessemer (simulated), 0.1C	0.081	0.505	0.095		0.077	0.058
11h	BOH, 0.2C	0.200	0.510	0.010		0.026	0.21_1
12h	BOH, 0.4C	0.407	0.842	0.018		0.027	0.235
13g	BOH, 0.6C	0.613	0.853	0.006		0.031	0.35_5
14f	BOH, 0.8C	0.753	0.410	0.009		0.039	0.172
15g	BOH, 0.1C	0.094	0.485	0.005		0.026	0.095
16f	BOH, 1.1C	0.97	0.404	0.014		0.026	0.214
19g	AOH, 0.2C	0.223	0.554	0.046	0.032	0.033	0.186
20g	AISI 1045	0.462	0.665	0.012		0.028	0.305
152a	BOH, 0.5C (Tin bearing)	0.486	0.717	0.012		0.030	0.202
178	Basic Oxygen 0.4C	0.395	0.824	0.012		0.014	0.163
335	BOH, 0.1C (Carbon only) 300 g	0.092					
337a	BOH, 1.1C (Carbon & Sulfur) 300 g	0.969				0.024	
368	AISI 1211	0.089	0.82	0.084		0.132	0.007

SRM	Cu	Ni	Cr	V	Mo	Co	Ti	Sn	Al (total)	N	Other
8j	0.020	0.113	0.047	0.015	0.038						
11h	0.061	0.028	0.025	0.001			0.004				
12h	0.073	0.032	0.074	0.003	0.006				(0.038)	0.006	
13g	0.066	0.061	0.050	0.001					0.04_8		
14f	0.072	0.053	0.070	0.002	0.013				0.060		
15g	0.036	0.017	0.028	0.001							
16f	0.006	0.008	0.020	0.002	0.003	0.003					
19g	0.093	0.066	0.374	0.012	0.013	0.012	0.027	0.008	0.031		Nb 0.026
20g	0.034	0.034	0.036	0.002	0.008				0.040		
152a	0.023	0.056	0.046	0.001	0.036			0.032			
178	0.032	0.010	0.016	0.001	0.003						
368	0.010	0.008	0.030	0.001	0.003					0.010	

Values in parentheses are not certified, but are given for information only.

Low Alloy Steels

SRM	Type	(Other Forms)	Chemical Composition (Nominal Weight Percent)						
			C	Mn	P	S		Si	Cu
						Grav	Comb		
30f	Cr-V (SAE 6150)		0.490	0.79	0.011		0.009	0.283	0.074
32e	Ni-Cr (SAE 3140)		0.409	0.798	0.008	0.022	0.021	0.278	0.127
33e	Ni-Mo (SAE 4820)		0.186	0.525	0.005		0.009	0.262	0.070
36b	Cr2-Mol		0.114	0.404	0.007		0.019	0.258	0.179
72g	Cr-Mo (SAE X4130)		0.278	0.492	0.009		0.014	0.223	0.011
100b	Manganese (SAE T1340)		0.397	1.89	0.023	0.029	0.028	0.210	0.064
106b	Cr-Mo-Al (Nitralloy G)		0.326	0.506	0.008	0.016	0.017	0.274	0.117
125b	High-Silicon	1134	0.028	0.278	0.029		0.008	2.89	0.071
129c	High-Sulfur		0.125	0.769	0.076		0.245	0.020	0.013
131c	Low Carbon-Silicon (100g)	1218	0.0029				0.020		
139b	Cr-Ni-Mo (AISI 8640)	1222	0.403	0.778	0.013		0.019	0.242	0.097
155	Cr0.5-W0.5		0.905	1.24	0.015	0.010	0.011	0.322	0.083
163	Low Alloy, 1.0 Cr (100g)		0.933	0.897	0.007		0.027	0.488	0.087
179	High-Silicon	1135	0.027	0.094	0.006		0.026	3.19	0.056
291	Cr-Mo (ASTM A213)		0.177	0.55_0	0.008		0.020	0.23_0	0.047
293	Cr-Ni-Mo (AISI 8620)		0.222	0.96_0	0.018		0.022	0.30_0	0.032
1036	Low Carbon Silicon (Sulfur only, 25 g)						0.0007		

SRM	Ni	Cr	V	Mo	Sn	Al (total)	N	Other
30f	0.070	0.945	0.182				0.010	
32e	1.19	0.678	0.002	0.023	(0.011)		0.009	
33e	3.36	0.068		0.224		0.030		
36b	0.203	2.18	0.004	0.996				
72g	0.016	0.905	0.003	0.170				
100b	0.030	0.063	0.003	0.237			0.004	
106b	0.217	1.18	0.003	0.199		1.07		
125b	0.038	0.019		0.008	0.003	0.329		Ca0.0051
129c	0.251	0.014	0.012	0.002				
139b	0.510	0.488	0.004	0.182			0.007	
155	0.100	0.485	0.014	0.039				W0.517
163	0.081	0.982		0.029			0.007	
179	0.050	0.022	<0.01	0.014	0.004	0.0028		
291	0.065	1.33		0.53_8		0.002		
293	0.48_0	0.51_0	0.004	0.20_4		0.039		

Special Low Alloy Steels

SRM	Type	(Other forms)	C	Mn	P	S	Si	Cu	Ni	Cr
361	AISI 4340	661,1095,1261a	0.383	0.66	0.014	0.014	0.222	0.042	2.00	0.69_4
362	AISI 94B17 (Mod)	662,1096,1262a	0.160	1.04	0.041	0.036	0.39	0.50	0.59	0.30
363	Cr-V (Mod)	663,1097,1263a	0.62	1.50	0.02_9	0.0068	0.74	0.10	0.30	1.31
364	High Carbon (Mod)	664,1098,1264a	0.87	0.25_5	0.01	0.0250	0.06_5	0.24_9	0.14_4	0.06_3
365	Iron, Electrolytic	665,1099,1265a	0.0068	0.0056	0.002_5	0.0055	0.008_0	0.058	0.041	0.007_2

SRM	V	Mo	W	Co	Ti	As	Sn	Al (total)	Nb	Ta	Zr	N	Ca
361	0.011	0.19	0.017	0.032	0.020	0.017	0.010	0.02_1	0.022	0.020	0.009	(0.0037)	0.0001_0
362	0.040	0.068	0.20	0.30	0.084	0.09_2	0.016	0.09_5	0.29	0.20	0.19	(0.00404)	0.0002_1
363	0.31	0.028	0.046	0.048	0.050	0.010	0.10_4	0.24	0.049	(0.053)	0.049	(0.0041)	0.0002_2
364	0.10_5	0.49	0.10	0.15	0.24	0.05_2	0.008	(0.008)	0.15_7	0.11	0.068	(0.0032)	0.00003
365	0.0006	0.0050		0.007_0	0.0006	(0.0002)	(0.0002)	(0.0007)				0.0013	

SRM	B	Pb	Sb	Bi	Ag	Se	Te	Ce	La	Nd	Fe
361	0.0003_7	0.00002_5	0.0042	(0.0004)	0.0004	(0.004)	(0.0006)	0.0040	(0.001)	0.0007_5	(95.6)
362	0.0025	0.0004_8	0.013	(0.002)	0.0011	(0.0012)	(0.0011)	0.0019	(0.001)	0.0007_5	(95.3)
363	0.0007_8	0.0018_6	0.002	(0.0008)	0.0037	(0.00016)	(0.0009)	0.0030	(0.002)	0.0012	(94.4)
364	0.0106	0.023_0	0.034	(0.0009)	(0.00002)	(0.00021)	(0.0002)	0.0005_7	(0.0002)	0.0001_5	(96.7)
365	0.00012	0.00001_9									99.90

SRM	Mg	Zn	Pr	Ge	O	H	Au	Hf	Sr
361	0.0002_6	(0.0001)	(0.0003)	[0.006]	(0.0009)	(<0.0005)	(<0.00005)	(0.0002)	(<0.0005)
362	0.0006_8	(0.0005)	(0.0003)	[0.002]	(0.00107)	(<0.0005)	(<0.00005)	(0.0003)	(<0.0005)
363	0.0006_2	(0.0004)	(0.0004)	[0.010]	(0.00066)	(<0.0005)	0.0005	(0.0005)	
364	0.00016	[0.001]	(0.0001)	[0.003]	(0.0010)	(<0.0005)	0.0001	(0.0013)	(0.001)

Values in parentheses are not certified, but are given for information only.
Brackets indicate approximate value from heat analysis.

High Alloy Steels

SRM	Type	(Other Forms)	Chemical Composition (Nominal Weight Percent)						
			C	Mn	P	S		Si	Cu
						Grav	Comb		
126c	High-Nickel (36% Ni)	1158	0.025	0.468	0.004		0.005	0.194	0.040
344	Cr15–Ni7–Mo2–Al1		0.069	0.57	0.018		0.019	0.395	0.106
345	Cr16–Ni4–Cu3		0.048	0.224	0.018	0.012	0.012	0.610	3.44
346a	Valve Steel	1233	0.502	9.16	0.031		0.002	0.219	0.375
348	Ni26–Cr15 (A286)		0.044	1.48	0.015		0.002	0.54	0.22

SRM	Ni	Cr	V	Mo	Co	Ti	Al (total)	Nb	Ta	B	Fe
126c	36.05	0.062	0.001	0.011	0.008						
344	7.28	14.95	0.040	2.40		0.076	1.16				
345	4.24	16.04	0.041	0.122	0.089			0.231	0.002		
346a	3.43	21.08	0.096	0.237	(0.05)	(<0.001)	(0.001)	(0.01)		(<0.001)	N0.415
348	25.8	14.54	0.25	1.3		2.24	0.23			0.0031	53.3

Solid metal SRM's are resurfaced as needed for optical emission spectroscopy.

Stainless Steels

SRM	Type	(Other Forms)	Chemical Composition (Nominal Weight Percent)					
			C	Mn	P	S	Si	Cu
73c	Cr13 (SAE 420)		0.310	0.330	0.018	0.036	0.181	0.080
101f	Stainless (AISI 304 L) (100g)		0.014	0.087	0.008	0.008	0.876	0.030
121d	Cr17–Ni11–Ti0.3 (AISI 321)	1171	0.067	1.80	0.019	0.013	0.54	0.121
123c	Cr17–Ni11–Nb0.6 (AISI 348)	1172	0.056	1.7_5	0.024	0.014	0.59	0.103
133b	Cr13–Mo0.3–S0.3		0.128	1.07	0.018	0.328	0.327	0.080
160b	Cr19–Ni12–Mo3	1155	0.044	1.64	0.020	0.018	0.50_9	0.172
166c	Low Carbon (AISI 3162) Carbon Only (100g)		0.0078					
339	Cr17–Ni9–Se0.2 (SAE 303Se)		0.052	0.738	0.129	0.013	0.654	0.199
343a	Cr16–Ni2 (AISI 431)	1219	0.149	0.42	0.026	0.001	0.545	0.162
367	Cr24–Ni0.3 (AISI 446)	1267	0.093	0.315	0.018	0.016	0.58	

SRM	Ni	Cr	V	Mo	Co	Ti	Nb	Ta	Pb	Se	N
73c	0.246	12.82	0.030	0.091							0.037
101	9.96	18.49	0.034	0.007	0.088						
121d	11.17	17.4_3		0.165	0.10	0.342					
123c	11.3_4	17.4_0		0.22	0.12		0.65	<0.001			
133b	0.230	12.63	0.071	0.052							
160b	12.2_6	18.4_5	0.047	2.38	0.10_1				0.001		0.03_9
339	8.89	17.42	0.058	0.248	0.096					0.247	
343a	2.16	15.64	0.056	0.164	(0.04)	(<0.001)	(0.01)		(<0.0001)		0.078
367	0.29	24.19	0.08								0.168

Tool Steels

SRM	Type	Chemical Composition (Nominal Weight Percent)						
		C	Mn	P	S		Si	Cu
					Grav	Comb		
50c	W18–Cr4–V1	0.719	0.342	0.022	0.010	0.009	0.311	0.079
132b	Mo-W-Cr-V	0.864	0.341	0.012		0.004	0.185	0.088
134a	Mo8–W2–Cr4–V1	0.808	0.218	0.018	0.007	0.007	0.323	0.101
153a	Co8–Mo9–W2–Cr4–V2	0.902	0.192	0.023	0.007	0.007	0.270	0.094

SRM	Ni	Cr	V	Mo	W	Co	Sn	As	N
50c	0.069	4.13	1.16	0.082	18.44		0.018	0.022	0.012
132b	0.230	4.38	1.83	4.90	6.28	0.029			
134a	0.088	3.67	1.25	8.35	2.00				
153a	0.168	3.72	2.06	8.85	1.76	8.47			0.024

Steels (Solid Form)

These SRM's are furnished in various forms. The 600 series is for microchemical methods of analysis such as electron probe microanalysis, spark source mass spectrometric analysis, and laser probe analysis. The 1100, 1200, and 1700 series are for optical emission and x-ray spectroscopic methods of analysis. These materials have been prepared to ensure high homogeneity.

NOTE: Values in parentheses are not certified, but are given for additional information on the chemical composition.

Nominal Sizes for Solid Steel SRM's:

600 Series: 3.2 mm (⅛ in) diameter, 51 mm (2 in) long.
1100, 1200, and 1700 Series: 31 mm (1¼ in) diameter, 19 mm (¾ in) thick.
C indicates a chill cast sample: 31 mm (1¼ in) diameter, 19 mm (¾ in) thick.

Low-Alloy Steels

SRM	Type	(Other Forms)	Chemical Composition (Nominal Weight Percent)				
			C	Mn	P	S	Si
1134	High-Silicon	125b	0.026	0.277	0.028	0.009	2.89
1135	High-Silicon	179	0.027	0.094	0.006	0.026	3.19
1136	High-Sulfur	129c	0.11_3	0.75_5	0.066	0.220	0.018
1169b	Lead-Bearing		0.1	(1.1)	(0.07)	(0.3)	(0.01)
1217	Nickel	33e	0.186	0.525	0.005	0.009	0.262
1218	Low Carbon and Sulfur Silicon	131c	0.0029	0.014	(0.002)	0.0011	(3.2)
C1221	Resulfurized/Rephosphorized		0.020	0.102	0.090	0.112	0.876
1222	Cr-Ni-Mo (AISI 8640)	139b	0.43	0.78	0.013	0.022	0.24
1224	Carbon		0.75	0.41	0.009	0.039	0.173
1225	Low Alloy (AISI 4130)		0.274	0.48	0.007	0.014	0.221
1226	Low Alloy		0.085	0.274	0.0022	0.0044	0.231
1227	Basic Open Hearth, 1% C		0.97	0.402	0.014	0.026	0.215
1228	Basic Open Hearth, 0.1% C		0.072	0.365	0.004	0.018	0.007
1254	Ca in Low Alloy (Si)		(0.03)	(0.28)	(0.03)	(0.008)	(2.9)
*661 1261a	AISI 4340	361,1095	0.39	0.66	0.015	0.015	0.223
*662 1262a	AISI 94B17 (Mod)	362,1096	0.163	1.05	0.044	0.037	0.40
*663 1263a	Cr-V (Mod)	363,1097	0.57	1.50	0.02_9	0.0055	0.74
*664 1264a	High Carbon (Mod)	364,1098	0.871	0.25_8	0.010	0.025	0.066
*665 1265a	Electrolytic Iron	365,1099	0.008	0.0057	0.002_5	0.0059	0.0080
1269	Low Alloy (AISI 1526, Mod)		0.298	1.35	0.012	0.0061	0.189
1270	Cr-Mo Low Alloy		0.077	0.626	0.0065	0.0065	0.247
C1285	Low Alloy (A242 Mod)		0.058	0.332	0.072	0.020	0.36
1286	Low Alloy (Hy 80)		0.196	0.152	0.008	0.017	0.130
1761	Low Alloy A		(IN PREP)				
1762	Low Alloy B		(IN PREP)				

Low-Alloy Steels (Continued)

SRM	Type	(Other Forms)	Chemical Composition (Nominal Weight Percent)				
			C	Mn	P	S	Si
1763	Low Alloy C		(IN PREP)				
1764	Low Alloy D		(IN PREP)				
1765	Low Alloy E		(IN PREP)				
1766	Low Alloy F		(IN PREP)				
1767	Low Alloy G		(IN PREP)				

SRM		Cu	Ni	Cr	V	Mo	W	Co	Ti
	1134	0.070	0.038	0.019		0.008			
	1135	0.056	0.050	0.022	<0.01	0.014			
	1136	0.014	0.270	0.014	0.012	0.002			
	1169b	(0.07)	(0.04)	(0.05)	(0.001)	(0.01)			
	1217	0.070	3.36	0.068	(0.001)	0.224		(0.06)	(0.001)
	1218	0.003	(0.002)	0.006	(<0.001)	(0.003)		(0.002)	(0.004)
	C1221	0.041	0.067	0.049	(0.0007)	0.038		(0.010)	(0.0014)
	1222	0.097	0.51	0.48	0.005	0.18		(0.016)	(0.002)
	1224	0.072	0.054	0.071	0.002	0.013			
	1225		0.018	0.91	0.004	0.166			
	1226	0.125	5.42	0.467	0.0018	0.446	(0.005)	0.029	0.0021
	1227	0.006	0.007	0.019	0.002	0.003		0.003	(0.0008)
	1228	0.012	0.018	0.016	<0.001	0.009			
	1254	(0.07)	(0.04)	(0.02)		(0.008)			
*661	1261a	0.042	1.99	0.69	0.011	0.19	0.017	0.032	0.020
*662	1262a	0.51	0.60	0.30	0.04_1	0.07_0	0.21	0.30	0.084
*663	1263a	0.098	0.32	1.31	0.31	0.030	0.046	0.048	0.050
*664	1264a	0.250	0.142	0.06_6	0.10_6	0.49	0.10_2	0.15	0.23
*665	1265a	0.0058	0.041	0.007_2	0.0006	0.005	(0.0004)	0.007_0	0.0006
	1269	0.095	0.108	0.201	0.004	0.036	(0.001)	(0.014)	(0.009)
	1270	0.114	0.174	2.34	0.013	0.956	(0.003)	0.038	(0.003)
	C1285	0.37	1.17	0.80					
	1286	0.043	2.81	1.53					

Low-Alloy Steels (Continued)

	SRM	As	Sn	Al (total)	B	Pb	Ag	Ge
	1134		0.003	0.329				
	1135		0.004	0.0028				
	1169b					0.193		
	1217			0.030				
	1218			0.005				Zr(0.002)
	C1221			0.111				
	1222			(0.038)				
	1224			0.060				
	1226		(0.003)	0.054				
	1227			(0.028)				
	1228			0.061				
	1254		(0.003)	(0.33)				Ca 0.0053
*661	1261a	0.017	0.011	0.02_1	0.0005	0.00002_5	0.0004	[0.006]
*662	1262a	0.092	0.016	0.09_5	0.0025	0.0004_3	(0.001)	[0.002]
*663	1263a	0.010	(0.095)	0.24	0.0009_1	0.0022	(0.0037)	[0.010]
*664	1264a	0.05_2	[0.005]	(0.008)	0.011	0.024	(0.00002)	[0.003]
*665	1265a	(0.0002)	(0.0002)	(0.0007)	0.00013	0.00001_5	(0.000002)	(~0.0014)
	1269	(0.006)	(0.039)	0.016	(<0.001)	0.005	(0.0002)	
	1270	(0.02)	(0.02)	(0.005)	(0.0033)	(0.0016)	(0.0001)	

	SRM	O	N	H	Nb	Ta	Zr
*661	1261a	(0.0009)	(0.0037)	[<0.0005]	0.022	0.020	0.009
*662	1262a	(0.0011)	(0.0041)	[<0.0005]	0.30	0.21	0.20
*663	1263a	(0.0007)	(0.0041)	[<0.0005]	0.049	(0.053)	0.050
*664	1264a	[0.0017]	[0.003]	[<0.0005]	0.15_7	0.11	0.69
*665	1265a	(0.0063)	(~0.0011)	(~0.0001)		(<0.00005)	(<0.00001)

	SRM	Sb	Bi	Ca	Mg	Te	Zn
*661	1261a	0.0042	0.0004	(<0.0001)	(0.0001)	0.006	(0.0001)
*662	1262a	0.012_0	(0.002)	(0.0002)	(0.0006)	(0.0005)	(0.0005)
*663	1263a	0.002	(0.0008)	(<0.0001)	(0.0005)	(0.0022)	(0.0004)
*664	1264a	(0.035)	(0.0009)	(<0.0001)	(0.0001)	[0.0002]	[0.001]
*665	1265a	-(<0.00005)	-(<0.00001)	-(<0.00001)	-(<0.00002)	-(<0.00001)	(<0.0001)

	SRM	Au	Ce	Hf	La	Nd	Pr	Fe
*661	1261a	(<0.00005)	0.0013	[0.0002]	0.0004	0.0003	(0.00014)	(95.6)
*662	1262a	(<0.00005)	(0.0011)	[0.006]	0.0004	(0.0005)	(0.00012)	(95.3)
*663	1263a	0.0005	(0.0016)	[0.0015]	0.0006	(0.0007)	(0.00018)	(94.4)
*664	1264a	0.0001	(0.00025)	[0.005]	0.00007	(0.00012)	(0.00003)	(96.7)
*665	1265a	-(<0.000002)	-(<0.000005)	-(<0.00002)	-(<0.000005)	-(<0.000005)	-(<0.000005)	(99.9)

*SRM's 661, 662, 663, 664, and 665 are sold in a set only as SRM 668.
Values in parentheses are not certified, but are given for information only.
Brackets indicate approximate value from heat analysis.

Stainless Steels

SRM	Type	Other Forms	Chemical Composition (Nominal Weight Percent)							
			C	Mn	P	S	Si	Cu	Ni	Cr
C1151	Cr22-Ni7		0.039	2.50	0.017	0.038	0.38	0.418	7.29	22.70
C1152	Cr18-Ni10		0.148	0.96	0.021	0.0064	0.80	0.102	10.88	17.81
C1153	Cr16-Ni8		0.264	0.50	0.030	0.018	1.07	0.23	8.77	16.69
C1154	Cr19-Ni12		0.086	1.42	0.06	0.053	0.50	0.40	12.92	19.06
1155	Cr18-Ni12-Mo2 (AISI 316)	160b	0.046	1.63	0.020	0.018	0.502	0.169	12.18	18.45
1170b	Selenium-Bearing		(0.052)	(0.738)	(0.129)	(0.013)	(0.654)	(0.199)	(8.89)	(17.42)
1171	Cr17-Ni11-Ti0.3	121d	0.067	1.8_0	0.018	0.01_3	0.54	0.121	11.2	17.4
1172	Cr17-Ni11-Nb0.6	123c	0.056	1.7_6	0.025	0.01_4	0.59	0.10_5	11.3_5	17.4_0
1219	Cr16-Ni2 (AISI 431)	343a	0.149	0.42	0.026	0.001	0.545	0.162	2.16	15.64
1223	Chromium Steel	133b	0.127	1.08	0.018	0.329	0.327	0.081	0.232	12.64
1267	AISI 446	367	0.093	0.315	0.018	0.015	0.58		0.29	24.14
C1287	AISI 310 Mod.		0.36	1.66	0.029	0.024	1.66	0.58	21.16	23.98
C1288	A-743		0.056	0.83	0.023	0.010	0.41	3.72	29.3	19.55
C1289	AISI 414 Mod.		0.014	0.35	0.017	0.021	0.156	0.205	4.13	12.12

SRM	V	Mo	Co	Ti	N	Al	Nb	Ta	W	Pb	Zr
C1151	0.037	0.80	0.032							0.0039	
C1152	0.030	0.43	0.22							0.0047	
C1153	0.18	0.24	0.127							0.0054	
C1154	0.135	0.07	0.38							0.0178	
1155	0.047	2.38	0.101							0.001	
1170b	(0.058)	(0.248)	(0.096)								Se 0.23
1171		0.16_5	0.10	0.34							
1172		0.22	0.12				0.65	<0.001			
1219	0.056	0.164	(0.04)	(<0.001)	0.078	(0.001)	(0.01)	Sn(0.008)	(0.02)	(<0.0001)	B(<0.001)
1223	0.068	0.053			(0.05)	(<0.005)		Sn(0.004)		(0.0001)	
1267	0.08				0.17						
C1287	0.09	0.46	0.31	0.050	(0.034)	(0.06)	(0.07)	O(0.017)		0.008	(0.006)
C1288	0.086	2.83	0.10	0.012	(0.028)	(0.0025)	(0.22)	O(0.029)	(0.2)	0.0041	(0.002)
C1289	0.007	0.82	0.035	0.005	(0.017)	(0.0016)	(0.10)	O(0.027)		0.0005	(0.001)

Values in parentheses are not certified, but are given for information only.

Specialty Steels

SRM	Type	Chemical Composition (Nominal Weight Percent)											
		C	Mn	P	S	Si	Cu	Ni	Cr	V	Mo	W	Co
1157	Tool (AISI M2)	0.836	0.34	0.011	0.004	0.18	0.088	0.228	4.36	1.82	4.86	6.28	0.028
1158	High-Nickel (Ni 36)	0.025	0.468	0.004	0.005	0.194	0.039	36.03	0.062	0.001	0.010		0.008
1233	Valve Steel (IN PREP)												

High-Temperature Alloys

SRM	Type	Chemical Composition (Nominal Weight Percent)					
		C	Mn	P	S	Si	Cu
1199*	L 605	(0.14)	1.42	(0.005)		0.83	
1200*	S 816	(0.40)	1.34	(0.015)		0.86	
1207–2	Waspaloy	0.083	0.29_5	0.005	0.009	0.61_5	0.033
1244	Inconel 600	0.062	0.29	0.010	0.003	0.12	0.26
1245	Inconel 625	0.036	0.18	0.011	0.001	0.40	0.37
1246	Incoloy 800	0.082	0.91	0.018	0.001	0.18	0.49
1247	Incoloy 825	0.021	0.38	0.018	0.002	0.32	1.75

SRM	Ni	Cr	Mo	Co	Ti	Al	Nb	Ta	Fe	W	B
1199	10.2	19.9	(<0.02)	51.6	(<0.01)		(<0.02)		0.6_5	15.4	
1200	20.0	19.9	4.0_0	42.0	(0.03)		3.1_8	1.08	3.19	3.8_6	
1207–2	55.7	19.4_4	4.34	13.5_0	2.54	1.3_9			2.09		
1244	73.2	15.7	0.20	0.058	0.25	0.26	(0.14)		9.6		<0.05
1245	59.5	21.9	8.6	0.074	0.28	0.26	3.5	<0.01	4.5		<0.001
1246	30.8	20.1	0.36	0.076	0.38	0.30	(0.09)		46.2		<0.001
1247	43.5	23.4	2.73	0.089	0.75	0.060	(0.46)		26.5		<0.002

Values in parentheses are not certified, but are given for information only.
*SRM's 1199 and 1200 sold only in a set as S1199.

Steelmaking Alloys

These SRM's are for checking chemical methods of analysis for major constituents and for selected minor elements. They are furnished as fine powders (usually <0.1 mm).

SRM	Type	Wt/Unit (grams)	Chemical Composition (Nominal Weight Percent)							
			C	Mn	P	S	Si	Cu	Ni	O
57a	Refined Silicon	60	0.024	0.015	0.003	0.003	98.55	0.004	0.008	(~0.3)
58a	Ferrosilicon (73Si)	75	0.014	0.16	0.009	<0.002	73.20	0.024	0.012	(0.20)
59a	Ferrosilicon (50Si)	50	0.046	0.75	0.016	0.002	48.10	0.052	0.033	
195	Ferrosilicon (75Si)	75	0.034	0.17	0.02	<0.002	75.3	0.047	0.032	0.42
64c	Ferrochromium HC	100	4.68	0.16	0.020	0.067	1.22	0.005	0.43	
196	Ferrochromium LC	100	0.035	(0.282)	0.020	0.003	0.373			
71	Calcium Molybdate	60								
90	Ferrophosphorus	75			26.2					
340	Ferroniobium	100	0.061	1.70	0.036		4.39		Sn 0.063	
68c	Ferromanganese HC	100	6.72	80.04	0.19	0.008	0.225			
689	Fe-Cr-Si	100	0.043	0.32	0.026	0.002	39.5	0.013	0.20	(0.06)

SRM	Cr	V	Mo	Ti	Al	Nb	Zr	Ca	Fe	B	As
57a	0.024	0.013	Pb<0.001	0.040	0.47		0.002	0.17	0.50	0.001	<0.001
58a	0.020	(0.002)	(0.01)	0.051	0.95	Co<0.01	0.002	0.30	25.23	0.0010	
59	0.08				0.35			0.042	50.05	0.058	
195	0.047	(0.001)	(0.01)	0.037	0.046	Co<0.01	(<0.02)	0.053	23.6	0.001	(0.0024)
64c	68.00	0.15		0.02		Co0.051		N0.045	24.98		
196	70.83	(0.12)									
71			35.29	0.063					1.92		
90											
340				0.89		57.51	Ta3.73				
68c	0.074								12.3		0.021
689	36.4	0.09	Pb(0.004)	0.40	0.049	Co0.034	Bi(<0.003)	N(0.002)	23.2	0.0017	(0.009)

Values in parentheses are not certified, but are given for information only.

Cast Irons (Chip Form)

These SRM's are furnished in 150-g units (unless otherwise noted) for use in checking chemical methods of analysis.

SRM	Type	Chemical Composition (Nominal Weight Percent)							
			C	Mn	P		S	Si	Cu
		Total	Graphitic			Grav	Comb		
3d	White (110g)	2.54		0.40	0.025		0.052	1.31	0.043
4k	Cast	3.2_2	2.6_5	0.82_5	0.149		0.043	1.33	0.24_3
5L	Cast	2.60	1.98	0.68	0.2804		0.124	1.82	1.01
6g	Cast	2.85	2.01	1.05	0.557		0.124	1.05	0.502
7g	Cast (High Phosphorus)	2.69	2.59	0.612	0.794	0.061	0.060	2.41	0.128
82b	Cast (Ni-Cr)	2.85	2.37	0.745	0.025		0.007	2.10	0.038
107c	Cast (Ni-Cr-Mo)	2.99	1.98	0.480	0.079		0.059	1.21	0.205
115a	Cast (Cu-Ni-Cr)	2.62	1.96	1.00	0.086	0.064	0.065	2.13	5.52
122h	Cast (Car Wheel)	3.52	2.82	0.543	0.311		0.072	0.513	0.028
334	Gray Cast	2.83					0.043		
338	White Cast	3.33		(0.76)	(0.054)		0.015	(1.82)	(0.27)
341	Ductile	1.81	1.23	0.92	0.024	0.007	0.007	2.44	0.152
342a	Nodular	1.86	1.38	0.274	0.019		0.006	2.73	0.135
365	Electrolytic Iron	0.0068		0.0056	0.0025		0.0055	0.0080	0.0058
890	HC 250+V	2.91		0.62	0.025		0.015	0.67	0.055
891	Ni-Hard, Type I	2.71		0.55	0.038		0.029	0.56	0.150
892	Ni-Hard, Type IV	3.33		0.76	0.054		0.015	1.83	0.270

SRM	Ni	Cr	V	Mo	Co	Ti
3d	0.025	0.03	(0.002)	(0.007)		(0.003)
4k	0.042	0.116	0.024	0.040	Zn(<0.001)	(0.03)
5L	0.086	0.148	0.034	0.020		0.050
6g	0.135	0.370	0.056	0.035		0.059
7g	0.120	0.048	0.010	0.012		0.044
82b	1.22	0.333	0.027	0.002		0.027
107c	2.20	0.693	0.015	0.83		0.19
115a	14.49	1.98	0.014	0.050		0.020
122h	0.078	0.052	0.041	(0.003)		0.034
338	(5.5)	(10.2)	(0.04)		(0.32)	
341	20.32	1.98	0.012	0.010		0.018
342a	0.06	0.058		0.006		0.020
365	0.041	0.007_2	0.0006	0.0050	0.007_2	0.0006
890	0.397	32.4	0.45	0.108	(0.03)	
891	4.48	2.23	0.039	0.27	0.19	(0.01)
892	5.53	10.18	0.041	0.20	0.31	(0.02)

Cast Irons (Chip Form) (Continued)

SRM	As	Sn	Al (total)	Mg	N	Fe
4k	(0.03)	(0.004)	(0.004)	Sb(<0.001)	(0.0016)	Pb(0.001)
5L					0.005	
6g	0.042				0.005	
7g	0.014				0.004	
341				0.068		
342a				0.070		
365	(0.0002)	(~0.0002)	(0.0007)	Pb0.000019	0.001	99.90
890	(0.008)		(<0.01)		(0.089)	(61.8)
891	(0.004)	(<0.01)	(0.008)		(0.012)	(88.5)
892	(0.006)	(0.02)	(0.009)		(0.019)	(77.4)

Values in parentheses are not certified, but are for information only.

Cast Steels, White Cast Irons, Ductile Irons, and Blast Furnace Irons (Solid Form)

These SRM's are for analysis of cast steels and cast irons by rapid instrumental methods.

SRM	Type	Chemical Composition (Nominal Weight Percent)							
		C	Mn	P	S	Si	Cu	Ni	Cr
C1137a	White Cast Iron	2.86	0.52	0.087	0.017	1.15	0.192	2.17	0.643
1138a	Cast Steel (No. 1)	0.11_8	0.35	0.035	0.056	0.25	0.09	0.10	0.13
1139a	Cast Steel (No. 2)	0.79_0	0.92	0.012	0.013	0.80	0.47	0.98	2.1_8
1144a	Blast Furnace Iron (2)	4.32	1.23	0.08_4	0.083	0.18_2	0.09_1	0.06_3	0.029
1145	White Cast Iron	2.85	0.040	0.24	0.21	0.29	0.52	0.59	0.67
1146	White Cast Iron	2.01	1.64	0.55	0.022	3.68	1.49	3.01	2.56
C1150a	White Cast Iron	3.48	0.81	0.063	0.070	1.24	0.092	0.074	0.95
C1173	Cast Steel 3	0.453	0.174	0.031	0.092	1.38	0.204	4.04	2.63
1173	Ni-Cr-Mo-V Steel	0.423	0.19	0.033	0.092	1.28	0.204	4.06	2.70
C1290	High Alloy (HC-250+V)	3.04	0.66	0.030	0.013	0.971	0.065	0.917	30.5
C1291	High Alloy (Ni-Hard, Type I)	2.67	1.14	0.028	0.032	1.34	0.26	4.34	2.78
C1292	High Alloy (Ni-Hard, Type IV)	3.47	0.55	0.049	0.016	0.59	0.36	5.04	11.4
C2423	Ductile Iron	3.76	0.98	0.27	(0.0006)	1.67	1.55	0.146	0.322
C2423a	Ductile Iron	3.66	0.91	0.246	(<0.001)	1.59	1.61	0.147	0.322
C2424	Ductile Iron	2.68	0.268	0.041	0.024	3.37	0.125	0.061	0.13
C2424a	Ductile Iron	2.76	0.207	0.034	0.016	3.30	0.099	0.045	0.15
C2425	Ductile Iron	3.26	0.76	0.191	0.012	2.50	0.47	0.55	0.092
C2425a	Ductile Iron	3.30	0.72	0.188	0.010	2.38	0.47	0.57	0.085

Cast Steels, White Cast Irons, Ductile Irons, and Blast Furnace Irons (Solid Form) (Continued)

SRM	V	Mo	Ti	As	Al	Te	Co
C1137a	0.019	0.86	(0.04)		(0.007)	Mg0.032	Ce0.016
1138a	0.020	0.05	(0.0012)	(<0.005)	(0.067)		
1139a	0.26	0.51	(0.004)	(<0.005)	(0.13)		
1144a	0.02_5	(0.007)	0.32	(0.004)	(<0.005)	0.02_2	
1145	0.11	0.48	0.017				0.058
1146	0.20	1.51	0.20				0.13
C1150a	0.034	0.074	0.045				0.014
C1173	0.42	1.46	0.037	(0.02)	(0.005)		0.064
1173	0.42	1.50	(0.015)			Nb(0.045)	0.076
C1290	0.442	(0.041)					
C1291	0.031	0.32					
C1292	0.041	0.25					
C2423	0.048	0.155	0.10		(0.09)		(0.02)
C2423a	0.043	0.159	0.10		(0.08)		(0.01)
C2424	0.083	0.019	0.050		(<0.01)		(0.05)
C2424a	0.081	0.019	0.045		(<0.01)		(0.05)
C2425	0.013	0.30	0.19		(0.02)		(0.02)
C2425a	0.013	0.29	0.20		(0.02)		(0.03)

SRM	Mg	Ce	La	B
C2423	0.058	0.036	0.011	(0.01)
C2423a	0.076	0.031	0.0042	(0.01)
C2424	0.006	0.0046	0.0011	(0.002)
C2424a	0.014	0.0053	0.0010	(0.001)
C2425	0.040	0.0062	0.0015	(0.10)
C2425a	0.047	0.023	0.0037	(0.1)

Values in parentheses are not certified, but are given for information only.

Nonferrous Alloys

Aluminum-Base Alloys

SRM	Type	Wt/ Unit (grams)	Chemical Composition (Nominal Weight Percent)					
			Mn	Si	Cu	Ni	Cr	V
85b	Wrought (Chip)	75	0.61	0.18	3.99	0.084	0.211	0.006
87a	Al-Si (Chip)	75	0.26	6.24	0.30	0.57	0.11	<0.01
853	Alloy 3004 (Chip)	30	1.26	0.18	0.15	0.004	<0.001	0.017
1240	Alloy 3004	Disk	1.26	0.18	0.15	0.004	<0.001	0.017
854	Alloy 5182 (Chip)	30	0.38	0.16	0.050	0.020	0.030	0.016
1241	Alloy 5182	Disk	0.38	0.16	0.050	0.020	0.030	0.016
855	Casting Alloy 356 (fine millings)	30	0.057	7.17	0.13	0.015	0.013	
1255a	Casting Alloy 356 (IN PREP)	Disk						
856	Casting Alloy 380 (fine millings)	30	0.35	9.21	3.51	0.37	0.055	
1256a	Casting Alloy 380 (IN PREP)	Disk						
1257	High Purity (IN PREP)	Disk						
858	Alloy 6011 (modified) (fine millings)	35	0.48	0.79	0.84	0.0006	0.0011	0.0030
1258	Alloy 6011 (35mm D×19mm thick)	Disk	0.48	0.78	0.84	0.0006	0.0011	
859	Alloy 7075 (fine millings)	35	0.078	0.17	1.59	0.063	0.176	0.0082
1259	Alloy 7075 (35mm D×19mm thick)	Disk	0.079	0.18	1.60	0.063	0.173	

SRM	Ti	Sn	Ga	Fe	Pb	Mg	Zn	Zr	Be
85b	0.022		0.019	0.24	0.021	1.49	0.030		
87a	0.18	0.05	0.02	0.61	0.10	0.37	0.16		
853	0.018		0.018	0.50		1.11	0.052	0.002	
1240	0.022		0.018	0.50		1.11	0.052	0.002	
854	0.030		0.018	0.20		4.54	0.051	0.002	
1241	0.030		0.018	0.20		4.54	0.051	0.002	
855	0.15	0.010		0.16	0.015	0.37	0.083		
856	0.068	0.10		0.92	0.10	0.061	0.96		
858	0.042			0.078		1.01	1.04		<0.0001
1258	(0.04)		(0.010)	0.079		0.98	1.03		<0.0001
859	0.041					2.45	5.46		0.0026
1259	(0.04)		(0.022)	0.205		2.48	5.44		0.0005

Copper-Base Alloys (Chip Form)

SRM	Type	Wt/ Unit (grams)	Chemical Composition (Nominal Weight Percent)				
			Cu	Ni	Fe	Zn	Pb
37e	Brass, Sheet	150	69.61	0.53	0.004	27.85	1.00
158a	Bronze, Silicon	150	90.93	0.001	1.23	2.08	0.097
871	Bronze, Phosphor (CDA 521)	100	91.68		<0.001	0.025	0.010
872	Bronze, Phosphor (CDA 544)	100	87.36		0.003	4.0	4.13
874	Cupro-Nickel, 10% (CDA 706) "High-Purity"	100	88.49	10.18	1.22	0.002	<0.0005
875	Cupro-Nickel, 10% (CDA 706) "Doped"	100	87.83	10.42	1.45	0.11	0.0092
879	Nickel Silver (CDA 762)	100	57.75	12.11	0.0020	30.04	0.002
880	Nickel Silver (CDA 770)	100	54.51	18.13	0.004	27.3	0.002
1034	*Unalloyed Copper	rod	(99.96%)	(0.6)	(2.0)	(<11)	(0.5)
1035	**Leaded-Tin Bronze Alloy	50	(78.5)	(0.75)	(0.001)	(0.25)	(13.5)

SRM	Mn	Sb	Sn	Cr	P	Ag	Si	Al	Te	Cd	Se
37e			1.00								
158a	1.11		0.96		0.026		3.03	0.46			
871			8.14		0.082						
872			4.16		0.26						
874	0.0020	<0.001	0.007		0.002		(0.0006)			<0.0002	0.00015
875	<0.0007	<0.001	0.009		0.0020		(0.0008)			0.0022	0.0004
879	<0.001										
880	<0.001										
1034	(<0.1)	(0.2)	(<0.2)	(0.3)		(8.1)	(<2)	(<2)	(0.5)	(<1)	(3.3)
1035			(6.8)								

SRM	Bi	O	Co	C	Au	H	S	As	Mg	Ti
874	<0.0002	(0.06)		(0.0023)		(0.0016)	(0.0011)	(<0.0006)	(0.0002)	(0.0001)
875	0.003	(0.14)		(0.0035)		(0.004)	(0.0011)	(0.0010)	(0.0010)	(<0.0002)
1034	(0.2)	(363)	(0.02)		(<0.05)		2.8	(0.2)	(<1)	
1035		(0.64)					22.3 ppm		P (0.004)	

Values in parentheses are not certified, but are given for information only.
*Values for SRM 1034 are ppm by weight.
**Sulfur value for SRM 1035 is ppm by weight.

Copper-Base Alloys (Solid Form)

The SRM's with "C" prefix are chill-cast blocks, 31 mm square, 19 mm thick; the others are wrought disks, 31 mm in diameter and 19 mm thick. Both forms have nearly identical chemical compositions.

SRM		Type	Chemical Composition (Nominal Weight Percent)							
			Cu	Zn	Pb	Fe	Sn	Ni	Al	Sb
1103		Free-Cutting Brass A	59.27	35.72	3.73	0.26	0.88	0.15		
1106	C1106	Naval Brass A	59.08	40.08	0.032	0.004	0.74	0.025		
1107	C1107	Naval Brass B	61.21	37.34	0.18	0.037	1.04	0.098		
1108	C1108	Naval Brass C	64.95	34.42	0.063	0.050	0.39	0.033		
	C1109	Red Brass A	82.2	17.43	0.075	0.053	0.10			
	C1110	Red Brass B	84.59	15.20	0.033	0.033	0.051	0.053		
1111	C1111	Red Brass C	87.14	12.81	0.013	0.010	0.019	0.022		
1112	C1112	Gilding Metal A	93.38	6.30	0.057	0.070	0.12	0.100		
1113	C1113	Gilding Metal B	95.03	4.80	0.026	0.043	0.064	0.057		
1114	C1114	Gilding Metal C	96.45	3.47	0.012	0.017	0.027	0.021		
1115	C1115	Commercial Bronze A	87.96	11.73	0.013	0.13	0.10	0.074		
1116	C1116	Commercial Bronze B	90.37	9.44	0.042	0.046	0.044	0.048		
1117	C1117	Commercial Bronze C	93.01	6.87	0.069	0.014	0.021	0.020		
1118		Aluminum Brass A	75.1	21.9	0.025	0.065			2.80	0.010
	C1119	Aluminum Brass B	77.1	20.4	0.050	0.030			2.14	0.050
	C1121	Beryllium Copper CA-170	97.4_6	(0.01)	(0.002)	0.08_5	0.01	0.012	0.07	
	C1123	Beryllium Copper CA-175	97.10	0.01	(0.001)	0.04	(0.01)	(0.01)	0.02	
1275		Cupro-Nickel (CDA 706)	88.2	0.085	0.006	1.46	0.008	9.76		0.0005

SRM		As	Be	Bi	Cd	Mn	P	Si	Ag
1103							0.003		
1106	C1106					0.005			
1108	C1108					0.025			
	C1109						0.006		
1112	C1112						0.009		
1113	C1113						0.008		
1114	C1114						0.009		
1115	C1115						0.005		
1116	C1116						0.008		
1117	C1117						0.002		
1118		0.007					0.13	0.0021	
	C1119	0.040					0.070	0.0015	
	C1121		1.92			(0.00_4)	(0.005)	0.11	(0.005)
	C1123		0.46			(0.002)	(0.002)	0.03	(0.009)
1275		(0.001)		(<0.001)	0.0003	0.42	0.005	(0.001)	(0.004)

SRM		Te	Co	Cr	Se	Mg	B	S	Ti
	C1121		0.29_5	(0.002)					
	C1123		2.35	(0.001)					
1275		(0.0002)	0.024	(0.0002)	0.0004	0.003	(0.0009)	(0.008)	(0.0002)

Values in parentheses are not certified, but are given for information only.

Copper "Benchmark"

SRM (Chip)	SRM (Solid)	Type	Cu(Wt%)	Chemical Composition (Nominal Parts Per Million by Weight) Sb	As	Bi	Cr	Co	Fe	Pb	Mn
393		Copper "O"	99.998	0.25	0.41	<0.1	<0.5	0.02	<1	0.039	<0.01
394	494	Copper I	99.91	4.5	2.6	0.35	2.0	0.5	147	26.5	3.7
395	495	Copper II	99.94	8.0	1.6	0.50	6.0	0.3	96	3.25	5.3
396	496	Copper III	99.95	<1	<0.2	0.07	4.3	0.4	143	0.41	7.5
	457	Copper IV	99.96	0.2	0.2	0.2	(0.3)	(0.2)	2.0	0.5	<0.1
398	498	Copper V	99.98	7.5	25	2.0	(0.3)	2.8	11.4	9.9	(0.3)
399	499	Copper VI	99.79	30	47	10.5	(0.5)	0.5	20.0	114	(0.3)
400	500	Copper VII	99.70	102	140	24.5	(0.5)	0.6	41	128	(0.2)
	C1251	Copper VIII	99.96	12.6	14	(3)	2.8	8.8	(10)	7.5	(7)
	C1252	Copper IX	99.89	42	115	20	7.4	90	(35)	60	(28)
	C1253	Copper X	99.42	(150)	432	70	216	(500)	(330)	244	(380)
454		Copper XI	99.84	24	46	19		(4)	(50)	66	

SRM (Chip)	SRM (Solid)	Ni	Se	Ag	S	Te	Sn	Zn	Al	Cd	Au	Mg
393		0.05	<0.05	0.10	<1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.05	<0.1
394	494	11.7	2.0	50.5	15	0.58	70	405	(<2)	(0.5)	(0.07)	(<1)
395	495	5.4	0.63	12.2	13	0.32	1.5	12.2	(<2)	(0.4)	(0.13)	(<1)
396	496	4.2	0.62	3.30	9.5	(0.02)	0.8	5.0	(<2)	(0.6)	(<0.05)	(<1)
	457	0.6	4.2	8.1	(4)	0.29	<0.2	<11	(<2)	(<1)	(<0.05)	(<1)
398	498	7.0	17.5	20.1	(11)	10.1	4.8	24	(<2)	(22)	(0.1)	(<1)
399	499	506	95	116.8	(10)	50	(~90)	45	(<2)	(<1)	(4)	(<1)
400	500	603	214	181	(9)	153	(~200)	114	(<2)	(<1)	(10)	(<1)
	C1251	22	11.1	81.4	(22)	15	(15)	8.3	(2)	2	15.0	(10)
	C1252	128	53.6	166.6	(29)	51	(110)	60	(7)	14	34.9	(20)
	C1253	(500)	165	503	55	199	(470)	368	(180)	74	74.4	(80)
454		(150)	479	286		27	2.2	7			7.5	

SRM (Chip)	SRM (Solid)	Si	Be	B	Ca	Li	Pd	P	Ti	Zr
393		<0.5	<0.01	<0.01	<0.05	<0.01	<0.05	<0.05	<0.5	<0.5
394	494	(<2)								
395	495	(<2)								
396	496	(<2)								
398	498	(<2)								
399	499	(<2)								
400	500	(<2)								

Values in parentheses are not certified, but are given for information only.

Lead-Base Alloys

SRM		Type	Chemical Composition (Nominal Weight Percent)							
Chip	Disk		Cu	Ni	As	Sn	Sb	Bi	Ag	Fe
127b	1131	Solder Pb60–Sn40	0.011	0.012	0.01	39.3	0.43	0.06	0.01	
53e	1132	Bearing Metal(84Pb-10Sb-6Sn)	0.054	0.003	0.057	5.84	10.2	0.052		<0.001

Nickel-Base Alloys

SRM	Type	Wt/Unit (grams)	Chemical Composition (Nominal Weight Percent)							
			C	Mn	P	S	Si	Cu	Ni	Cr
349a	Ni57-Co14-Cr20	(IN PREP)								
882	Ni66-Cu31-A13	100	0.006	0.0007		0.0014	0.006	31.02	65.25	
864	Inconel, 600	100	0.064	0.29	0.010	0.003	0.12	0.26	73.1	15.7
865	Inconel, 625	100	0.037	0.18	0.012	0.001	0.41	0.36	59.5	21.9
866	Incoloy, 800	100	0.082	0.92	0.017	0.001	0.17	0.49	30.8	20.1
867	Incoloy, 825	100	0.021	0.39	0.018	0.002	0.32	1.74	43.5	23.4
1160	Ni80, Mo4, balance Fe	Disk	0.019	0.550	0.003	0.001	0.37	0.021	80.3	0.05

SRM	Mo	Co	Ti	Al	B	Fe	Nb
882			0.57	2.85		0.009	
864	0.20	0.059	0.26	0.26	<0.005	9.6	(0.14)
865	8.6	0.072	0.28	0.21	<0.001	4.5	3.5
866	0.36	0.075	0.31	0.29	<0.001	46.1	(0.09)
867	2.73	0.089	0.75	0.062	0.002	26.6	(0.45)
1160	4.35	0.054				14.3	

Trace Elements in Nickel-Base Superalloys (Chip Form)

SRM	Type	Wt/Unit (grams)	Nominal Trace Composition (Parts Per Million by Weight)				
			Pb	Bi	Se	Te	Tl
897	"Tracealloy" A	35	11.7	(0.5)	9.1	1.05	0.51
898	"Tracealloy" B	35	2.5	(1.0)	2.00	0.54	2.75
899	"Tracealloy" C	35	3.9	(0.3)	9.5	5.9	0.252

SRM	Approximate Base Composition (Weight Percent)											
	C	Cr	Co	Ni	W	Nb	Al	Ti	B	Zr	Ta	Hf
897	(0.12)	(12.0)	(8.5)	(Bal)	(1.75)	(0.9)	(2.0)	(2.0)	(0.010)	(0.10)	(1.75)	(1.2)
898	(0.12)	(12.0)	(8.5)	(Bal)	(1.75)	(0.9)	(2.0)	(2.0)	(0.010)	(0.10)	(1.75)	(1.2)
899	(0.12)	(12.0)	(8.5)	(Bal)	(1.75)	(0.9)	(2.0)	(2.0)	(0.010)	(0.10)	(1.75)	(1.2)

Values in parentheses are not certified, but are given for information only.

Nickel Oxides (Powder Form)

SRM	Type	Wt/Unit (grams)	Chemical Composition (Nominal Weight Percent)								
			Mn	Si	Cu	Cr	Co	Ti	Al	Fe	Mg
671	Oxide 1	25	0.13	0.047	0.20	0.025	0.31	0.024	0.009	0.39	0.030
672	Oxide 2	25	0.095	0.11	0.018	0.003	0.55	0.009	0.004	0.079	0.020
673	Oxide 3	25	0.0037	0.006	0.002	0.0003	0.016	0.003	0.001	0.029	0.003

SRM	Nominal Trace Composition (Parts Per Million by Weight)											
	Pb	Se	Bi	As	Sn	Sb	Cd	Ga	Ag	Te	Tl	Zn
671	16	2.0	0.07	(59)	(2.7)	(0.4)	(0.7)	(0.8)	(0.5)	(<0.2)	(<0.1)	(160)
672	38	0.40	0.3	(74)	(4)	(0.5)	(1.7)	(0.4)	(0.3)	(<0.2)	(<0.1)	(140)
673	3.5	0.2	0.06	(0.4)	(<0.5)	(<0.05)	(0.05)	(<0.1)	(<0.1)	(0.4)	(<0.1)	(1.7)

Values in parentheses are not certified, but are given for information only.

Titanium-Base Alloys (Chip Form)

SRM	Type	Wt/ Unit (grams)	Chemical Composition (Nominal Weight Percent)									
			C	Mn	Cu	Mo	Sn	Al	Fe	N	V	Si
173b	6Al–4V	100	0.025		0.008	0.013	(0.03)	6.36	0.23	0.015	4.31	0.46
176	5Al–2.5Sn	100	0.015	0.0008	0.003	0.0003	2.47	5.16	0.070	0.010		
650	Unalloyed A	30	W1.55	0.016	0.033	0.002	0.03	<0.01	0.024	Cr 0.002	0.009	0.004
651	Unalloyed B	30	W0.39	0.005	0.032	0.031	0.026	<0.006	0.058	Cr 0.037	0.021	0.011
652	Unalloyed C	30	W0.5	0.046	0.081	0.039	0.053	0.039	0.67	Cr 0.082	0.024	0.16

Titanium-Base Alloys (Solid Form)

SRM 31 mm D× 19 mm thick	Type	Chemical Composition (Nominal Weight Percent)					
		Mn	Cr	Fe	Mo	Al	V
641	8Mn (A)	6.68					
642	8Mn (B)	9.08					
643	8Mn (C)	11.68					
644	2Cr–2Fe–2Mo (A)		1.03	1.36	3.61		
646	2Cr–2Fe–2Mo (C)		3.43	2.14	1.11		
654a*	6Al–4V (B)	(<0.1)	(0.20)	(0.20)	(<0.05)	6.3_4	3.9_5

*31 mm D×6.4 mm thick.
Values in parentheses are not certified, but are given for information only.

Frank Mills controls the chipping of a titanium alloy that will be ground, sieved, and blended to insure high homogeneity before analytical testing for certification.

Zinc-Base Alloys

SRM	Type	Wt/ Unit (grams)	Chemical Composition (Nominal Weight Percent)								
			Mn	Cu	Ni	Sn	Al	Cd	Fe	Pb	Mg
94c	Die Casting Alloy	150	0.014	1.01	0.006	0.006	4.13	0.002	0.018	0.006	0.042

SRM	Type	Chemical Composition (Nominal Weight Percent)							
		Cu	Al	Mg	Fe	Pb	Cd	Sn	Cr
625	Zinc-base A–ASTM AG 40A	0.034	3.06	0.070	0.036	0.0014	0.0007	0.0006	0.0128
626	Zinc-base B–ASTM AG 40A	0.056	3.56	0.020	0.103	0.0022	0.0016	0.0012	0.0395
627	Zinc-base C–ASTM AG 40A	0.132	3.88	0.030	0.023	0.0082	0.0051	0.0042	0.0038
628	Zinc-base D–ASTM AC 41A	0.611	4.59	0.0094	0.066	0.0045	0.0040	0.0017	0.0087
629	Zinc-base E–ASTM AC 41A	1.50	5.15	0.094	0.017	0.0135	0.0155	0.012	0.008
630	Zinc-base F–ASTM AC 41A	0.976	4.30	0.030	0.023	0.0083	0.0048	0.0040	0.0031
631	Zinc spelter (modified)	0.0013	0.50	(<0.001)	0.005	(0.001)	0.0002	0.0001	0.0001

SRM	Mn	Ni	Si	In	Ga	Ca	Ag	Ge
625	0.031	0.0184	0.017					
626	0.048	0.047	0.042					
627	0.014	0.0029	0.021					
628	0.0091	0.030	0.008					
629	0.0017	0.0075	0.078					
630	0.0106	0.0027	0.022					
631	0.00015	(<0.0005)	(0.002)	0.0023	(0.002)	<0.001	(<0.0005)	(0.0002)

Values in parentheses are not certified, but are given for information only.

Zirconium-Base Alloys

SRM	Type	Wt/Unit (grams)	Chemical Composition (Nominal Parts Per Million)										
			C	Mn	Si	Cu	Ni	Cr	Ti	Sn(Wt%)	Fe	N	U
360b	Zircaloy–2	(IN PREP)											

SRM 31 mm D× 9.5 mm thick	Type	Chemical Composition (Nominal Parts Per Million)											
		Hf	C	Cr	Cu	Fe	Mn	Mo	Ni	N	Si	Ti	W
1234	Zirconium A	46	(80)	(55)	(<10)	(240)	(10)	(2)	(20)	(14)	(40)	(20)	(25)
1235	Zirconium B	95	(170)	(60)	(80)	(850)	(25)	(40)	(65)	(32)	(95)	(90)	(50)
1236	Zirconium C	198	(280)	(250)	(250)	(1700)	(45)	(100)	(140)	(69)	(205)	(185)	(140)
1237	Zircaloy D	31	(100)	(1510)	(<10)	(1650)	(10)	(<10)	(40)	(19)	(35)	(30)	(25)
1238	Zircaloy E	178	(310)	(580)	(60)	(2500)	(60)	(120)	(100)	(72)	(170)	(100)	(95)
1239	Zircaloy F	77	(170)	(1055)	(130)	(2300)	(50)	(45)	(45)	(42)	(95)	(40)	(45)

Values in parentheses are not certified, but are given for information only.

Bob Alvarez (left) and research chemist John Norris discuss optical emission spectrometric analyses of solid metal SRM's.

Gases in Metals

These SRM's are for determining hydrogen, oxygen and nitrogen by vacuum fusion, inert gas fusion, and neutron activation methods. SRM's 1095 to 1099 are sold only in a set as SRM 1089.

SRM	Type	Form	Oxygen (ppm)	Hydrogen (ppm)	Nitrogen (ppm)
352b	Unalloyed titanium for hydrogen	Platelets		50	
354a	Unalloyed titanium for hydrogen	IN PREP			
355	Unalloyed titanium	Rod	3031		
357	Unalloyed zirconium	Wire	(1200)	19	49
358	Unalloyed zirconium	Wire	(1100)	107	28
1086	Unalloyed titanium	Chips	(1350)	116	
1087	Unalloyed titanium	Chips	(840)	57.5	
1088	Unalloyed titanium	Chips	(1450)	88.5	
1090	Ingot iron	Rod	491		(60)
1091a	Stainless steel (AISI 431)	Rod	132.2		
1093	Valve steel	Rod	60		(4807)
1094	Maraging steel	Rod	4.5		(71)
1089	Set of 5: 1095, 1096, 1097, 1098, and 1099	Rods			
1095	AISI 4340 steel	Rod	9		(37)
1096	AISI 94B17 (mod)steel	Rod	10.7		40.4
1097	Cr–V (mod)steel	Rod	6.6		(41)
1098	High carbon (mod)steel	Rod	10		32
1099	Electrolytic iron	Rod	61		(13)

Values in parentheses are not certified, but are given for information only.

High-Purity Metals

These SRM's are for determining impurity elements in high-purity metals. (See also specific metals.)

SRM	Type	Unit Size	Chemical Compositions (Nominal Parts Per Million by Weight)				
			Cu	Ni	Sn	Pb	Zr
685W*	High-Purity Gold (Wire)	1.4 mm D×102 mm long	0.1				
685R*	High-Purity Gold (Rod)	5.9 mm D×25 mm long	0.1				
680aL1	High-Purity Platinum (Wire)	0.51 mm D×102 mm long	0.1	<1		<1	<0.1
680aL2	High-Purity Platinum (Wire)	0.51 mm D×1.0 m long	0.1	<1		<1	<0.1
681L1	Doped-Platinum (Wire)	0.51 mm D×102 mm long	5.1	0.5		12	11
681L2	Doped-Platinum (Wire)	0.51 mm D×1.0 m long	5.1	0.5		12	11
682*	High-Purity Zinc	Semicircular segments 57 mm D	0.042		(0.02)		
683*	Zinc Metal	Semicircular segments 57 mm D	5.9		(0.02)	11.1	
728	Zinc	Shot, 450 g	5.7		(0.02)	11.1	
726	Selenium, Intermediate Purity	Shot, 450 g	<1	<0.5	<1	<1	Mn<0.3
1257	Aluminum, High Purity	(IN PREP)					

SRM	Ag	Mg	In	Fe	O	Pd	Au	Rh	Ir	Cd	Ti
685W*	[0.1]		0.007	0.3	[2]						
685R*	[0.1]		0.007	0.2	[<2]						
680aL1	<0.1	<1		1.3	4	0.2	<1	<0.2	<0.01		
680aL2	<0.1	<1		1.3	4	0.2	<1	<0.2	<0.01		
681L1	2.0	12		5	7	6	9	9	11		
681L2	2.0	12		5	7	6	9	9	11		
682*	(0.02)			(0.1)						(0.1)	
683*	1.3			2.2						1.1	(0.2)
728	1.1			2.7						1.15	
726	<1	<1	S12	1	Cr<1	Mo<0.3	Te 0.3	As<2	Al<1	B<1	Ca<1

*Certificate gives upper limits for other elements found to be present.
Values in parentheses are not certified, but are given for information only.
Values in brackets are subject to greater error since only one method of analysis was employed.

RM 1R—Ultra-Purity Aluminum Polycrystalline Rods

These rods are intended for use in research on the mechanical and physical properties of extremely pure aluminum; e.g., in the determination of resistivity as a function of strain at cryogenic temperatures to facilitate the design of cryogenic magnets, or superconductor stabilizing elements. Unit of issue: 4.2 mm in diameter and 25.4 mm long.

Microanalytical

These SRM's provide a highly homogeneous material at microscopic spatial resolution. They are intended primarily for use in calibration of quantitative electron probe, secondary ion mass spectrometry, spark source mass spectrometry, and laser probe microanalytical techniques.

SRM	Type	Unit Size
470	Mineral Glasses (K–411 & K–412)	2 Rods: 1×1×15 mm
479a	Fe-Cr-Ni Alloy	Plate: 4.6 mm D, 1 mm thick
480	Tungsten–22% Mo Alloy	Rod: 1 mm D, 1 mm long
481	Au–Ag Set	6 Wire: 0.5 mm D, 50 mm long
482	Au-Cu Set	6 Wire: 0.5 mm D, 50 mm long
483	Iron–3.22% Silicon	Plate: 3×3×0.28 mm thick
1871	Glasses (K–456, K–493, & K–523)	3 Rods: 1×1×15 mm
1872	Glasses (K–453, K–491, & K–968)	3 Rods: 1×1×15 mm
1873	Glasses (K–458, K–489 & K–963)	3 Rods: 1×1×15 mm
1874	Glasses (K–495, K–490, & K–546)	3 Rods: 1×1×15 mm
1875	Glasses (K–496, K–497, & K–1013)	3 Rods: 1×1×15 mm
8531	Glass Fibers (K–456, K–493, K–453, K–491, K–458, K–489, K–495, K–490, K–496, K–497)	Fibers: 10–100 μm D×50–60 mm long

Metals for Microanalysis

SRM	Type	Chemical Composition (Nominal Weight Percent)						
		Au	Cu	Ag	W	Mo	Si	Fe (by difference)
479a	Fe-Cr-Ni Alloy				Cr18.1	Ni10.9		71.0
480	Tungsten–22% Mo Alloy				78.5	21.5		
481	Au 100 A	100.00						
	Au–20% Ag B	80.05		19.96				
	Au–40% Ag C	60.05		39.92				
	Au–60% Ag D	40.03		59.93				
	Au–80% Ag E	22.43		77.58				
	Ag 100 F			100.00				
482	Au 100 A	100.00						
	Au–20% Cu B	80.15	19.83					
	Au–40% Cu C	60.36	39.64					
	Au–60% Cu D	40.10	59.92					
	Au–80% Cu E	20.12	79.85					
	Cu 100 F		100.00					
483	Iron–3.22% Silicon						3.22	96.7–96.8

Mineral Glasses for Microanalysis

SRM 470	Composition (Nominal Weight Percent)				
Glass	SiO_2	FeO	MgO	CaO	Al_2O_3
K-411	54.30	14.42	14.67	15.47	—
K-412	45.35	9.96	19.33	15.25	9.27

Glasses for Microchemical Analysis

	SRM 1871			SRM 1872			SRM 1873			SRM 1874			SRM 1875		
	Glass			Glass			Glass			Glass			Glass		
	K-456	K-493	K-523	K-453	K-491	K-968	K-458	K-489	K-963	K-495	K-490	K-546	K-496	K-497	K-1013
	Composition (Nominal Weight Percent)														
Pb	65.67	63.28	63.10	54.21	54.69	54.74	—	(1.32)	—	—	(1.47)	—	—	(0.86)	—
Si	13.37	(13.09)	(12.94)	—	(0.11)	—	23.05	(22.23)	(21.96)	—	(0.19)	—	—	(0.13)	—
Ge	—	—	(0.24)	28.43	26.10	25.93	—	—	(0.39)	—	—	(0.50)	—	—	(0.34)
Ba	—	—	(0.61)	—	—	(0.46)	41.79	39.53	39.21	—	—	(0.99)	—	—	(0.52)
Zn	—	—	—	—	—	—	3.01	2.93	2.95	—	—	—	—	—	—
P	—	—	(0.24)	—	—	(0.21)	—	—	(0.33)	—	—	(0.42)	32.98	31.59	32.26
Mg	—	—	(0.12)	—	—	(0.22)	—	—	(0.34)	—	—	(0.17)	6.65	6.49	5.86
Al	—	(0.13)	—	—	(0.10)	—	—	(0.11)	—	10.89	(10.2)	(10.1)	6.47	5.97	6.08
B	—	[0.04]	—	—	[0.03]	—	—	[0.06]	—	(23.0)	(21.5)	(21.6)	—	[0.05]	—
Zr	—	(0.38)	(0.33)	—	(0.26)	(0.48)	—	(0.40)	(0.61)	—	(0.53)	(0.52)	—	(0.32)	(0.45)
Ti	—	(0.20)	(0.21)	—	(0.14)	(0.16)	—	(0.27)	(0.32)	—	(0.31)	(0.39)	—	(0.22)	(0.21)
Ce	—	(0.53)	—	—	(0.59)	—	—	[0.80]	—	—	(1.46)	—	—	(0.94)	—
Ta	—	(0.64)	—	—	(0.52)	—	—	(0.95)	—	—	(1.02)	—	—	(0.71)	—
Fe	—	(0.25)	—	—	(0.17)	—	—	(0.35)	—	—	(0.38)	—	—	(0.26)	—
Li	—	[0.0005]	—	—	[0.0005]	—	—	[0.0009]	—	(2.3)	(2.2)	(2.2)	—	[0.0005]	—
Ni	—	—	(0.25)	—	—	(0.20)	—	—	(0.33)	—	—	(0.39)	—	—	(0.31)
Eu	—	—	(0.73)	—	—	(0.64)	—	—	(0.95)	—	—	(1.21)	—	—	(0.53)
U	—	—	(0.23)	—	—	(0.05)	—	—	(0.16)	—	—	(0.24)	—	—	(0.15)
Th	—	—	(0.08)	—	—	(0.12)	—	—	(0.06)	—	—	(0.16)	—	—	(0.10)
Cr	—	—	(0.20)	—	—	(0.19)	—	—	(0.31)	—	—	(0.14)	—	—	(0.14)
O	(20.35)	(20.58)	(20.82)	(16.73)	(16.45)	(16.67)	(31.86)	(31.84)	(31.96)	(63.49)	(60.75)	(61.36)	(53.90)*	(52.46)*	(53.05)*
Total	(99.39)	(99.12)	(100.10)	(99.37)	(99.16)	(100.07)	(99.71)	(100.79)	(99.88)	(99.68)	(100.01)	(100.39)	(100.00)	(100.00)	(100.00)

Values in parentheses are for information only, they are *not certified.*

Values in brackets were calculated from the weight of material added to the melt, they are *not certified.*

*Oxygen values in SRM 1875 were calculated by difference, not by the stoichiometry of the oxides as was done for the other glasses.

Beth Thomas confirms SRM availability via computer as she takes a telephone purchase order.

Glass Fibers for Microanalysis—RM 8531

	K-456	K-493	K-453	K-491	K-458	K-489	K-495	K-490	K-496	K-497
					Chemical Composition (Nominal Weight Percent)					
SiO_2	28.77	27.89	—	0.19	49.38	46.76	—	0.42	—	0.27
PbO	71.23	69.08	58.72	59.35	—	1.28	—	1.55	—	.99
GeO_2	—	—	41.28	37.98	—	—	—	—	—	—
BaO	—	—	—	—	46.80	43.88	—	—	—	—
ZnO	—	—	—	—	3.82	3.72	—	—	—	—
P_2O_5	—	—	—	—	—	—	—	—	79.54	76.03
MgO	—	—	—	—	—	—	—	—	9.03	8.64
Al_2O_3	—	0.20	—	0.16	—	0.29	20.00	18.68	11.43	10.92
B_2O_3	—	.14	—	.11	—	.20	75.00	70.00	—	0.15
ZrO_2	—	.49	—	.40	—	.70	—	0.85	—	.54
TiO_2	—	.32	—	.26	—	.46	—	.55	—	.35
CeO_2	—	.68	—	.56	—	.98	—	1.19	—	.76
Ta_2O_5	—	.88	—	.72	—	1.26	—	1.53	—	.98
Fe_2O_3	—	.32	—	.26	—	0.046	—	0.55	—	.35
Li_2O	—	.001	—	.001	—	.002	5.00	4.67	—	.001

Primary, Working, and Secondary Chemicals

These SRM's are high-purity chemicals defined as primary, working, and secondary standards in accordance with recommendations of the Analytical Chemistry Section of the International Union of Pure and Applied Chemistry [Ref. Analyst **90,** 251 (1965)]. These definitions are as follows:

Primary Standard:
a commercially available substance of purity 100±0.02 percent (Purity 99.98 + percent).

Working Standard:
a commercially available substance of purity 100±0.05 percent (Purity 99.95 + percent).

Secondary Standard:
a substance of lower purity which can be standardized against a primary grade standard.

SRM	Type	Wt/Unit (grams)	Certified Use	Purity Stoichi-ometric
17d	Sucrose	60	Polarimetric Value	[a]
40h	Sodium Oxalate	60	Reductometric Value	99.972
41c	Dextrose (D-Glucose)	70	Reductometric Value	99.9
83d	Arsenic Trioxide	60	Reductometric Value	99.9926
84j	Potassium Hydrogen Phthalate	60	Acidimetric Value	99.996
136d	Potassium Dichromate	60	Oxidimetric Value	99.9931
350a	Benzoic Acid	30	Acidimetric Value	99.9958
723a	Tris(hydroxymethyl)aminomethane	50	Basimetric Value	99.9703
949f	Plutonium Metal	0.5	Assay	99.99
950b	Uranium Oxide (U_3O_8)	25	Uranium Oxide Standard Value	99.968
951	Boric Acid	100	Acidimetric and Boron Isotopic Value	100.00
960	Uranium Metal	26	Assay	99.975
987	Strontium Carbonate	1	Assay and Isotopic	99.98
999	Potassium Chloride	60	Assay Standard for:	
			Potassium	99.98
			Chloride	99.99

[a]Sucrose=Moisture <0.02 percent, Ash <0.005 percent, In Prep.

Microchemical

SRM	Type	Wt/Unit (grams)	Elements Certified
141c	Acetanilide	2	N,C,H
142	Anisic Acid	2	Methoxyl (CH_3O—)
143c	Cystine	2	S,C,H,N
148	Nicotinic Acid	2	N,C,H
2141	Urea	2	N
2142	o-Bromobenzoic Acid	2	Br
2143	p-Fluorobenzoic Acid	2	F
2144	m-Chlorobenzoic Acid	2	Cl

Spectrometric Solutions

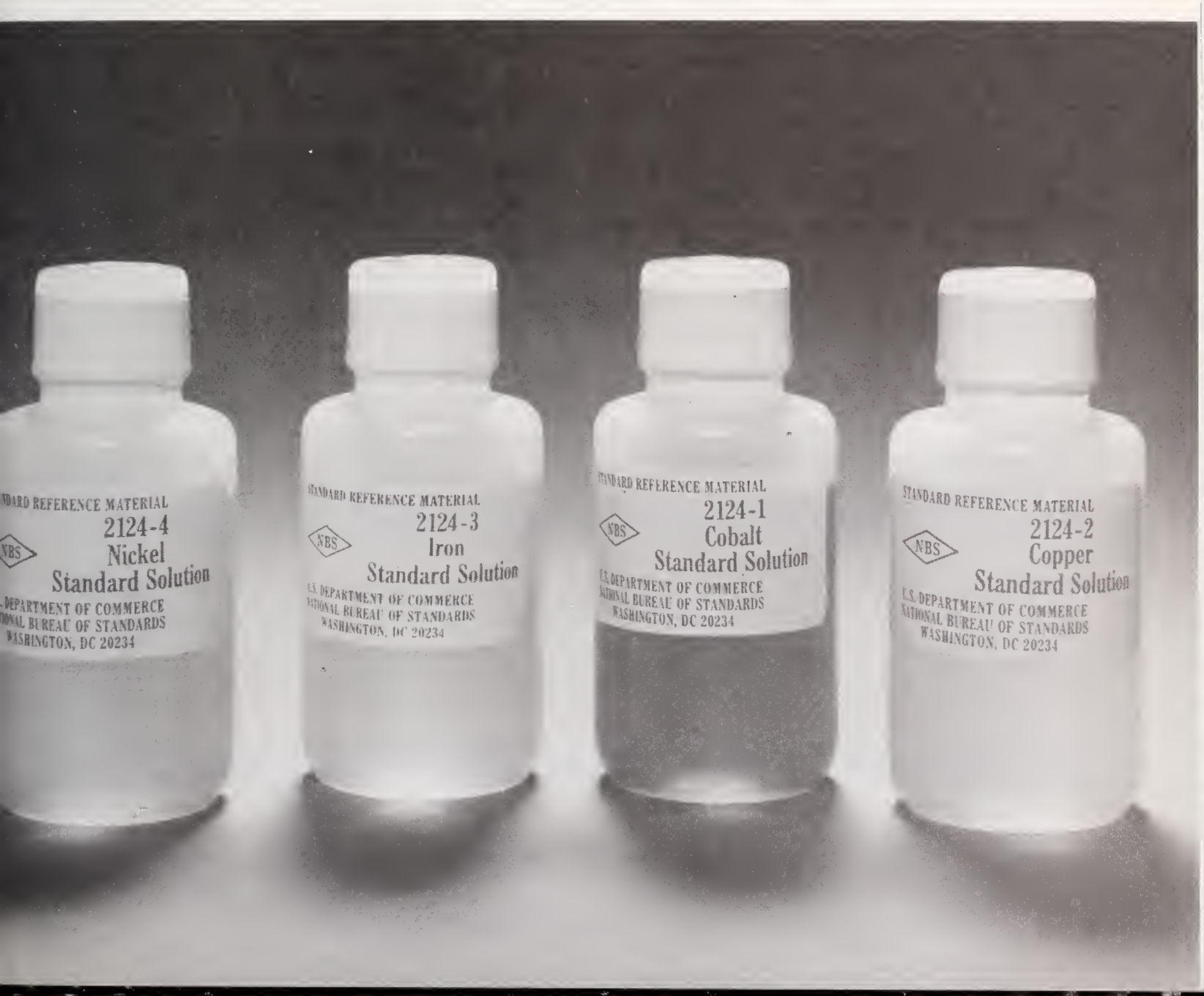
These SRM's are intended as standard stock solutions for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, or any other analytical technique that requires aqueous solutions for calibrating instruments. Each SRM contains four single element solutions of 50 mL each.

SRM	Solution 1	Solution 2	Solution 3	Solution 4
2121	Cadmium	Lead	Silver	Zinc
2122	Barium	Calcium	Magnesium	Strontium
2123	Lithium	Potassium	Sodium	Rubidium
2124	Cobalt	Copper	Iron	Nickel
2125	Boron	Chromium	Manganese	Molybdenum
2126	Antimony	Arsenic	Selenium	Tin
2127	Aluminum	Beryllium	Phosphorus	Silicon
2128	Gold	Mercury	Palladium	Platinum
2129	Titanium	Tungsten	Vanadium	Zirconium

Element	Concentration, mg/mL	Acid Concentration	SRM
Aluminum	10.00	HCl 10%	2127–1
Antimony	10.00	HCl 50%	2126–1
Arsenic	10.00	HCl 15%	2126–2
Barium	10.00	HCl 10%	2122–1
Beryllium	10.00	HCl 10%	2127–2
Boron	5.00	Water	2125–1
Cadmium	10.00	HNO_3 10%	2121–1
Calcium	10.00	HCl 10%	2122–2
Chromium	10.00	HCl 10%	2125–2
Cobalt	10.00	HNO_3 10%	2124–1
Copper	10.00	HNO_3 10%	2124–2
Gold	10.00	HCl 10%	2128–1
Iron	10.00	HCl 10%	2124–3
Lead	10.00	HNO_3 10%	2121–2
Lithium	10.00	HCl 1%	2123–1
Magnesium	10.00	HCl 10%	2122–3
Manganese	10.00	HNO_3 10%	2125–3
Mercury	10.00	HNO_3 10%	2128–2
Molybdenum	10.00	HCl 10%	2125–4
Nickel	10.00	HNO_3 10%	2124–4
Palladium	10.00	HCl 10%	2128–3
Phosphorus	10.00	HCl 0.05%	2127–3
Platinum	10.00	HCl 10%	2128–4
Potassium	10.00	HCl 1%	2123–2
Rubidium	10.00	HCl 1%	2123–4
Selenium	10.00	HNO_3 10%	2126–3
Silicon	10.06	Water	2127–4

Spectrometric Solutions (Continued)

Element	Concentration, mg/mL	Acid Concentration	SRM
Silver	10.00	HNO_3 10%	2121–3
Sodium	10.00	HC1 1%	2123–3
Strontium	10.00	HC1 10%	2122–4
Tin	10.00	HC1 60%	2126–4
Titanium	IN PREP		2129–1
Tungsten	IN PREP		2129–2
Vanadium	IN PREP		2129–3
Zinc	10.00	HC1 10%	2121–4
Zirconium	IN PREP		2129–4



Clinical Laboratory

These SRM's are for calibrating apparatus and validating analytical methods used in clinical and pathology laboratories. See also: spectrophotometric SRM's and temperature SRM's.

SRM	Type	Associated Publications	Purity %	Wt/Unit
900	Antiepilepsy Drug Level Assay (phenytoin, ethosuximide, phenobarbital, and primidone)		4 drugs 3 levels	Set of 4 vials
909	Human Serum		#	Set of 6 vials
910	Sodium Pyruvate		98.7	25 g
911a	Cholesterol		99.8	2 g
912a	Urea		99.9	25 g
913	Uric Acid		99.7	10 g
914a	Creatinine		99.7	10 g
915	Calcium Carbonate	SP 260–36	99.9	20 g
916	Bilirubin		99.0	100 mg
917	D-Glucose		99.9	25 g
918	Potassium Chloride	SP 260–63	99.9	30 g
919	Sodium Chloride	SP 260–60	99.9	30 g
920	D-Mannitol		99.8	50 g
921	Cortisol		98.9	1 g
922	Tris(hydroxymethyl) aminomethane		99.9	25 g
923	Tris(hydroxymethyl) aminomethane HC1		99.7	35 g
924	Lithium Carbonate	SP 260–69	100.0	30 g
925	VMA (4–hydroxy–3–methoxymandelic acid)		99.4	1 g
926	Bovine Serum Albumin (Powder)		*	5 g
927a	Bovine Serum Albumin (7% Solution)	(IN PREP)	*	10 vials, 2.15 mL ea.
928	Lead Nitrate		100.00	30 g
929	Magnesium Gluconate		100.1	5 g
937	Iron Metal		99.90	50 g
938	4–Nitrophenol		99.75	15 g
955	Lead in Blood		4 levels	Set of 4 vials
998	Angiotensin I (Human)		94.1	500 μg
1595	Tripalmitin		99.5	2 g
1599	Anticonvulsant Drug Level Assay (valproic acid and carbamazepine)		2 drugs/ 3 levels	Set of 4 vials
1700	Blood Gas: CO_2–10%, Bal N_2		—	0.56 m^3 (20 ft^3)
1701	Blood Gas: CO_2–5%, O_2–12%, Bal N_2		—	0.56 m^3 (20 ft^3)
1702	Blood Gas: CO_2–5%, O_2–20%, Bal N_2		—	0.56 m^3 (20 ft^3)
1703	Blood Gas: CO_2–10%, O_2–7%, Bal N_2		—	0.56 m^3 (20 ft^3)
8419	Bovine Serum, Inorganic Constituents			Set of 3, 4 mL vials

*Conforms to NCCLS specification ACC–1.
Electrolytes, selected organics.

Serum Reference Materials

These materials are for calibrating instrumentation and evaluating the reliability of analytical methods for the determination of major, minor, and trace constituents in blood serum, plasma, and similar biological fluids. NOTE: The values in parentheses are not certified.

Constituent	Concentrations					
	SRM 909 (Procedure A)		SRM 909 (Procedure B)		RM 8419	
	(per gram)					
Aluminum	—		—		(1.1)	μg/L
Cadmium	1.46	ng/mL g	1.24	ng/mL	—	
Calcium	3.560	mmol/L g	3.013	mmol/L	(5.1)	mmol/L
Chloride	128.0	mmol/L g	108.4	mmol/L	—	
Chromium	108	ng/mL g	91.3	ng/mL	(0.30)	μg/L
Cholesterol	4.359	mmol/L g	3.69	mmol/L	—	
Cobalt	—		—		(1.2)	μg/L
Copper	1.29	μg/mL g	1.10	μg/mL	(0.75)	mg/L
Creatine	0.179	mmol/L g	0.152	mmol/L	—	
Glucose	7.56	mmol/L g	6.41	mmol/L	—	
Iron	2.34	μg/mL g	1.98	μg/mL	(2.0)	mg/L
Lead	23.7	ng/mL g	20.0	ng/mL	—	
Lithium	1.945	mmol/L g	1.65	mmol/L	—	
Magnesium	1.425	mmol/L g	1.21	mmol/L	(0.85)	mmol/L
Manganese	—		—		(2.6)	μg/L
Molybdenum	—		—		(16)	μg/L
Nickel	—		—		(1.8)	μg/L
Potassium	4.155	mmol/L g	3.52	mmol/L	(5.1)	mmol/L
Selenium	—		—		(16)	μg/L
Sodium	158.4	mmol/L g	134.1	mmol/L	(141)	mmol/L
Urea	11.387	mmol/L g	9.64	mmol/L	—	
Uric Acid	0.570	mmol/L g	0.483	mmol/L	—	
Vanadium	3.19	ng/mL g	2.70	ng/mL	(<2)	μg/L
Zinc	—		—		(1.1)	mg/L

Biological Materials

These SRM's are intended for use in the calibration of apparatus and methods used in the analysis of biological materials for major, minor, and trace constituents.

Food and Beverage

SRM	1549	1566	1567	1568	1569	1577a	RM 50
Type	Non-fat Powdered Milk	Oyster Tissue	Wheat Flour	Rice Flour	Brewers Yeast	Bovine Liver	Albacore Tuna
Unit Size	100 g	30 g	80 g	80 g	50 g	50 g	70 g
ELEMENTS	Nominal Composition in μg/g, unless otherwise noted.						
Aluminum	(2)					(2)	
Antimony	(0.00027)					(0.003)	
Arsenic	(0.0019)	13.4	(0.006)	0.41		0.047	(3.3)
Bromine	(12)	(55)	(9)	(1)		(9)	
Cadmium	0.0005	3.5	0.032	0.029		0.44	
Calcium	1.30%	0.15%	0.019%	0.014%		120	
Chlorine	1.09%	(1.0%)				0.28%	
Chromium	0.0026	0.69			2.12		
Cobalt	(0.0041)	(0.4)		0.02		0.21	
Copper	0.7	63.0	2.0	2.2		158	
Fluorine	(0.20)	(5.2)					
Iodine	3.38	(2.8)					
Iron	1.78	195	18.3	8.7		194	
Lead	0.019	0.48	0.020	0.045		0.135	(0.46)
Magnesium	0.120%	0.128%				600	
Manganese	0.26	17.5	8.5	20.1		9.9	
Mercury	0.0003	0.057	0.001	0.0060		0.004	(0.95)
Molybdenum	(0.34)	(<0.2)	(0.4)	(1.6)		3.5	
Nickel		1.3	(0.18)	(0.16)			
Nitrogen						(10.7%)	
Phosphorus	1.06%	(0.81%)				1.11%	
Potassium	1.69%	0.969%	0.136%	0.112%		0.996%	
Rubidium	(11)	4.45	(1)	(7)		12.5	
Selenium	0.11	2.1	1.1	0.4		0.71	(3.6)
Silver	(<0.0003)	0.89				0.04	
Sodium	0.497%	0.51%	8.0	6.0		0.243%	
Strontium		10.36				0.138	
Sulfur	0.351%	(0.76%)				0.78%	
Tellurium			(<0.002)	(<0.002)			
Thallium		(<0.005)				(0.003)	
Thorium		(0.1)					
Tin	(<0.02)						
Uranium		0.116				0.00071	
Vanadium		2.3					
Zinc	46.1	852	10.6	19.4		123	(13.6)

Values in parentheses are not certified, but are given for information only.

Ethanol Solutions

SRM	Type	Certified Constituent	Wt/Unit
1590	Stabilized Wine	Ethanol: 18.57% by volume	Set of 10, 10-mL vials
1828	Ethanol-Water Solutions	Ethanol: 95.629 wt%	Set: 1, 15-mL vial
		Ethanol: 0.2992 wt%	2, 3-mL vials
		Ethanol: 0.1487 wt%	2, 3-mL vials

Agricultural

SRM	1572	1573	1575	RM 8412	RM 8413
Type	Citrus Leaves	Tomato Leaves	Pine Needles	Corn Stalk	Corn Kernel
Unit Size	70 g	70 g	70 g	34 g	47 g
ELEMENT	Nominal Composition in μg/g, unless otherwise noted.				
Aluminum	92	(0.12%)	545		(4)
Antimony	(0.04)		(0.2)		
Arsenic	3.1	0.27	0.21		
Barium	21				
Boron		(30)			
Bromine	(8.2)	(26)	(9)		
Cadmium	0.03	(3)	(<0.5)		
Calcium	3.15%	3.00%	0.41%	(2160)	(42)
Cerium	(0.28)	(1.6)	(0.4)		
Cesium	(0.098)				
Chlorine	(414)			(2440)	(450)
Chromium	0.8	4.5	2.6		
Cobalt	(0.02)	(0.6)	(0.1)		
Copper	16.5	11	3.0	(8)	(3.0)
Europium	(0.01)	(0.04)	(0.006)		
Fluorine				(0.65)	(0.24)
Iodine	1.84				
Iron	90	690	200	(139)	(23)
Lanthanum	(0.19)	(0.9)	(0.2)		
Lead	13.3	6.3	10.8		
Magnesium	0.58%	(0.7%)		(1600)	(990)
Manganese	23	238	675	(15)	(4.0)
Mercury	0.08	(0.1)	0.15		

Agricultural (Continued)

SRM	1572	1573	1575	RM 8412	RM 8413
Type	Citrus Leaves	Tomato Leaves	Pine Needles	Corn Stalk	Corn Kernel
Unit Size	70 g	70 g	70 g	34 g	47 g
Molybdenum	0.17				
Nickel	0.6		(3.5)		
Nitrogen	(2.86%)	(5.0%)	(1.2%)	(6970)	(13750)
Phosphorous	0.13%	0.34%	0.12%		
Potassium	1.82%	4.46%	0.37%	(17350)	(3570)
Rubidium	4.84	16.5	11.7		
Samarium	(0.052)				
Scandium	(0.01)	(0.13)	(0.03)		
Selenium	(0.025)			(0.016)	(0.004)
Sodium	160			(28)	
Strontium	100	44.9	4.8	(12)	
Sulfur	0.407%				
Tellurium	(0.02)				
Thallium	(<0.01)	(0.05)	(0.05)		
Thorium		0.17	0.037		
Tin	(0.24)				
Uranium	(<0.15)	0.061	0.020		
Zinc	29	62		(32)	(15.7)

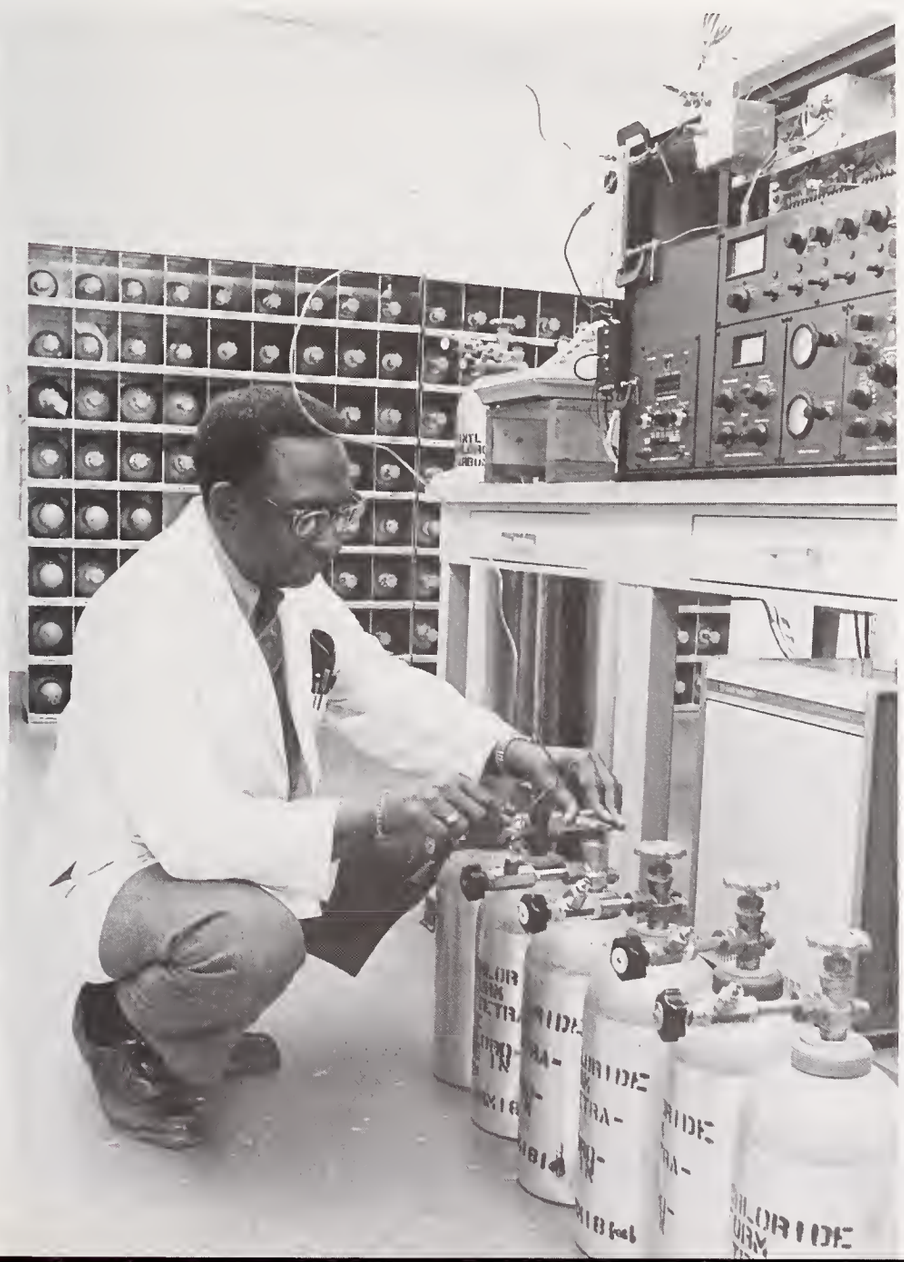
Values in parentheses are not certified, but are given for information only.

Environmental Materials

Analyzed Gases

These SRM's are for calibrating apparatus used to measure various components of gas mixtures, and atmospheric pollutants. All cylinders conform to the appropriate DOT specifications.

SRM	Type	Certified Component	Nominal Concentration	
1658a	Methane in Air	CH_4	1	μmole/mole (ppm)
1659a	Methane in Air	CH_4	10	μmole/mole (ppm)
1660a	Methane-Propane in Air	CH_4	4	μmole/mole (ppm)
		C_3H_8	1	μmole/mole (ppm)
1661a	Sulfur Dioxide in Nitrogen	SO_2	500	μmole/mole (ppm)
1662a	Sulfur Dioxide in Nitrogen	SO_2	1000	μmole/mole (ppm)
1663a	Sulfur Dioxide in Nitrogen	SO_2	1500	μmole/mole (ppm)
1664a	Sulfur Dioxide in Nitrogen	SO_2	2500	μmole/mole (ppm)



Research chemist Bill Cuthrell prepares to analyze the concentration of a proposed gas SRM.

Analyzed Gases (Continued)

SRM	Type	Certified Component	Nominal Concentration	
1665b	Propane in Air	C_3H_8	3	μmole/mole (ppm)
1666b	Propane in Air	C_3H_8	10	μmole/mole (ppm)
1667b	Propane in Air	C_3H_8	50	μmole/mole (ppm)
1668b	Propane in Air	C_3H_8	100	μmole/mole (ppm)
1669b	Propane in Air	C_3H_8	500	μmole/mole (ppm)
1670	Carbon Dioxide in Air	CO_2	0.033	mole percent
1671	Carbon Dioxide in Air	CO_2	0.034	mole percent
1672	Carbon Dioxide in Air	CO_2	0.035	mole percent
1674b	Carbon Dioxide in Nitrogen	CO_2	7.0	mole percent
1675b	Carbon Dioxide in Nitrogen	CO_2	14.0	mole percent
1677c	Carbon Monoxide in Nitrogen	CO	10	ppm
1678c	Carbon Monoxide in Nitrogen	CO	50	ppm
1679c	Carbon Monoxide in Nitrogen	CO	100	ppm
1680b	Carbon Monoxide in Nitrogen	CO	500	ppm
1681b	Carbon Monoxide in Nitrogen	CO	1000	ppm
1683b	Nitric Oxide in Nitrogen	NO	50	ppm
1684b	Nitric Oxide in Nitrogen	NO	100	ppm
1685b	Nitric Oxide in Nitrogen	NO	250	ppm
1686b	Nitric Oxide in Nitrogen	NO	500	ppm
1687b	Nitric Oxide in Nitrogen	NO	1000	ppm
1693	Sulfur Dioxide in Nitrogen	SO_2	50	ppm
1694	Sulfur Dioxide in Nitrogen	SO_2	100	ppm
1696	Sulfur Dioxide in Nitrogen	SO_2	3500	ppm
1700	Blood Gas: CO_2–10%, Bal N_2	Concentration in mole percent		
1701	Blood Gas: CO_2–5%, O_2–12%, Bal N_2	Concentration in mole percent		
1702	Blood Gas: CO_2–5%, O_2–20%, Bal N_2	Concentration in mole percent		
1703	Blood Gas: CO_2–10%, O_2–7%, Bal N_2	Concentration in mole percent		
1805	Benzene in Nitrogen	C_6H_6	0.25	ppm
1806	Benzene in Nitrogen	C_8H_8	10	ppm
1808	Tetrachloroethylene in N_2	C_2Cl_4	0.25	ppm
1809	Tetrachloroethylene in N_2	C_2Cl_4	10	ppm
2612a	Carbon Monoxide in Air	CO	10	μmole/mole (ppm)
2613a	Carbon Monoxide in Air	CO	20	μmole/mole (ppm)
2614a	Carbon Monoxide in Air	CO	45	μmole/mole (ppm)

Analyzed Gases (Continued)

SRM	Type	Certified Component	Nominal Concentration	
2619a	Carbon Dioxide in Nitrogen	CO_2	0.5	mole percent
2620a	Carbon Dioxide in Nitrogen	CO_2	1.0	mole percent
2621a	Carbon Dioxide in Nitrogen	CO_2	1.5	mole percent
2622a	Carbon Dioxide in Nitrogen	CO_2	2.0	mole percent
2623a	Carbon Dioxide in Nitrogen	CO_2	2.5	mole percent
2624a	Carbon Dioxide in Nitrogen	CO_2	3.0	mole percent
2625a	Carbon Dioxide in Nitrogen	CO_2	3.5	mole percent
2626a	Carbon Dioxide in Nitrogen	CO_2	4.0	mole percent
2627	Nitric Oxide in Nitrogen	NO	5	μmole/mole (ppm)
2628	Nitric Oxide in Nitrogen	NO	10	μmole/mole (ppm)
2629	Nitric Oxide in Nitrogen	NO	20	μmole/mole (ppm)
2630	Nitric Oxide in Nitrogen	NO	1500	μmole/mole (ppm)
2631	Nitric Oxide in Nitrogen	NO	3000	μmole/mole (ppm)
2632	Carbon Dioxide in Nitrogen	CO_2	300	ppm
2633	Carbon Dioxide in Nitrogen	CO_2	400	ppm
2634	Carbon Dioxide in Nitrogen	CO_2	800	ppm
2635	Carbon Monoxide in Nitrogen	CO	25	ppm
2636	Carbon Monoxide in Nitrogen	CO	250	ppm
2637	Carbon Monoxide in Nitrogen	CO	2500	ppm
2638	Carbon Monoxide in Nitrogen	CO	5000	ppm
2639	Carbon Monoxide in Nitrogen	CO	1	mole percent
2640	Carbon Monoxide in Nitrogen	CO	2	mole percent
2641	Carbon Monoxide in Nitrogen	CO	4	mole percent
2642	Carbon Monoxide in Nitrogen	CO	8	mole percent
2643	Propane in Nitrogen	C_3H_8	100	ppm
2644	Propane in Nitrogen	C_3H_8	250	ppm
2645	Propane in Nitrogen	C_3H_8	500	ppm
2646	Propane in Nitrogen	C_3H_8	1000	ppm
2647	Propane in Nitrogen	C_3H_8	2500	ppm
2648	Propane in Nitrogen	C_3H_8	5000	ppm
2649	Propane in Nitrogen	C_3H_8	1	mole percent
2650	Propane in Nitrogen	C_3H_8	2	mole percent
2651	Propane in Nitrogen and Oxygen	C_3H_8/O_2	0.01/5.0	mole percent
2652	Propane in Nitrogen and Oxygen	C_3H_8/O_2	0.01/10.0	mole percent
2653	Nitrogen Dioxide in Air	NO_2	250	ppm
2654	Nitrogen Dioxide in Air	NO_2	500	ppm
2655	Nitrogen Dioxide in Air	NO_2	1000	ppm
2656	Nitrogen Dioxide in Air	NO_2	2500	ppm
2657	Oxygen in Nitrogen	O_2	2	mole percent
2658	Oxygen in Nitrogen	O_2	10	mole percent
2659	Oxygen in Nitrogen	O_2	21	mole percent

Permeation Devices

These SRM's are for calibrating air pollution monitoring apparatus, and may be used to verify air pollution analytical methods and procedures. Each tube is individually certified.

SRM's 1625, 1626, and 1627 are certified over the temperature range of 20 to 30°C. SRM's 1629a, 1911, and 1912 are calibrated at 25.0°C only; and they cannot be shipped by air.

SRM	Type	Tube Length (cm)	Permeation Rate (μg/min) at 25°C	Typical Concentrations (ppm) Flow Rates (liters per minute)		
				1	5	10
1625	Sulfur Dioxide Permeation Tube	10	2.8	1.07	0.214	0.107
1626	Sulfur Dioxide Permeation Tube	5	1.4	0.535	0.107	0.0535
1627	Sulfur Dioxide Permeation Tube	2	0.56	0.214	0.0428	0.0214
1629a	Nitrogen Dioxide Permeation Device	10	1.0	0.5	0.1	0.05
1911	Benzene Permeation Device	10	0.4	0.2	0.04	0.02
1912	Tetrachloroethylene Perm. Device	10	1.0	0.5	0.1	0.05

Analyzed Liquids and Solids

These SRM's are for analysis of materials for constituents of interest in health or environmental problems. See also: Clinical SRM's and Industrial Hygiene SRM's.

SRM	Type	Unit Size	Certified Element				
			Lead	Nickel	Sulfur	Mercury	Vanadium
1579	Powdered Lead Base Paint	35 g	11.87%				
1618	Vanadium and Nickel in Residual Fuel Oil	100 mL		75μg/g	(4.3%)		423μg/g
1630	Trace Mercury in Coal	50 g				0.13 μg/g	
1636a	Lead in Reference Fuel	3 vials each	0.03, 0.05, 0.07, 2.0 g/gal				
1637a	Lead in Reference Fuel	4 vials each	0.03, 0.05, 0.07 g/gal				
1638b	Lead in Reference Fuel	IN PREP					
1641b	Mercury in Water (μg/mL)	6×20 mL				1.52 μg/mL	
1642b	Mercury in Water (ng/mL)	950 mL				1.49 ng/mL	
8505	Vanadium in Crude Oil	250 mL					390μg/g

Simulated Rainwaters

These materials were developed to aid in the analysis of acidic rainwater by providing stable, homogeneous material as control standards at two levels of acidity.

NOTE: Values in parentheses for SRM 2694 are not certified, and no values are certified for RM 8409.

SRM	Type	Unit of Issue
2694	Simulated Rainwater	Set 4: 2–50mL each of 2 levels
8409	Simulated Rainwater	Set 2, 1–50mL each of 2 levels

Constituent Element/Parameter	2694–I	2694–II	8409–I	8409–II
pH, 25°C	4.30	3.59	(4.320)	(3.61)
Specific Conductance (μS/cm, 25°C)	26	130	(25)	(128)
Acidity, meq/L	0.050	0.248	(0.055)	(0.280)
Fluoride, mg/L	0.054	0.098	(0.058)	(0.102)
Chloride, mg/L	(0.24)	(1.0)	(0.230)	(1.00)
Nitrate, mg/L	0.501	7.06	(0.535)	(7.18)
Nitrate-Nitrogen, mg/L	—	—	(0.121)	(1.62)
Sulfate, mg/L	2.69	10.8	(2.62)	(10.5)
Sulfate-Sulfur, mg/L	—	—	(0.875)	(3.49)
Sodium, mg/L	0.205	0.419	(0.208)	(0.410)
Potassium, mg/L	0.052	0.106	(0.058)	(0.112)
Ammonium, mg/L	—	(1.0)	—	(1.07)
Ammonium-Nitrogen, mg/L	—	—	—	(0.83)
Calcium, mg/L	0.014	0.049	(0.027)	(0.05)
Magnesium, mg/L	0.024	0.051	(0.026)	(0.05)

Sulfur in Fossil Fuels

SRM	Type	Unit Size	Sulfur Wt.%	Furnace Ash Wt.%	HHV2 MJ•Kg^{-1}	HHV2 (BTU•lb^{-1})
1616	Sulfur in Kerosene (IN PREP)					
1617	Sulfur in Kerosene (IN PREP)					
1619	Sulfur in Residual Fuel Oil	100 mL	0.719			
1620a	Sulfur in Residual Fuel Oil	100 mL	4.504			
1621b	Sulfur in Residual Fuel Oil	100 mL	0.950			
1622b	Sulfur in Residual Fuel Oil	100 mL	1.982			
1623a	Sulfur in Residual Fuel Oil	100 mL	0.240			
1624a	Sulfur in Distillate Fuel Oil	100 mL	0.141			
2682	Coal (Sub-bituminous)	50 g	0.47	6.37	27.45	(11800)
2683	Coal (Bituminous)	50 g	1.85	6.85	32.70	(14060)
2684	Coal (Bituminous)	50 g	3.00	11.09	29.68	(12760)
2685	Coal (Bituminous)	50 g	4.62	16.53	28.15	(12100)
1819	Sulfur in Lubricating Base Oil:					
	Oil I	20 g	299 μg/g			
	Oil II	20 g	1070 μg/g			
	Oil III	20 g	2865 μg/g			
	Oil IV	20 g	6030 μg/g			
	Oil V	20 g	10550 μg/g			

NOTE: The calorific values (MJ·Kg^{-1}) may decrease upon the aging or normal oxidation of the coals. NBS will continue to monitor these calorific values and report any substantive change to the purchaser.

Trace Elements

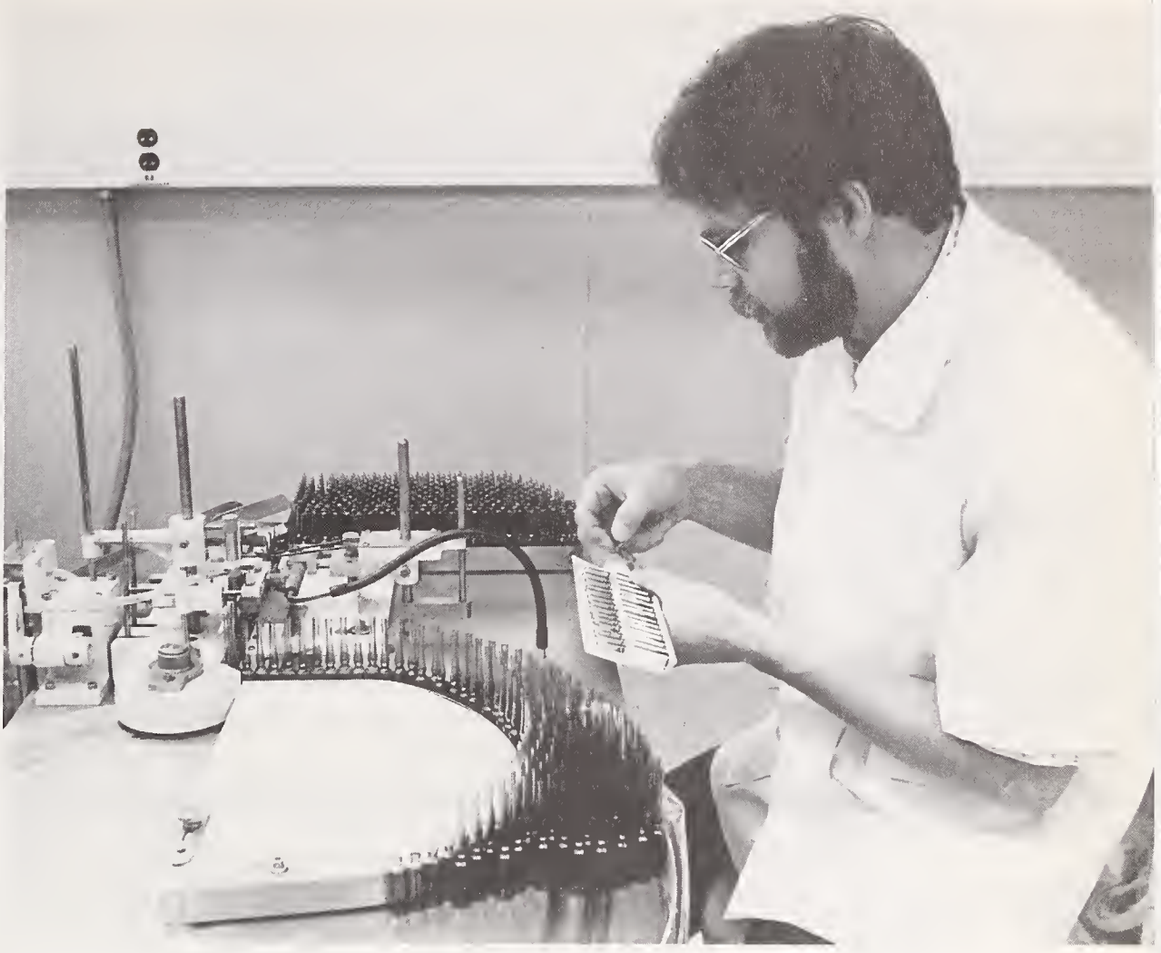
SRM	1632b	1633a	1634b	1635	1643b	1645	1646	1648
Type	Coal (Bituminous)	Coal Fly Ash	Fuel Oil	Coal (Subbituminous)	Water	River Sediment	Estuarine Sediment	Urban Particulate
Unit Size	75 g	75 g	100 mL	75 g	950 mL	70 g	75 g	2 g
ELEMENT	Nominal Concentrations in μg/g, unless otherwise noted.							
Aluminum	0.855%	(14%)	(16)	(0.32%)		2.26%	6.25%	3.42%
Antimony	(0.24)	(7)		(0.14)		(51)	(0.4)	(45)
Arsenic	3.72	145	0.12	0.42	(49) ng/g	(66)	11.6	115
Barium	67.5	(0.15%)	(1.3)		44 ng/g			(737)
Beryllium		(12)			19 ng/g		(1.5)	
Bismuth					(11) ng/g			
Bromine	(17)				B(94) ng/g			(500)
Cadmium	0.0573	1.0		0.03	20 ng/g	10.2	0.36	75
Calcium	0.204%	1.11%	(15)			(2.9)	0.83%	
Cerium	(9)	(180)		(3.6)			(80)	(55)
Cesium	(0.44)	(11)					(3.7)	(3)
Chlorine	(1260)							(0.45%)
Chromium	(11)	196	(0.7)	2.5	18.6 ng/g	2.96%	76	403
Cobalt	2.29	(46)	0.32	(0.65)	26 ng/g	10.1	10.5	(18)
Copper	6.68	118		3.6	21.9 ng/g	109	18	609
Europium	(0.17)	(4)		(0.06)			(1.5)	(0.8)
Fluorine						(0.09%)		
Gallium		(58)		(1.05)				
Germanium							(1.4)	
Hafnium	(0.43)	(7.6)		(0.29)				(4.4)
Hydrogen	5.07%							
Indium								(1.0)

Trace Elements (Continued)

SRM	1632b	1633a	1634b	1635	1643b	1645	1646	1648
Type	Coal (Bituminous)	Coal Fly Ash	Fuel Oil	Coal (Subbituminous)	Water	River Sediment	Estuarine Sediment	Urban Particulate
Unit Size	75 g	75 g	100 mL	75 g	950 mL	70 g	75 g	2 g
Iodine								(20)
Iron	0.759%	9.4%	31.6	0.239%	99 ng/g	11.3%	3.35%	3.91%
Lanthanum	(5.1)					(9)		(42)
Lead	3.67	72.4	(2.8)	1.9	23.7 ng/g	714	28.2	0.655%
Lithium	(10)						(49)	
Magnesium	0.0383%	0.455%				0.74%	1.09%	(0.8%)
Manganese	12.4	(190)	0.23	21.4	28 ng/g	785	375	(860)
Mercury		0.16	(<0.001)			1.1	0.063	
Molybdenum	(0.9)	(29)			85 ng/g		(2)	
Nickel	6.10	127	28	1.74	49 ng/g	45.8	32	82
Nitrogen	1.56%							
Phosphorus							0.054%	
Potassium	0.0748%	1.88%				1.26%	(1.4%)	1.05%
Rubidium	5.05	131					(87)	(52)
Samarium	(0.87)							(4.4)
Scandium	(1.9)	(40)		(0.63)		(2)	(10.8)	(7)
Selenium	1.29	10.3	0.18	0.9	9.7 ng/g	(1.5)	(0.6)	27
Silicon	(1.4%)	22.8%					(31%)	
Silver					9.8 ng/g			(6)
Sodium	0.0515%	0.17%	(90)	(0.24%)		0.54%	(2%)	0.425%
Strontium	(102)	830			227 ng/g			
Sulfur	1.89%		2.8%	0.33%		(1.1)	(0.96%)	(5%)
Tellurium							(0.5)	
Thallium		5.7			8.0 ng/g	1.44	(0.5)	
Thorium	1.342	24.7		0.62		1.62	(10)	(7.4)
Titanium	0.0454%	(0.8%)		(0.02%)			(0.51%)	(0.40%)
Tungsten	(0.48)							(4.8)
Uranium	0.436	10.2		0.24		1.11		5.5
Vanadium	(14)	(300)	55.4	5.2	45.2 ng/g	23.5	94	140
Zinc	11.89	220	3.0	4.7	66 ng/g	0.172%	138	0.476%

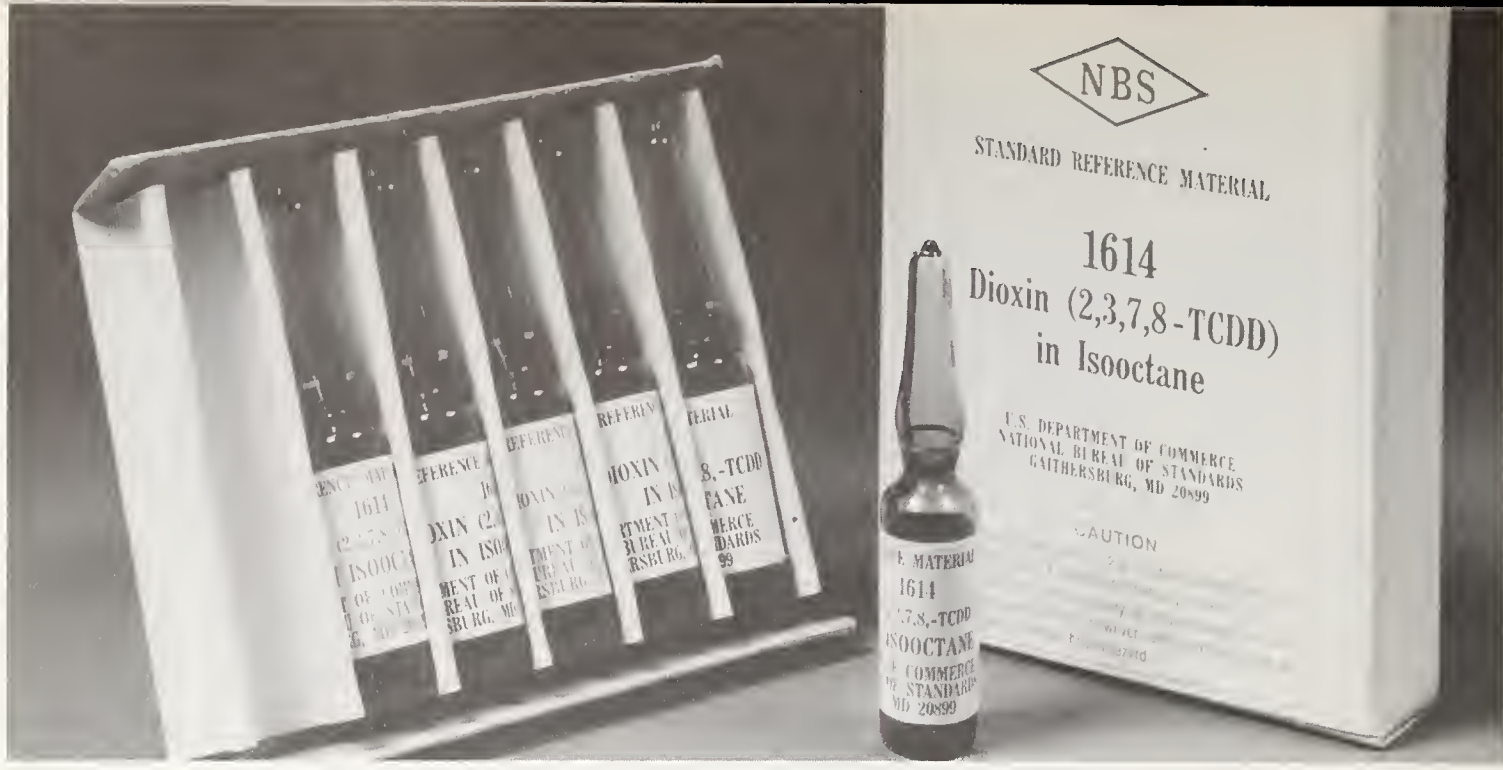
Values in parentheses are not certified, but are given for information only.

Dale Friend operates equipment that fills and seals ampoules used for various liquid SRM's.



Organic Constituents

SRM	Type	Unit of Issue
1580	Shale Oil	Set of 5, 2mL/ampoules
1581	Polychlorinated Biphenyls in Oil	Set of 4, 5mL/ampoules
1582	Petroleum Crude Oil	Set of 5, 2mL/ampoules
1583	Chlorinated Pesticides in *Iso*octane	Set of 6, 2mL/ampoules
1584	Phenols in Methanol	Set of 5, 2mL/ampoules
1585	Chlorinated Biphenyls	IN PREP
1586	Isotopically Labelled Priority Pollutants	Set of 6, 2mL/ampoules
1587	Nitro PAH in Solution	Set of 4, 1mL/ampoule
1614	Dioxin (2,3,7,8 TCDD) in *Iso*octane	Set of 6, 1.2mL/ampoule
1639	Halocarbons (in Methanol)	Set of 5, 1.5 mL/ampoule
1644	Polynuclear Aromatic Hydrocarbon Generator Columns	Set of 3 columns
1647	Priority Pollutant PAH (in Acetonitrile)	Set of 5, 1.2mL/ampoule
1649	Urban Dust/Organics	10 grams
1650	Diesel Particulate Matter	Set of 5, 100mg/ampoule



Organic Constituents (Continued)

SRM	1580	1582	1644	1647	1649	1650
Constituents	(μg/g)	(μg/g)	(μg/kg)	(μg/mL)	(μg/g)	(μg/g)
Anthracene			16.6 to 60.1	3.29		
Benz[a]anthracene		3.0	3.38 to 12.8	5.03	2.6	6.5
Benzo[a]pyrene	21	1.1	0.59 to 2.26	5.3	2.9	1.2
Benzo[e]pyrene	18					(10)
Fluoranthene	54	2.5		10.1	7.1	51
o-Cresol	385					
Phenol	407					
Perylene	3.4	31				(0.13)
Pyrene	104			9.84		48
2,6–Dimethylphenol	175					
Benzo[f]quinoline	16					
(5,6-Benzoquinoline)						
Naphthalene				22.5		
Acenaphthylene				19.1		
Acenaphthene				21.0		
1–Nitropyrene						19
Fluorene				4.92		
Phenanthrene		101		5.06		(71)
Chrysene				4.68		(22)
Benzo[b]fluoranthene				5.11		
Benzo[k]fluoranthene				5.02		(2.1)
Benzo[ghi]perylene				4.01	4.5	2.4
Dibenz[a,h]anthracene				3.68		
Indeno[1,2,3–cd]pyrene				4.06	3.3	
Dibenzothiophene		33				

Organic Constituents (Continued)

SRM 1639—Certified Concentration of Halocarbons at 23±3°C.

Compound	Concentration, ng/μL
Chloroform	6235
Chlorodibromomethane	124.6
Bromodichloromethane	389.9
Bromoform	86.5
Carbon Tetrachloride	157.0
Trichloroethylene	85.8
Tetrachloroethylene	40.6

SRM 1581 Polychlorinated Biphenyls in Oils

Matrix	Aroclor Type	Concentration (μg/g)
Motor Oil	1242	100
Motor Oil	1260	100
Transformer Oil	1242	100
Transformer Oil	1260	100

SRM 1583 Chlorinated Pesticides in 2,2,4–Trimethylpentane

Pesticide	Concentrations	
	(μg/g)	(μg/mL, 23°C)
Y-BHC (Lindane)	1.11	0.77
d-BHC	0.76	0.53
Aldrin	0.86	0.59
Heptachlor Epoxide	(0.997)	
4,4′–DDE (p,p′–DDE)	1.23	0.85
4,4′–DDT (p,p′–DDT)	1.90	1.31

SRM 1584 Priority Pollutant Phenols in Methanol

Compound	Concentration (μg/mL, 23°C)
2–Chlorophenol	64.4
Phenol	29.7
2–Nitrophenol	25.2
2,4–Dimethylphenol	51.6
2,4–Dichlorophenol	35.6
4–Chloro-m-cresol	27.4
2,4,6–Trichlorophenol	20.4
4–Nitrophenol	20.7
4,6–Dinitro-o-cresol	20.1
Pentachlorophenol	15.4
2,4–Dinitrophenol	(22.4)

Organic Constituents (Continued)

SRM 1586 Isotopically Labeled and Unlabeled Priority Pollutants in Methanol

Compound	Concentrations (μg/g)	
	1586–1 (unlabeled)	1586–2 (labeled)
Carbon tetrachloride	128.5	124.4
Benzene	101.1	99.0
Chlorobenzene	133.0	144.0
Phenol	117.0	116.0
Nitrobenzene	126.0	134.5
2–Nitrophenol	103.6	101.9
2,4–Dichlorophenol	102.5	82.2
Naphthlene	126.5	126.6
Bis(2–ethylhexyl)phthalate	63.9	60.4
Benzo(a)pyrene	49.2	44.1

SRM 1587 Nitrated Polycyclic Aromatic Hydrocarbons in Methanol

Compound	Concentrations	
	(μg/g)	(μg/mL, 23°C)
2–Nitrofluorene	9.67	7.64
9–Nitroanthracene	5.01	3.96
3–Nitrofluoranthene	9.24	7.30
1–Nitropyrene	8.95	7.07
7–Nitrobenz[a]anthracene	9.27	7.32
6–Nitrochrysene	8.13	6.42
6–Nitrobenzo[a]pyrene	(6.1)	(4.8)

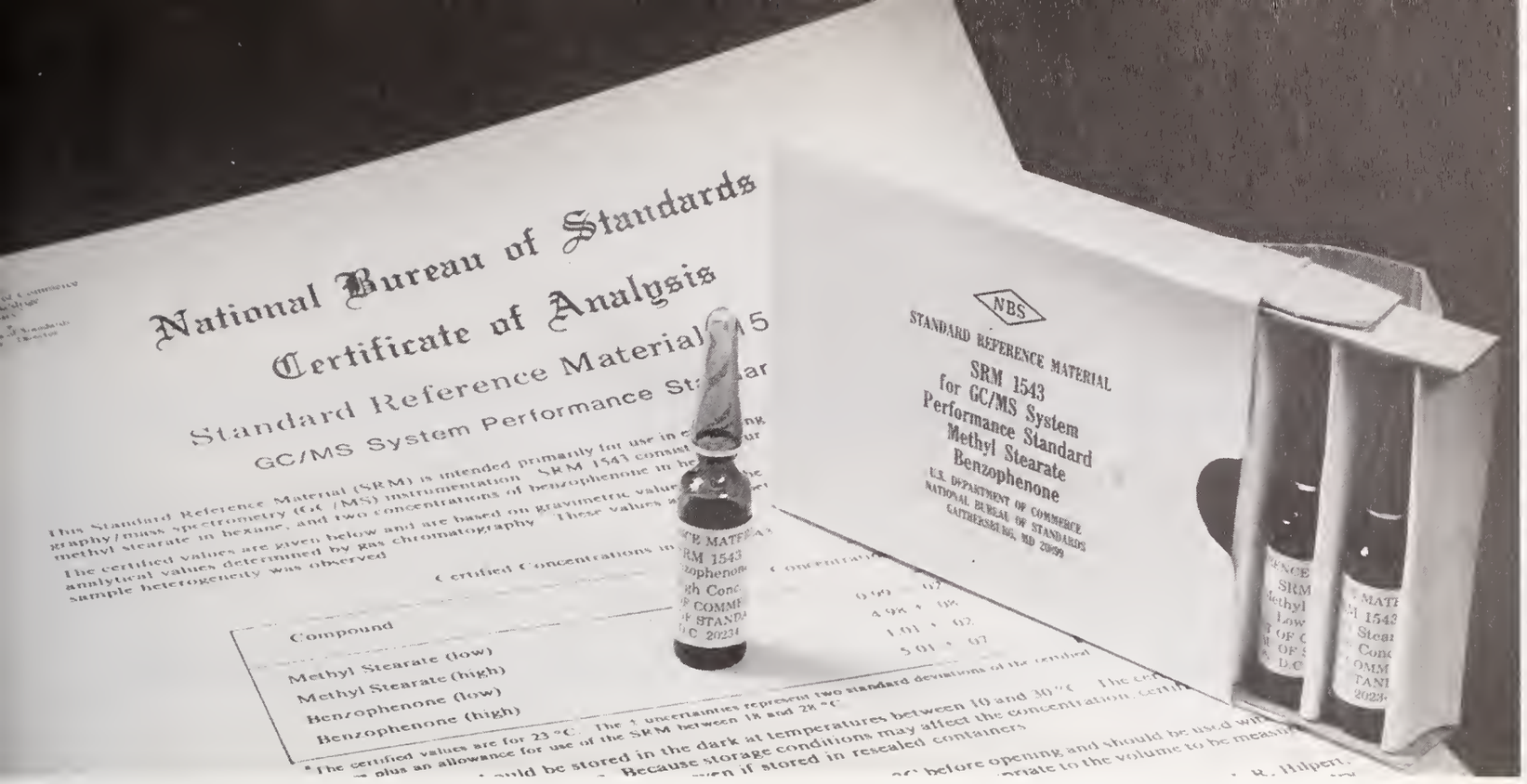
SRM 1614 Dioxin (2,3,7,8-TCDD in *Iso*octane)

Compound	Concentrations	
	(ng/g)	(ng/mL, 23°C)
2,3,7,8-TCDD	98.3	67.8
2,3,7,8–TCDD–^{13}C	95.6	65.9

GC/MS System Performance

These SRM's are for evaluating the sensitivity of gas chromatographic/mass spectrometry (GC/MS) instrumentation. They consist of two concentrations each of methyl stearate and benzophenone.

SRM	Type	Concentrations (ng/μL)		Unit Size
		Methyl Stearate	Benzophenone	
1543	GC/MS System Performance	0.99; 4.98	1.01; 5.01	1 Set, 4 vials
8443	GC/MS System Performance	0.99; 4.98	1.01; 5.01	5 Sets, 20 vials



Top: SRM 1543, GC/MS Performance Standard, contains 4 vials, two each of different concentrations of methyl stearate and benzophenone.

Left: Inspection, labeling, and packaging of SRM's often combine automated and hand operations. Frances Smithers labels small vials not suitable for machine labeling.

Industrial Hygiene

These SRM's were developed for industrial hygiene analyses to provide reference materials for toxicology research and for monitoring human exposure to selected toxic elements.

Freeze-Dried Urine

SRM's 2670, 2671a, and 2672a consist of freeze-dried urine in 30 mL serum bottles. The freeze-dried urine SRM's are to be reconstituted by the addition of 20 mL of pure water to each bottle. Each unit contains a set of four bottles, two bottles each at normal and elevated levels.

SRM	Matrix	Constituent Certified or Determined
2670	Freeze-Dried Urine	Arsenic, Cadmium, Calcium, Chloride, Copper, Lead, Magnesium, Manganese, Nickel, Potassium, Selenium, Sodium, Zinc
2671a	Freeze-Dried Urine	Flouride
2672a	Freeze-Dried Urine	Mercury

Materials on Filter Media

These SRM's consist of potentially hazardous materials deposited on filters to be used to determine the levels of these materials in industrial atmospheres.

SRM	Type	Unit Size	Material Certified	Quantity Certified (μg/filter)			
				I	II	III	IV
2673	Sulfate and Nitrate	2 filters at	Sulfate	503	2002	6939	2
	on Filter Media	each level	Nitrate	100	1002	2513	2
2676b	Metals on Filter Media	Set of 12	Cadmium	0.99	2.49	10.14	(<0.01)
			Lead	7.55	14.9	30.4	(<0.04)
			Manganese	1.88	9.41	18.5	(<0.01)
			Zinc	10.01	49.7	99.5	(0.4)
2677	Beryllium and Arsenic	2 sets of 4	Beryllium	0.052	0.256	1.03	<0.001
	on Filter Media		Arsenic	0.103	1.07	10.5	<0.002
2679a	Quartz on Filter Media	Set of 4	Quartz	<2	30.8	80.2	202.7
			Clay	(370)	(370)	(370)	(370)

Values in parentheses are not certified, but are given for information only.

Thin Films for X-ray Fluorescence

These SRM's are for standardizing x-ray spectrometers. They may be useful in elemental analysis of particulate matter collected on filter media, and where x-ray spectrometer calibration functions are determined using thin film standards. Each SRM is individually certified and consists of a silica-base glass film deposited on a polycarbonate filter.

SRM	Type	Elements Certified
1832	Thin-Glass Film	Al, Ar, Ca, Co, Cu, Fe, Mn, Si, Na, and V
1833	Thin-Glass Film	Ar, Fe, Pb, K, Si, Ti, and Zn

Respirable Quartz

This SRM consists of quartz powder that is in the respirable size range. It is intended for use in determining the level of quartz in an industrial atmosphere by x-ray diffraction.

SRM	Type	Constituent Certified	Amount
1878	Alpha Quartz	95.5% Crystalline α-quartz	5 g

Asbestos

These SRM's consists of four 3×3 mm sections of a 0.4 mm pore size polycarbonate filter containing chrysotile fibers mixed with an urban dust. It is intended for use in evaluating the techniques used to count and identify chrysotile asbestos fibers in filter samples by transmission electron microscopy.

SRM	Type	Fiber Loading
1876a	Chrysotile Asbestos	37 fibers/0.01 mm²
8410	Chrysotile Asbestos Research Filter	20 fibers/0.01 mm²

Powdered SRM's are packaged by weight. John Savoy uses a balance to assure the correct amount in each bottle.

Lubricating Materials

Metallo-Organic Compounds

These SRM's are for preparing solutions in oils of known and reproducible concentrations of metals. Certificates give directions for preparing a solution of known concentration in lubricating oil.

SRM	Type	Constituent Certified		
		Element	(Wt. percent)	Wt/Unit (grams)
1075a	Aluminum 2-ethylhexanoate	Aluminum	8.07	5
1051b	Barium cyclohexanebutyrate	Barium	28.7	5
1053a	Cadmium cyclohexanebutyrate	Cadmium	24.8	5
1074a	Calcium 2-ethylhexanoate	Calcium	12.5	5
1078b	Tris (1-phenyl-1,3-butanediono) chromium (III)	Chromium	9.6	5
1055b	Cobalt cyclohexanebutyrate	Cobalt	14.8	5
1080a	Bis(1-phenyl-1,3-butanediono)copper (II)	Copper	16.37	5
1079b	Tris (1-phenyl-1,3-butanediono)iron (III)	Iron	10.45	5
1059c	Lead cyclohexanebutyrate	Lead	IN PREP	5
1060a	Lithium cyclohexanebutyrate	Lithium	4.1	5
1061c	Magnesium cyclohexanebutyrate	Magnesium	6.45	5
1062b	Manganous cyclohexanebutyrate	Manganese	13.2	5
1065b	Nickel cyclohexanebutyrate	Nickel	13.89	5
1071b	Triphenyl phosphate	Phosphorus	9.48	5
1066a	Octaphenylcyclotetrasiloxane	Silicon	14.14	5
1077a	Silver 2-ethylhexanoate	Silver	42.60	5
1069b	Sodium cyclohexanebutyrate	Sodium	12.0	5
1070a	Strontium cyclohexanebutyrate	Strontium	20.7	5
1057b	Dibutyltin bis (2-ethylhexanoate)	Tin	22.95	5
1052b	Bis(1-phenyl-1,3-butanediono)oxovanadium (IV)	Vanadium	13.01	5
1073b	Zinc cyclohexanebutyrate	Zinc	16.66	5

Catalyst Package for Lubricant Oxidation

SRM 1817 is intended primarily for use in evaluating the oxidation stability of lubricating oils, i.e., automative crankcase lubricants. The SRM contains: (1) an oxidized/nitrated fuel fraction, (2) a metal naphthenate mixture, and (3) distilled water. The metal naphthenate mixture has the following weight percentages of metal naphthenates: lead–82, iron–7, copper–4, manganese–3.5, and tin–3.5. SRM 1817 is available as a kit of 5 ampoules of each of the three components. The fuel and metal catalysts are sealed under inert atmosphere to ensure their stabilities.

Wear-Metals in Oil

SRM	1083	1084	1085
Type	Base Oil (ppm)	Wear-Metals in Oil 100 ppm	Wear-Metals in Oil 300 ppm
Unit Size	150 mL	85 mL	85 mL
ELEMENT (Values in μg/g)			
Aluminum	(<0.5)	98	296
Chromium	(<0.02)	100	298
Copper	(<0.5)	98	295
Iron	(<1)	100	300
Lead	(<0.04)	(101)	(305)
Magnesium	(<0.1)	98	297
Molybdenum	(<0.01)	97	292
Nickel	(<0.4)	101	303
Silicon	(<1)	(102)	(308)
Silver	(<0.05)	(101)	(296)
Sulfur	(980)	(2237)	(4806)
Tin	(<0.4)	102	296
Titanium	(<5)	99	300

Values in parentheses are not certified, but are given for information only.

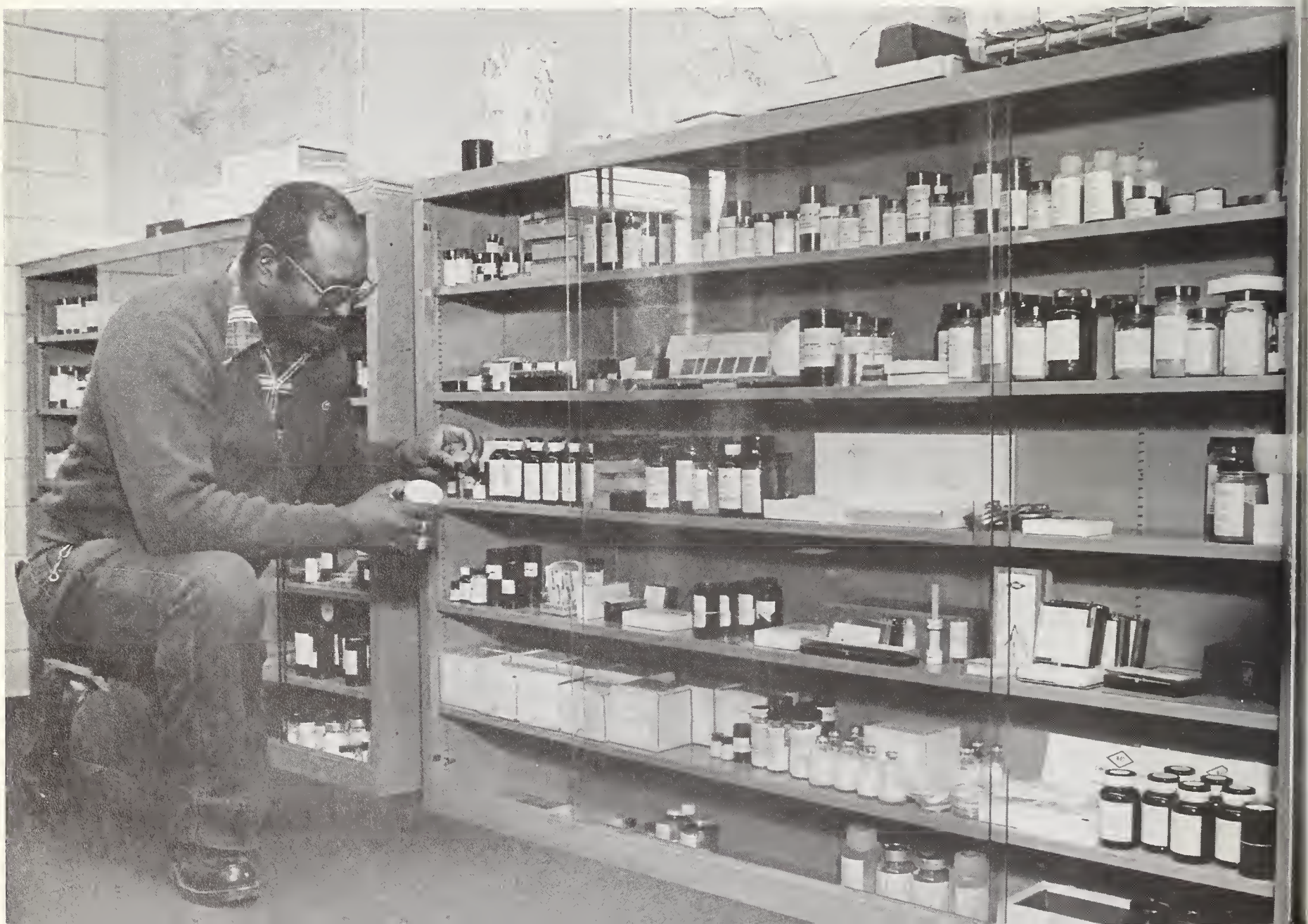
Many SRM's are certified as bulk material and then packaged by weight into individual containers, as Helen Tyler is doing with this powdered SRM.

Fertilizers

These SRM's are intended for use in the fertilizer industry as working standards for the determination of the certified constituents.

SRM	Type	Wt/Unit (grams)	Composition (Nominal Weight Percent)					
			N	P	K	P_2O_5	K_2O	CaO
193	Potassium Nitrate	90	13.85		38.66			
194	Ammonium Dihydrogen Phosphate	90	12.15	29.92				
200	Potassium Dihydrogen Phosphate	90		22.74	28.76			
120b	Phosphate Rock (Florida)	90				34.57	0.12	49.40
694	Phosphate Rock (Western)	90				30.2	0.51	43.6

SRM	Composition (Nominal Weight Percent)											
	SiO_2	F	Fe_2O_3	Al_2O_3	MgO	Na_2O	MnO	TiO_2	CO_2	CdO	U	V_2O_5
120b	4.68	3.84	1.10	1.06	0.28	0.35	0.032	0.15	2.79	0.002	0.01284	
694	11.2	3.2	0.79	1.8	0.33	0.86	0.0116	(0.11)		0.015	0.01414	0.31



Ores

SRM	79a	180	181	182	183
Type	Fluorspar, Customs grade	Fluorspar, high grade	Lithium ore (Spodumene)	Lithium ore (Petalite)	Lithium ore (Lepidolite)
Unit Weight	120g	120 g	45 g	45 g	45 g
Constituents					
CaF_2	97.39%	98.80%			
Li_2O			6.39%	4.34%	4.12%

SRM	330	331	332	333
Type	Copper, ore mill heads	Copper, ore mill tails	Copper, Concentrate	Molybdenum, Concentrate
Unit Weight	100 g	100 g	50 g	35 g
Constituents				
Cu	0.84%	0.091%	28.4%	1.038%
Re	0.30 ppm	0.4 ppm	10.2 ppm	0.087%
Mo	0.018%	0.0022%	0.64%	55.3%
Au	(0.093 ppm)	(0.034 ppm)	(2.14 ppm)	(8.9 ppm)
Ag	(1.37 ppm)	(0.243 ppm)	(38.7 ppm)	(25.0 ppm)

SRM	Type	Wt/ Units (grams)	Constituent (Nominal Weight Percent)				
			WO_3	Ca	Fe	Pb	Mn
277	Tungsten Concentrate	100	67.4	(0.37)	(7.4)	(0.07)	(10.0)

SRM	Mo	Nb	O_2	P	Si	S	Ta	Sn	Ti
277	(0.06)	(1.0)	(21.4)	(0.03)	(0.85)	(0.25)	(0.20)	(0.54)	(2.2)

Values in parentheses are not certified, but are given for information only.

SRM's are issued in a variety of sizes, shapes, and packages. Carlton Fisher compares a 64 mm diameter aluminum spectrometric SRM with that of a 32 mm diameter steel SRM.

Ores (Continued)

SRM	27f	690	691	692	693	113a	329
Type	Iron Ore, Sibley	Iron Ore, Canada	Iron Oxide, reduced	Iron Ore, Labrador	Iron Ore, Nimba	Zinc Concentrate	Zinc Concentrate
Unit Weight	100 g	150 g	100 g	150 g	150 g	100 g	100 g
Constituents (Nominal Weight Percent)							
Al_2O_3	0.82	0.18	1.22	1.41	1.02		
BaO							
Cd						0.78	0.14
CaO	0.039	0.20	0.63	0.023	0.016	1.1_9	0.08
Co			0.030			(0.11)	(0.009)
Cu			0.032			0.31	0.13_2
In							0.019
Total Fe	65.97	66.85	90.8	59.58	65.11	2.08	12.9_4
Pb						2.80	6.0_6
MgO	0.019	0.18	0.52	0.035	0.013	0.75	0.16_5
MnO	0.011	0.23	0.043	0.46	0.091	Ni(0.07)	Ni(0.006)
P	0.041	0.011	0.006	0.039	0.056		
K_2O	0.008	0.0030		0.039	0.0028		
SiO_2	4.17	3.71	3.7	10.14	3.87	(1.54)	(0.61)
Ag						0.046_7	0.0089
Na_2O	0.012	0.003	0.186	0.008	0.0028		
S	0.005	0.003	0.008	0.005	0.005	30.6	(31.7)
TiO_2	0.019	0.022	0.27	0.045	0.035		
Zn						$57._3$	$45._5$
Moisture						0.008	0.4_5

Ores (Continued)

SRM	69b	696	697	698	699	120b	694	25d	670
Type	Bauxite, Arkansas	Bauxite, Surinam	Bauxite, Dominican	Bauxite, Jamaican	Alumina (Reduction Grade)	Phosphate Rock, Florida	Phosphate Rock, Western	Manganese Ore	Rutile Ore
Unit Weight	60 g	60 g	60 g	60 g	60 g	90 g	90 g	100 g	90 g
Constituents (Nominal Weight Percent)									
Al_2O_3	48.8	54.5	45.8	48.2		1.06	1.8	5.32	
BaO	(0.008)	(0.004)	(0.015)	(0.008)				(0.21)	
CdO						0.002	0.015		
CaO	0.13	0.018	0.71	0.62	0.036	49.40	43.6	(0.052)	
Co	(0.0001)	(0.00009)	(0.0013)	(0.0045)			F 3.2		
Cr_2O_3	0.011	0.047	0.100	0.080	0.0002	F 3.84	(0.10)		0.23
FeO_3	7.14	8.70	20.0	19.6	0.013	1.10	0.79	3.92	0.86
MgO	0.085	0.012	0.18	0.058	0.0006	0.28	0.33		
MnO	0.110	0.004	0.41	0.38	0.0005	0.032	0.0116	Mn51.78	
P_2O_5	0.118	0.050	0.97	0.37	0.0002	34.57	30.2	0.25	
K_2O	0.068	0.009	0.062	0.010		0.12	0.51	0.93	
SiO_2	13.43	3.79	6.81	0.69	0.014	4.68	11.2	2.52	0.51
Na_2O	0.025	(0.007)	(0.036)	(0.015)	0.59	0.35	0.86		
SO_3	0.63	0.21	10.13	0.22				0.13	
TiO_2	1.90	2.64	2.52	2.38		0.15	(0.11)		96.16
U						128.4μg/g	141.4μg/g		
V_2O_5	0.028	0.072	0.063	0.064	0.0005		0.31		0.66
ZnO	0.0035	0.0014	0.037	0.029	0.013		(0.19)		
ZrO_2	0.29	0.14	0.065	0.061					0.84
Ga_2O_3					0.010				
Li_2O					0.002				
Available Oxygen								14.28	
Moisture								(0.96)	
Loss on Ignition	27.2	29.9	22.1	27.3					

Values in parentheses are not certified, but are given for information only.

Rocks, Minerals, and Refractories

SRM	1c	88b	70a	99a	97b	98a	81a	165a	1413
Type	Lime-stone, argilla-ceous	Lime-stone, dolomi-tic	Feld-spar, potash	Feld-spar, soda	Clay, flint	Clay, plastic	Glass sand	Glass sand (low iron)	Glass sand (high alumi-na)
Unit Weight	50 g	IN PREP	40 g	40 g	IN PREP	60 g	75 g	75 g	75g
Constituents (Nominal Weight Percent)									
Al_2O_3	1.3		17.9	20.5		33.19	0.66	0.059	9.90
BaO			0.02	0.26		0.03			0.12
CaO	50.3		0.11	2.14		0.31			0.74
Cr_2O_3						0.03	46 μg/g	(1.1 μg/g)	
Fe_2O_3	0.55		0.07_5	0.06_5		1.34	0.082	0.012	0.24
Li_2O						0.070			
MgO	0.42			0.02		0.42			0.06
MnO	0.025								
P_2O_5	0.04			0.02		0.11			
K_2O	0.28		11.8	5.2		1.04			3.94
Rb_2O			0.06						
SiO_2	6.84		67.1	65.2		48.94			82.77
Na_2O	0.02		2.5_5	6.2		0.082			1.75
SrO	0.030					0.039			
TiO_2	0.07		0.01	0.007		1.61	0.12	0.011	0.11
ZrO_2						0.042	0.034	0.006	
Loss on Ignition	39.9		0.40	0.26		12.44			

Rocks, Minerals, and Refractories (Continued)

SRM	154b	278	688	76a	77a	78a
Type	Titanium dioxide	Obsidian rock	Basalt rock	Burnt Refractory (Al_2O_3–40%)	Burnt Refractory (Al_2O_3–60%)	Burnt Refractory (Al_2O_3–70%)
Unit Weight	90 g	35 g	60 g	75 g	75 g	75 g
Constituents (Nominal Weight Percent)						
Al_2O_3		14.15	17.36	38.7	60.2	71.7
CaO		0.983		0.22	0.05	0.11
FeO			7.64			
Fe_2O_3		2.04	10.35	1.6_0	1.0_0	1.2
Li_2O				0.042	0.2_5	0.12
MgO				0.52	0.38	0.70
MnO		0.052	0.167			
P_2O_5		0.036	0.134	0.12_0	0.092	1.3
K_2O		4.16	0.187	1.33	0.09_0	1.22
SiO_2		73.05	48.4	54.9	35.0	19.4
Na_2O		4.84	2.15	0.07	0.037	0.078
SrO				0.037	0.009	0.25
TiO_2	99.74	0.245	1.17	2.0_3	2.6_6	3.2_2
ZrO_2				0.15	0.21	0.31
Loss on Ignition				(0.34)	(0.22)	(0.42)

Pam Clark processes orders from foreign customers whose use (and purchases) of SRM's has increased markedly in recent years.

Rocks, Minerals, and Refractories (Continued)

SRM	103a	198	199
Type	Chrome Refractory	Silica Refractory	Silica Refractory
Unit Weight	60 g	45 g	45 g
Constituents (Nominal Weight Percent)			
Al_2O_3	29.96	0.16	0.48
CaO	0.69	2.71	2.41
Cr_2O_3	32.06		
FeO	12.43		
Fe_2O_3		0.66	0.74
Li_2O		0.001	0.002
MgO	18.54	0.07	0.13
MnO	0.11	0.008	0.007
P_2O_5	0.01	0.022	0.015
K_2O		0.017	0.094
SiO_2	4.63		
Na_2O		0.012	0.015
TiO_2	0.22	0.02	0.06
ZrO_2	0.01	<0.01	0.01
Loss on Ignition		0.21	0.17

Values in parentheses are not certified, but are given for information only.

Carbides

SRM	Type	Wt/Unit (grams)	Chemical Composition (Nominal Weight Percent)					
			SiC	Total C	Free C	Fe	O_2	N_2
112b	Silicon Carbide	80	97.37	29.43	0.26	0.13		
276a	Tungsten Carbide	75		6.11	(0.02)		(0.03)	(0.003)

Glasses

SRM	89	91	92	93a	620	621	1411	1412	1830	1831
Type	Lead-Barium	Opal	Low-Boron	High-Boron	Soda-Lime, Flat	Soda-Lime, Container	Soft Borosilicate	Multi Component	Soda-Lime, Float	Soda-Lime, Sheet
Unit Size	45 g	45 g	45 g	Wafer 32 mm D×6 mm	3 platelets 35×35×3 mm	3 disks 38 mm D×5 mm	10 platelets	8 platelets	3 platelets 38×38×6 mm	3 platelets 37×37×3 mm
Constituent (Nominal Weight Percent)										
SiO_2	65.35	67.50	(75.0)	80.8	72.8	71.13	58.04	42.38	73.07	73.08
PbO	17.50	0.10						4.40		
Al_2O_3	0.18	6.01		2.28	1.80	2.76	5.68	7.52	0.12	1.21
Fe_2O_3	0.049	0.079		0.028	0.043	0.040	0.050	(0.031)	0.121	0.087
ZnO		0.08	(0.2)				3.85	4.48		
CdO								4.38		
MnO	0.088	(0.008)								
TiO_2	0.01	0.019		0.014	0.018	0.014	0.02		0.011	0.019
ZrO_2	0.005	0.009		0.042		0.007				
CaO	0.21	10.49	(8.3)	0.01	7.11	10.71	2.18	4.53	8.56	8.20
BaO	1.40					0.12	5.00	4.67		
Li_2O								(4.50)		
MgO	0.03	(0.008)	(0.1)	0.005	3.69	0.27	0.33	(4.69)	3.90	3.51
K_2O	8.40	3.24	(0.6)	0.014	0.41	2.01	2.97	4.14	0.04	0.33
Na_2O	5.70	8.47	(13.1)	3.98	14.39	12.74	10.14	4.69	13.75	13.32
B_2O_3			0.70	12.56			10.94	4.53		
P_2O_5	0.23	0.023								
As_2O_5	0.36	0.10								
As_2O_3	0.03	0.09			0.056	0.030				
SO_3	0.03				0.28	0.13			0.26	0.25
Cl	0.05	0.015		0.06						
SrO							0.09	4.55		
F		5.73								
Loss on Ignition	0.32		(0.42)							

Values in parentheses are not certified, but are given for information only.

Cements

These SRM's are for x-ray spectroscopic and chemical analysis of portland cements and related materials. Each unit consists of three sealed vials each containing approximately 5 g of material.

SRM	633	634	635	636	637	638	639	1880	1881
Type	RED	GOLD	BLUE	YELLOW	PINK	GREEN	CLEAR	BLACK	WHITE
Unit Weight	15 g	15 g	15 g	15 g	15 g	15 g	15 g	15 g	15 g
Constituent (Nominal Weight Percent)									
CaO	64.5_0	62.5_8	59.8_3	63.5_4	66.0_4	62.0_9	65.7_6	63.13	58.67
SiO_2	21.8_8	20.7_3	18.4_1	23.2_2	23.0_7	21.4_8	21.6_1	19.82	22.25
Al_2O_3	3.7_8	5.2_1	6.2_9	3.0_2	3.2_8	4.4_5	4.2_8	5.02	4.19
Fe_2O_3	4.20	2.84	2.61	1.61	1.80	3.55	2.40	2.91	4.68
SO_3	2.2_0	2.2_1	7.0_7	2.3_1	2.3_8	2.3_4	2.4_8	3.37	3.65
MgO	1.0_4	3.3_0	1.2_3	3.9_5	0.6_7	3.8_3	1.2_6	2.69	2.62
K_2O	0.17	0.42	0.45	0.59	0.25	0.59	0.06	0.91	1.17
TiO_2	0.24	0.29	0.32	0.18	0.21	0.25	0.32	0.23	0.23
Na_2O	0.64	0.15	0.07	0.11	0.15	0.13	0.65	0.28	0.04
SrO	0.31	0.12	0.21	0.04	0.09	0.07	0.15	0.06	0.11
P_2O_5	0.24	0.10	0.17	0.08	0.24	0.06	0.08	0.29	0.09
Mn_2O_3	0.04	0.28	0.09	0.12	0.06	0.05	0.08	0.08	0.26
F	0.08	0.08	0.04	0.06	0.04	0.04	0.02	0.10	0.09
ZnO	0.01	0.02	0.01	0.03	0.01	0.10	0.01	0.01	0.01
Cr_2O_3	0.01	0.08	0.01	0.01	0.01	0.01	0.01		
Ignition loss	0.7_5	1.6_2	3.2_4	1.1_6	1.6_9	0.9_5	1.0_0	1.38	2.01
Total	100.06	100.00	100.03	100.00	99.97	99.97	100.16	100.30	100.07

SRM	Type	Unit
1882	Calcium Aluminate Cement (40% Al_2O_3)	IN PREP
1883	Calcium Aluminate Cement (70% Al_2O_3)	IN PREP

Trace Elements

The SRM's are for trace chemical analysis, specifically for calibrating instruments and evaluating analytical techniques used to determine trace elements in inorganic matrices.

SRM	607	610–611	612–613	614–615	616–617
Type	**Trace Elements in Potassium Feldspar**	**Trace Elements in Glass**	**Trace Elements in Glass**	**Trace Elements in Glass**	**Trace Elements in Glass**
Concentration		**500 ppm**	**50 ppm**	**1 ppm**	**0.02 ppm**
Wafer Thickness		**610 3 mm 611 1 mm**	**612 3 mm 613 1 mm**	**614 3 mm 615 1 mm**	**616 3 mm 617 1 mm**
Unit of Issue	**5 g**	**6 Wafers**	**6 Wafers**	**6 Wafers**	**6 Wafers**
Element			**Nominal Concentrations (ppm)**		
Antimony				(1.06)	(0.078)
Barium			(41)		
Boron		(351)	(32)	(1.30)	(0.20)
Cadmium				(0.55)	
Cerium			(39)		
Cobalt		(390)	(35.5)	(0.73)	
Copper		(444)	(37.7)	1.37	(0.80)
Dysprosium			(35)		
Erbium			(39)		
Europium			(36)	(0.99)	
Gadolinium			(39)		
Gallium				(1.3)	(0.23)
Gold		(25)	(5)	(0.5)	(0.18)
Iron		458	51	(13.3)	(11)
Lanthanum			(36)	(0.83)	(0.034)
Lead		426	38.57	2.32	1.85
Manganese		485	(39.6)		
Neodymium			(36)		
Nickel		458.7	38.8	(0.95)	
Potassium		(461)	(64)	30	29
Rubidium	523.90	425.7	31.4	0.855	0.100
Samarium			(39)		
Scandium				(0.59)	(0.026)
Silver		(254)	22.0	0.42	
Strontium	65.485	515.5	78.4	45.8	41.72
Thallium		(61.8)	(15.7)	(0.269)	(0.0082)
Thorium		457.2	37.79	0.748	0.0252
Titanium		(437)	(50.1)	(3.1)	(2.5)
Uranium		461.5	37.38	0.823	0.0721
Ytterbium			(42)		
Zinc		(433)			

In addition to the elements listed above, the glass SRM's contain the following 25 elements: As, Be, Bi, Cs, Cl, F, Ge, Hf, Hg, Li, Lu, Mg, Nb, P, Pr, Se, S, Te, Tb, Tm, Sn, W, V, Y, and Zr.

NOTE: Glass—Nominal Composition: 72% SiO_2, 12% CaO, 14% Na_2O, and 2% Al_2O_3.

Values in parentheses are not certified, but are given for information only.

Nuclear Materials

Special Nuclear Materials

These SRM's are available to Department of Energy contractors, Nuclear Regulatory Commission, or State Licensees, and foreign governments that have entered into an agreement of cooperation with the U.S. Government regarding the use of these materials. Purchase orders and requests for information regarding ordering procedures, availability, and shipment of these SRM's should be directed to:

NBS Special Nuclear Standard Reference Materials
U.S. Department of Energy
New Brunswick Laboratory, D–350
9800 South Cass Avenue
Argonne, IL 60439
(312) 972–2453
FTS: 972–2453

Plutonium Assay

SRM	Identification (Batch Name)	Constituent Certified	Element Weight* (g)	(Weight Percent)
945	Plutonium Metal, standard matrix	Impurities	5	99.9
949f	Plutonium Metal Assay	Plutonium Content	0.5	99.99

*Nominal weight

Plutonium Isotopic

SRM	Identification (Batch Name)	Element Weight (g)	Certified Isotopes (Atom Percent)					
			^{238}Pu	^{239}Pu	^{240}Pu	^{241}Pu	^{242}Pu	^{244}Pu
946	Plutonium Sulfate Tetrahydrate	0.25	0.232	84.464	12.253	2.477	0.574	
947	Plutonium Sulfate Tetrahydrate	0.25	0.278	77.089	18.610	2.821	1.202	
948	Plutonium Sulfate Tetrahydrate	0.25	0.010	91.736	7.922	0.299	0.0330	
996	Plutonium—Spike	0.001	0.005	0.034	0.677	0.092	1.325	97.867

Uranium Assay

SRM	Identification (Batch Name)	Constituent Certified	Element Weight (g)	Assay (Weight Percent)
950b	Uranium Oxide	U_3O_8	25	99.968
960	Uranium Metal	U	26	99.975
993	Uranium—235 Spike (solution)	U-235	0.1	99.8184
995	Uranium—233 Spike (solution)	U-233	0.005	99.9232
969	Uranium Oxide (for NDA measurements)	U-235	200	Set of 5 enrichments 0.3, 0.7, 2.0, 3.0, 4.5%

Uranium Isotopic

SRM	Uranium Oxide (U_3O_8)	Wt (grams)	Certified Isotopes (Atom Percent)			
			^{234}U	^{235}U	^{236}U	^{238}U
U-0002	Depleted	1.0	0.00016	0.01755	<0.00001	99.9823
U-005a	Depleted	1.0	0.0034	0.5064	0.00118	99.4890
U-010	Enriched	1.0	0.00541	1.0037	0.00681	98.984
U-015	Enriched	1.0	0.00850	1.5323	0.0164	98.443
U-020a	Enriched	1.0	0.01732	2.0262	0.01179	97.9447
U-030a	Enriched	1.0	0.02778	3.0404	0.000599	96.9312
U-050	Enriched	1.0	0.0279	5.010	0.0480	94.915
U-100	Enriched	1.0	0.0676	10.190	0.0379	89.704
U-150	Enriched	1.0	0.0993	15.307	0.0660	84.528
U-200	Enriched	1.0	0.1246	20.013	0.2116	79.651
U-350	Enriched	1.0	0.2498	35.190	0.1673	64.393
U-500	Enriched	1.0	0.5181	49.696	0.0755	49.711
U-750	Enriched	1.0	0.5923	75.357	0.2499	23.801
U-800	Enriched	1.0	0.6563	80.279	0.2445	18.820
U-850	Enriched	1.0	0.6437	85.137	0.3704	13.848
U-900	Enriched	1.0	0.7777	90.196	0.3327	8.693
U-930	Enriched	1.0	1.0812	93.336	0.2027	5.380
U-970	Enriched	1.0	1.6653	97.663	0.1491	0.5229

Special Nuclear Containers

SRM	Type	Size
9900	Special Nuclear Container	Service
9940	Special Nuclear Container, DOT 6M	13 gallon
9941	Special Nuclear Container	55 gallon
9942	Special Nuclear Container, Type A	10 gallon

NOTE: These special packaging materials may be necessary to fill your order, depending upon Department of Energy, Department of Transportation, and Nuclear Regulatory Commission shipping requirements.

Radiation Dosimetry

This SRM is a cobalt-in-aluminum alloy wire 0.5 mm in diameter and 1 meter long for use as a neutron density monitor standard.

SRM	Identification (Batch Name)	Cobalt Content (Weight Percent)
953	Neutron density monitor wire (Co in A1)	0.116

Fission Track Glass

These SRM's containing uranium at three concentration levels, will aid laboratories, performing fission track analyses, in interlaboratory comparisons of data and in monitoring neutron fluences. The materials were irradiated in the NBS 10 Megawatt Research Reactor, at two different neutron energies.

Each SRM unit contains four unirradiated glass wafers and two irradiated wafers.

SRM	Uranium Content (ng/g)	U (Atom Percent)	Reactor Position	Cu Foil	Au Foil
				Neutron Flux ($\times 10^{12}$n·cm^{-2}·s^{-1})	
961	461.5	0.2376	RT-3:	4.56	5.43
			RT-4:	1.31	1.46
				Neutron Fluence($\times 10^{14}$n·cm^{-2})	
962a	37.38	0.2392	RT-3:	4.37	4.75
			RT-4:	3.87	4.17
963a	0.823	0.2792	RT-3:	41.2	45.8
			RT-4:	39.5	43.0

Stable Isotopic Materials

The isotopic composition of these SRM's has been determined by mass spectrometry.

SRM	Isotopic Reference Standards	Element Certified	Wt/Unit (grams)
951	Boric Acid	Boron	100
952	Boric Acid, 95% Enriched ^{10}B	Boron	0.25
975	Sodium Chloride	Chlorine	0.25
977	Sodium Bromide	Bromine	0.25
978a	Silver Nitrate	Silver	0.25
979	Chromium Nitrate	Chromium	0.25
980	Magnesium Metal	Magnesium	0.25
*981	Lead Metal, Natural	Lead	1.0
*982	Lead Metal, Equal Atom (206/208)	Lead	1.0
*983	Lead Metal, Radiogenic (92%-206)	Lead	1.0
984	Rubidium Chloride, assay and isotopic	Rubidium	0.25
985	Potassium Chloride, assay and isotopic	Potassium	1.0
987	Strontium Carbonate, assay and isotopic	Strontium	1.0
989	Rhenium, assay and isotopic	Rhenium	pkg. (50)
990	Silicon, assay and isotopic	Silicon	wafer, 3 cm×0.2 cm
991	Lead-206 Spike, assay and isotopic	Lead	15
994	Gallium Metal, isotopic	Gallium	0.25
997	Thallium Metal, isotopic	Thallium	0.25

*Sold as a set containing SRM 981, 982, and 983.

Rosemary Blasingame prepares hazardous-material documentation to accompany the certificates and invoices issued with SRM's.

High-purity succinonitrile sealed in a glass cell forms SRM 1970, a melting point standard near 58 °C.

Physical Properties

ION ACTIVITY

pH

These SRM's are used to prepare solutions of known hydrogen ion concentration to calibrate commercial pH instruments. SRM's 186Ic and 186IIc, 191a and 192a, and 922 and 923 are certified for use as admixtures only. SRM's 186Ic and 186IIc may be used to prepare a solution with a pH of 6.863 at 25 °C, or a physiological buffer solution with a pH of 7.415 at 25 °C.

SRM	Type	pH(S) Values (at 25°C)	Wt/Unit (grams)
185f	Potassium hydrogen phthalate	4.006	60
186Ic	Potassium dihydrogen phosphate	6.863	30
186IIc	Disodium hydrogen phosphate	7.415	30
187c	Sodium tetraborate decahydrate (Borax)	9.180	30
188	Potassium hydrogen tartrate	3.557	60
189	Potassium tetroxalate	1.679	65
191a	Sodium bicarbonate	10.011	25
192a	Sodium carbonate		30
922	Tris(hydroxymethyl)aminomethane	7.699	25
923	Tris(hydroxymethyl)aminomethane hydrochloride		35

pD

These SRM's are for the preparation of solutions of known deuterium-ion concentration to calibrate pH indicating equipment to indicate pD data. SRM's 2186I and 2186II, and 2191a and 2192a are certified for use as admixtures only.

SRM	Type	pD(S) Values (at 25°C)	Wt/Unit (grams)
2185	Potassium hydrogen phthalate	4.518	60
2186I	Potassium dihydrogen phosphate	7.428	30
2186II	Disodium hydrogen phosphate		30
2191a	Sodium bicarbonate	10.732	30
2192a	Sodium carbonate		30

Ion-Selective Electrodes

These SRM's are certified for the calibration of ion-selective electrodes and have conventional ionic activities based on the Stokes-Robinson hydration theory for ionic strengths greater than 0.1 mole per liter.

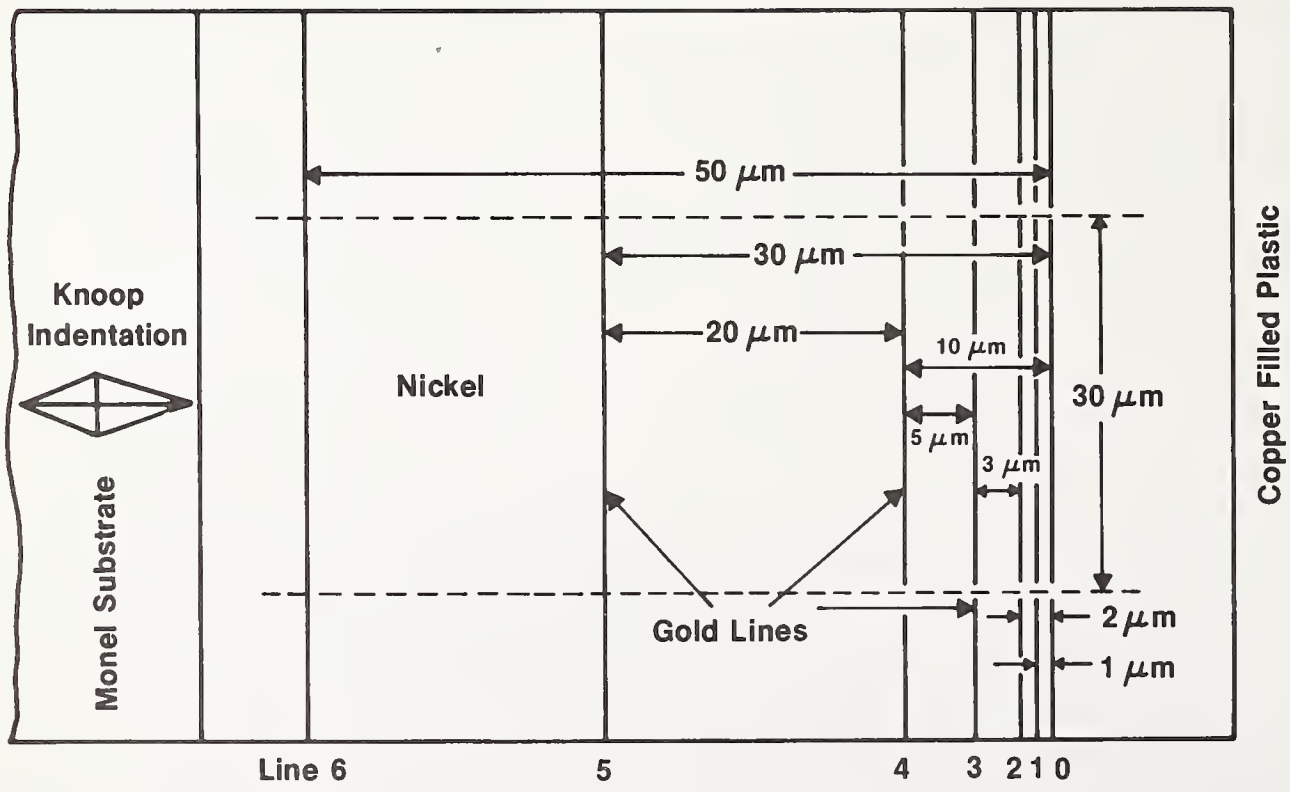
SRM	Type	Certified Property	Wt/Unit (grams)
2201	Sodium Chloride	pNa, pCl	125
2202	Potassium Chloride	pK, pCl	160
2203	Potassium Flouride	pF	125

METROLOGY

Scanning Electron Microscope (SEM)

These SRM's are for calibrating the magnification scale and evaluating the performance of Scanning Electron Microscopes. SRM 484d has spacings of 1, 2, 3, 5, 10, 20, 30, and 50 μm and can be used to calibrate the magnification scale of an SEM from 1000 to 20,000 X to an accuracy of 5 percent or better. SRM 2069a consists of graphitized natural fibers with smooth and uniform edges on an SEM specimen mount.

SRM	Type	Size
484d	SEM Magnification Standard	11 mm D, 6.5 mm high
2069a	SEM Performance Standard	12 mm D, 3 mm peg



Alternating layers of gold and nickel are used to fabricate SRM 484d. The diagram shows the spacings between gold lines used to calibrate the magnification scale of scanning electron microscopes.

Optical Microscope Linewidth-Measurement

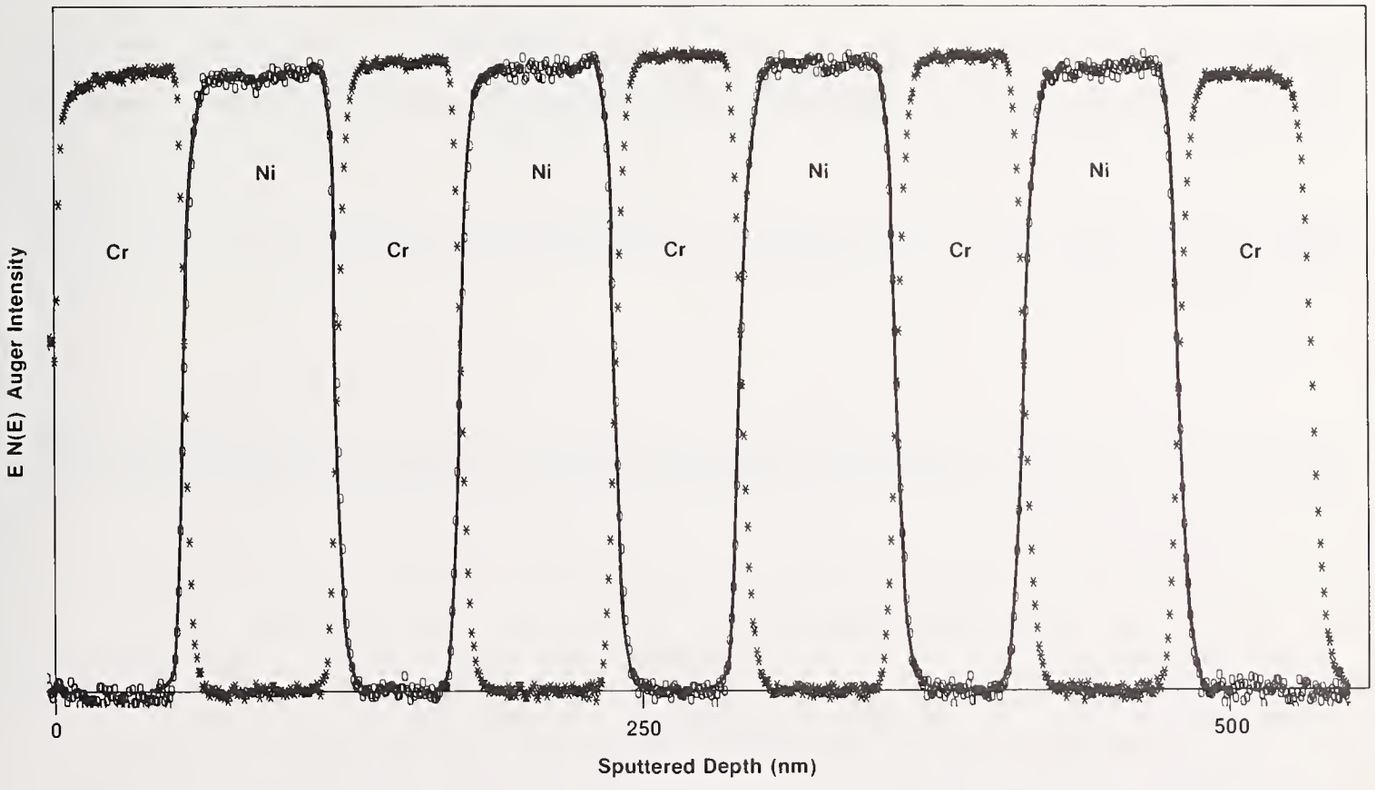
These SRM's are for use in calibrating optical microscopes used to measure the widths of opaque lines and clear spaces on integrated-circuit photomasks. They can also be used to calibrate line spacings and line-to-space ratios. The accuracy of a measured linewidth or line spacing is $\pm 0.05 \mu m$ or better. They are not for use with partially transmitting materials, in reflected light with opaque materials, or in a scanning electron microscope. SRM 475 is made with anti-reflective chromium on a borosilicate glass substrate. SRM 476 is made with bright chromium.

SRM	Type	Spacings	Size
475	Linewidth Measurement Standard	0.5 to 12 μm	$6.35 \times 6.35 \times 0.15$ cm
476	Linewidth Measurement Standard	0.5 to 12 μm	$6.35 \times 6.35 \times 0.15$ cm

Depth Profiling

This SRM is for calibrating equipment used to measure sputtered depth and erosion rates in surface analysis. SRM 2135 consists of nine alternating metal thin-film layers—five layers of pure chromium and four of pure nickel—on a polished silicon (100) substrate. 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. The nominal thicknesses for Cr and Ni are 53 and 66 nm, respectively.

SRM	Type	Unit/Size
2135	Ni-Cr Thin-Film Depth Profile Standard	$1 \times 2.54 \times 0.04$ cm



Auger sputter depth profile of SRM 2135 was obtained using 1 keV argon ion bombardment. Total sputtering time was 16 hours; the Ni (0) and Cr (x) Auger intensities shown have been normalized.

COATING THICKNESS

These magnetic type thickness SRM's are 30 × 30 mm for calibrating coating thickness gages used to measure the thickness of nonmagnetic coatings on steel, or nickel on steel. The steel substrates have the properties of AISI 1010 steel and the nickel coatings have the properties of an annealed Watts nickel electrodeposited free of cobalt and iron.

These SRM's may be used to measure the thickness of paint and other organic coatings on steel, as well as zinc (galvanized) and other nonmagnetic metallic coatings.

Nonmagnetic Coating on Magnetic Substrate (Cu and Cr on Steel)

SRM	Unit Size	Nominal Coating Thickness	
		micrometer	milliinch (mil)
1357	Set of 3	6, 20, 48	0.2, 0.8, 2.0
1358	Set of 3	80,225,1000	3.1, 9.8, 39
1359	Set of 4	48, 140, 505, 800	2.0, 5.5, 20, 32
1360	Set of 4	2.5, 6, 12, 20	0.1, 0.2, 0.5, 0.8
1361a	Set of 4	6, 12, 25, 50	0.2, 0.5, 1.0, 2.0
1362a	Set of 4	40, 80, 140, 200	1.6, 3.1, 5.5, 7.9
1363a	Set of 4	255, 385, 505, 635	9.8, 16, 20, 26
1364a	Set of 4	800, 1000, 1525, 1935	32, 39, 59, 79

Magnetic Coating on Magnetic Substrate (Nickel on Steel)

SRM	Unit Size	Nominal Coating Thickness	
		micrometer	milliinch (mil)
1365a	Set of 4	3, 8.5 14, 19	0.1, 0.4, 0.6, 0.8
1366a	Set of 4	25, 34.5, 42, 50	1.0, 1.4, 1.6, 2.0

COATING WEIGHT

The gold coating SRM's are 15 × 15 mm and were measured by beta-ray backscatter and x-ray fluorescence techniques relative to NBS gold coating materials for which the average weights per unit area were determined by weight and area measurements. These SRM's are for calibrating equipment used to measure weight per unit area of gold coating of equivalent purity.

Gold Coating on Glass Sealing Alloy (Fe53–Ni29–Co17)

SRM	Unit Size	Nominal Coating Weight (mg/cm²)	Nominal Coating Thickness	
			micrometer	microinch
1398a	Set of 4	1.5, 3.0, 6.0, 14.0	0.8, 1.5, 3, 7	30, 60, 120, 280

Gold Coating on Nickel

SRM	Unit Size	Nominal Coating Weight (mg/cm²)	Nominal Coating Thickness	
			micrometer	microinch
1379	1 each	0.35	0.175	7
1380	1 each	0.55	0.275	11
1387	1 each	2.2	1.4	45
1399b	Set of 4	1.5, 3.0, 6.0, 14.0	0.8, 1.5, 3, 7	30, 60, 120, 280

Glass

Chemical Resistance (Durability) of Glass

These SRM's are for checking test methods and calibrating equipment used to determine the resistance of glass containers to chemical attack. The values below represent the volume of fiftieth-normal sulfuric acid used to titrate to the methyl-red end point the alkaline extract from a crushed sample of glass after exposure to high-purity water at 121°C.

SRM	Type	Unit of Issue	mL of N/50 H_2SO_4
622	Soda-lime-silica	2.2 kg	7.67
623	Borosilicate	2.2 kg	0.34

Electrical Properties of Glass

SRM 624 is for checking test methods and for calibrating equipment used to determine the dc volume resistivity of glass per ASTM C657. SRM 774 is for checking methods used to determine dielectric constant and ac loss characteristics of insulating materials per ASTM D150.

SRM	Type	Unit of Issue	Approximate Value
624	Lead-silica, for dc resistivity	200 kg	$\log_{10}\rho \sim 9.9$ Ω-cm
774	Lead-silica, for dielectric constant	5×5×2.5 cm	K ~ 7.47

Viscosity

SRM's 710a, 711, and 717 are rectangular bars for checking the performance of high-temperature viscosity equipment (rotating cylinders) and low-temperature viscosity equipment (fiber elongation, beam-bending, parallel-plates, etc.).

SRM	Temperature (°C) at Viscosity (poises)										
	10^2	10^3	10^4	10^5	10^6	10^7	10^8	10^9	10^{10}	10^{11}	10^{12}
710a	(IN PREP)										
711	1327.1	1072.8	909.0	794.7	710.4	645.6	594.3	552.7	518.2	489.2	464.5
717	1545.1	1248.8	1059.4	927.9	831.2	757.1	698.6	651.1	611.9	579.0	550.9

Viscosity Fixpoints

SRM	Type of Glass	Unit of Issue	Softening Point °C	Annealing Point °C	Strain Point °C
709	Extra Dense Lead	500 g	384	328	311
710a	Soda Lime-Silica, type 523/586	IN PREP			
711	Lead-Silica, type 617/366	1.3 kg	602	432	392
712	Mixed Alkali Lead Silicate ¼ in patties (6 pcs.)	225 g	528	386	352
713	Dense Barium Crown 620/603 1⅜ in diam × ⅝ in thick gobs (4 pcs.)	225 g	738	631	599
714	Alkaline Earth Alumina Silicate ¼ in diam cane (16 pcs.—6 in long)	225 g	908	710	662
715	Alkali-Free Aluminosilicate ¼ in diam cane (13 pcs.—6 in long)	200 g	961	764	714
716	Neutral, ½ in diam cane (6 pcs.—6 in long)	250 g	794	574	530
717	Borosilicate, 4.2 cm × 4.2 cm × 12.5 cm bar	450 g	720	516	471

Relative Stress Optical Coefficient

These glasses are for calibrating instruments used to measure relative stress optical coefficient per ASTM C770. They are rectangular bars.

SRM	Type of Glass	Unit of Issue	Relative Stress Optical Coefficient at $\lambda = 546.1$ nm
708	Lead-Silica, A	625 g	Glass A $C = 2.857$ Brewsters, $10^{-12} m^2/N$
	Borosilicate, B	275 g	Glass B $C = 3.652$ Brewsters, $10^{-12} m^2/N$
709	Extra dense Lead	500 g	$C = -1.359$ Brewsters, $10^{-12} m^2/N$

Glass Liquidus Temperature

This SRM is for checking test methods and for calibrating equipment used to determine the liquidus temperature of glass by the gradient furnace methods per ASTM C829.

SRM	Type	Unit of Issue	Temperature, °C
773	Soda-lime-silica, for liquidus temperature 2.5×2.5×0.6 cm	60 g	990

Elasticity

This SRM is for calibrating apparatus used in the measurement of resonance frequencies from which elastic moduli are calculated. Each bar has been individually measured and calibrated, and all surfaces were machined flat and parallel.

SRM	Type	Size
718	Polycrystalline Alumina	12.7×1.27×0.32 cm

Density

SRM's 211c, 217c, 2211, 2212, and 2213 are certified for density (air saturated at 1 atm) at 20, 25, and 30°C, and may be used to calibrate pycnometers and density balances.

SRM's 1840 and 1841 are certified for density at 20°C and may be used to determine the density of solids and liquids by means of hydrostatic weighing.

SRM	Type	Density 20 °C (g/cm³)	Amount
211c	Toluene	0.86686	5mL
2211	Toluene	0.86686	8 mL
2212	Toluene	0.86686	25mL
217c	2,2,4 Trimethylpentane (*Iso*octane)	0.691929	5mL
2213	2,2,4 Trimethylpentane (*Iso*octane)	0.691929	25mL
1840	Silicon	2.329	100 g
1841	Silicon	2.329	200 g

Microhardness

These SRM's are for use in calibrating and checking the performance of microhardness testers. These test blocks were made by electroforming the test metal on a steel substrate. The hardness numbers are certified at loads of 25, 50, and 100 gram-force for both Vickers and Knoop indenters.

SRM	Type	Hardness	Size
1893	Bright Copper (Knoop)	125 KHN	12.5 mm square
1894	Bright Copper (Vickers)	125 VHN	12.5 mm square
1895	Bright Nickel (Knoop)	550 KHN	12.5 mm square
1896	Bright Nickel (Vickers)	550 VHN	12.5 mm square
1905	Bright Nickel (Knoop) (IN PREP)		

Ultrasonics

This SRM is a displacement-measuring transducer to be used to determine the size and character of surface vibrations in the frequency range of 0.1 to 1 MHz. It may also be used as a standard against which other transducers may be calibrated.

SRM	Type	Unit
1856	Acoustic Emission Transducer	Each

Polymers

Molecular Weight

SRM	Type	Wt/Unit (grams)
705	Polystyrene, narrow molecular weight distribution, $M_w \approx 179{,}300$, $M_w/M_n \approx 1.07$	5
706	Polystyrene, broad molecular weight distribution, $M_w \approx 257{,}800$, $M_w/M_n \approx 2.1$	18
1475	Polyethylene, linear, $M_w \approx 52{,}000$, $M_w/M_n \approx 2.9$	50
1476	Polyethylene, branched	50
1478	Polystyrene, narrow molecular weight distribution, $M_w \approx 37{,}400$, $M_w/M_n \approx 1.04$	2
1479	Polystyrene, narrow molecular weight distribution, $M_w \approx 1{,}050{,}000$	2
1482	Polyethylene, linear, $M_w \approx 13{,}600$	1
1483	Polythylene, linear, $M_w \approx 32{,}100$	1
1484	Polythylene, linear, $M_w \approx 119{,}600$	1

These materials are certified for the properties indicated in the table.

Property	Method	705	706	1475	1476	1478	1479	1482	1483	1484
Molecular Weight: Weight Average	(Light Scattering)	X	X	X			X	X	X	X
	(Sedimentation Equilibrium)	X	X			X				
	(Gel Permeation Chromatography-GPC)			X						
Number Average	(Osmometry)	X				X		X	X	X
	(GPC)			X						
Molecular Weight Distribution	(GPC)			X						
Limiting Viscosity Number	(Capillary Viscometer)					X				
Benzene 25°C		X	X							
Benzene 35°C		X								
Cyclohexane 35°C		X	X							
1-Chloronaphthalene 130°C				X	X			X	X	X
1,2,4-trichlorobenzene 130°C				X	X			X	X	X
Decahydronaphthalene 130°C				X	X					
Melt Flow	(ASTM)			X	X					
Density	(ASTM)			X	X					
Heat Capacity	(Adiabatic)	X		X						

Rheology

This SRM is for calibrating instruments used in polymer technology and science to determine rheological properties of polymer melts or solutions. It is certified for Rate of Shear, Viscosity, and First Normal Stress Difference at 25°C.

SRM	Type	Unit size
1490	Polyisobutylene Solution in Cetane	250 mL

Heat

Calorimetric

These SRM's are intended to relate the gain or loss of energy and work experienced during a chemical reaction or by change of temperature to the units of energy and work as defined by the International System of Units (SI). The unit for energy and work under this system is the joule, which is related to the calorie by the equation: 4.184 joule=1 calorie.

Combustion Calorimetric

SRM	Type	Approximate Heat of Combustion (MJ/kg)	Unit Amount
39i	Benzoic Acid	26.4	30 g
217c	2,2,4-Trimethylpentane (*Iso*octane)	47.712	5 mL
2213	2,2,4-Trimethylpentane (*Iso*octane)	47.712	25 mL
1656	Thianthrene	33.480	30 g
1657	Synthetic Refuse Derived Fuel	13.87	100 g
2151	Nicotinic Acid	22.184	25 g
2152	Urea	−10.536	25 g
2682	Coal, Sub-bituminous: %S=0.47; %Ash=6.37	27.45 (11800 BTU/lb)	50 g
2683	Coal, Bituminous: %S=1.85; %Ash=6.85	32.70 (14060 BTU/lb)	50 g
2684	Coal, Bituminous: %S=3.00; %Ash=11.09	29.68 (12760 BTU/lb)	50 g
2685	Coal, Bituminous: %S=4.62; %Ash=16.53	28.15 (12100 BTU/lb)	50 g

NOTE: The calorific values (MJ/kg) may decrease upon the aging or normal oxidation of the coals. NBS will continue to monitor these calorific values and report any substantive change to the purchaser.

Solution Calorimetric

SRM	Type	Heat of Solution (MJ/kg)	Wt/Unit (grams)
724a	Tris(hydroxymethyl)aminomethane (Hydrochloric Acid and Sodium Hydroxide Solution Calorimetry)	Evolved 0.24576 Absorbed 0.1418	50
1655	Potassium Chloride (Water Solution Calorimetry)	Absorbed 0.235	30

Heat Source Calorimetric

SRM	Type	Heat of Evolution (MJ/kg)	Wt/Unit (grams)
1651	Zirconium-barium chromate heat source powder	1.46	50
1652	Zirconium-barium chromate heat source powder	1.632	50
1653	Zirconium-barium chromate heat source powder	1.762	50

Enthalpy and Heat Capacity

SRM	Type	Temperature Range (K)	Unit Size
RM 5	Copper	~25	19 mm D×12 cm
705	Polystyrene, powder	10–350	5 g
720	Synthetic sapphire, small rods	0–2250	15 g
781-D1	Molybdenum, sintered rod	273.15–2800	10 cm×0.32 cm D
781-D2	Molybdenum, sintered rod	273.15–2800	10 cm×0.64 cm D
1475	Polyethylene, powder	5–360	50 g

Differential Scanning Calorimetry

These SRM's are for calibrating differential scanning calorimeters, differential thermal analyzers, and similar instruments.

SRM	Type	Melting Temperature	Enthalpy of Fusion	Unit of Issue (mm)
2220	Tin (99.9995%)	505.08 K	56.057 J/g	6096×25×0.127
2221	Zinc (99.999%)	692.59 K	111.18 J/g	965.2×152.4×0.0508

This SRM is for evaluating methods of determining purity by differential scanning calorimetry. It consists of phenacatin and phenacetin doped with p-aminobenzoic acid.

SRM	Type	Dopant Level (p-ABA, mol%)	Unit
1514	Thermal Analysis Purity	0, 0.7, 2, 5	Set of 4, 0.5 g/vial

Differential Thermal Analysis

GM's 754, 757, 758, 759, 760, and 761 have been issued by NBS in cooperation with the International Confederation of Thermal Analysis as standards for calibrating differential thermal analysis, differential scanning calorimetry, and thermogravimetry equipment under operating conditions.

GM	Material		Peak Temp.	Unit
754	Polystyrene	(glass transition)	105°C	10 g
757	1,2–Dichloroethane	(melting point)	−32°C	4 mL
	Clycohexane	(transition point)	−83°C	4 mL
		(melting point)	7°C	
	Phenyl Ether	(melting point)	30°C	4 mL
	o-Terphenyl	(melting point)	58°C	5 g
758	Potassium Nitrate	(transition point)	128°C	10 g
	Indium	(melting point)	157°C	3 g
	Tin	(melting point)	232°C	3 g
	Potassium Perchlorate	(transition point)	300°C	10 g
	Silver Sulfate	(transition point)	430°C	3 g
759	Potassium Perchlorate	(transition point)	300°C	10 g
	Silver Sulfate	(transition point)	430°C	3 g
	Quartz	(transition point)	573°C	3 g
	Potassium Sulfate	(transition point)	583°C	10 g
	Potassium Chromate	(transition point)	665°C	10 g

Differential Thermal Analysis (Continued)

GM	Material		Peak Temp.	Unit
760	Quartz	(transition point)	573°C	3 g
	Potassium Sulfate	(transition point)	583°C	10 g
	Potassium Chromate	(transition point)	665°C	10 g
	Barium Carbonate	(transition point)	810°C	10 g
	Strontium Carbonate	(transition point)	925°C	10 g
761	Permanorm 3	(magnetic transition)	259°C	1 g
	Nickel	(magnetic transition)	353°C	1 g
	Mumetal	(magnetic transition)	381°C	1 g
	Permanorm 5	(magnetic transition)	454°C	1 g
	Trafoperm	(magnetic transition)	750°C	1 g

Superconductive Thermometric Fixed Point Devices

Each device is composed of small cylinders of high purity material mounted in a threaded copper stud and enclosed by a mutual inductance coil set. SRM 767a is intended to provide fixed points on the 1976 Provisional 0.5 to 30 K Temperature Scale (EPT–76). Both SRM's should prove particularly valuable to users of ^{3}He–^{4}He dilution refrigerators, in which direct calibrations on the liquid helium vapor pressure-temperature scales are difficult, and to those who wish to determine the temperature reproducibility of physical phenomena or of cryogenic equipment.

SRM	Type	Material	Nominal Temperature (K)
767a	Superconductive Thermometric Fixed Point Device	Niobium	9.3
		Lead	7.2
		Indium	3.4
		Aluminum	1.2
		Zinc	0.9
		Cadmium	0.5
768	Superconductive Thermometric Fixed Point Device (Low)	Gold-Indium	0.205
	(Available after November 1986)	Gold-Aluminum	0.157
		Iridium	0.098
		Beryllium	0.024
		Tungsten	0.015

Freezing Point

SRM's 740 and 741 are defining fixed points for the International Practical Temperature Scale of 1968 (IPTS-68). The secondary reference points are for calibrating thermometers, thermocouples, and other temperature measuring devices. These SRM's are certified per IPTS-68.

Defining Fixed Points

SRM	Type	Temperature °C	Wt/Unit (grams)
740	Zinc	419.58	350
741	Tin	231.9681	350

Secondary Reference Points

SRM	Type	Temperature °C	Wt/Unit (grams)
42g	Tin	231.967	350
43h	Zinc	*419.58	350
44f	Aluminum	660.3	200
45d	Copper	1084.8	450
49e	Lead	327.493	600
743	Mercury	−38.841	680

*SRM 43h is less pure than SRM 740 and has a freezing point 0.001 °C lower.

Melting Point

SRM	Type	Form	Temperature °C	Wt/Unit (grams)
742	Alumina, 99.9+%	Powder	2053	10
1968	Gallium, 99.9999+%	Sealed Cell	29.7723	25
1969	Rubidium, 99.9+%	Sealed Cell	39.30	154
1970	Succinonitrile, 99.999+%	Sealed Cell	58.0796	60
1971	Indium, 99.9999+%	Sealed Cell	156.65	100

GM 8000 is issued by NBS in cooperation with the Office of Reference Materials at the National Physical Laboratory (NPL) in Teddington, England. This set of ten highly purified substances is intended for use in the calibration of thermometry used in determining the melting points of samples in glass capillary tubes. Both the meniscus point and the liquefaction point for each substance are certified by NPL.

GM	Type	Melting Point	Amount
8000	4–Nitrotoluene	52°C	1 g
	Naphthalene	80	1 g
	Benzil	95	1 g
	Acetanilide	114	1 g
	Benzoic Acid	122	1 g
	Diphenylacetic Acid	147	1 g
	Anisic Acid	183	1 g
	2–Chloroanthraquinone	210	1 g
	Carbazole	246	1 g
	Anthraquinone	285	1 g

Laboratory Thermometer

This mercury-in-glass thermometer is for use in clinical laboratories. Its main scale extends from 24.00 to 38.00 °C, in 0.05 in °C divisions. It has an auxiliary scale from −0.20 to +0.20 °C.

SRM	Type	Calibrated Points (°C)	Unit
934	Clinical Laboratory Thermometer	0, 25, 30, 37	1 each

Thermocouple Material

SRM	Type	Form
1967	Platinum, High-Purity (99.999+%)	Wire: 0.51 mm D, 1 meter long

Vapor Pressure

SRM	Type	Pressure Range (atmosphere)	Temperature Range (K)	Unit Size
745	Gold	10^{-3} to 10^{-8}	1300–2100	Wire 1.44 mm×152 mm
746	Cadmium	10^{-4} to 10^{-11}	350–594	Rod 6.4 mm×64 mm
748	Silver	10^{-3} to 10^{-12}	800–1600	Rod 6.4 mm×64 mm

Thermal Conductivity

SRM	Type	Dimension (mm)	Temperature Range (K)	Conductivity at 293 K (W/M·K)
1450b	Fibrous Glass Board	600×600×25.4	260–330	0.03
1451	Fibrous Glass Batt	600×600×25.4	260–330	0.039
1460	Stainless Steel	6.4 D, 50 length	5–1200	14.1
1461	Stainless Steel	12.7 D, 50 length	5–1200	14.1
1462	Stainless Steel	34 D, 50 length	5–1200	14.1
8420	Electrolytic Iron	6.4 D, 50 length	6–1000	77.9
8421	Electrolytic Iron	31.7 D, 50 length	6–1000	77.9
8422	Sintered Tungsten	3.2 D, 50 length	4–3000	173
8423	Sintered Tungsten	6.4 D, 50 length	4–3000	173
8424	Graphite	6.4 D, 50 length	5–2500	90.9
8425	Graphite	12.7 D, 50 length	5–2500	90.9
8426	Graphite	25.4 D, 50 length	5–2500	90.9

Thermal Expansion

SRM	Type	Temperature Range (K)	Diameter (mm)	Length (mm)
731-L1	Borosilicate Glass	80-680	6.4	51
731-L2	Borosilicate Glass	80-680	6.4	102
731-L3	Borosilicate Glass	80-680	6.4	152
737	Tungsten	80-1800	6.4	51
739-L1	Fused Silica	80-1000	6.4	51
739-L2	Fused Silica	80-1000	6.4	102
739-L3	Fused Silica	80-1000	6.4	152

Magnetic

Magnetic Susceptibility

SRM	Type	Form/Unit
763	Aluminum	Cylinder 3 mm diameter × 3 mm
764	Platinum	Cylinder 3 mm diameter × 3 mm
765	Palladium	Cylinder 3 mm diameter × 3 mm
766	Manganese Flouride	Cube 3 × 3 × 3 mm

Magnetic Moment

SRM	Type	Size
772	Nickel Sphere	2.4 mm D

OPTICAL

Spectrophotometric

SRM 930D: This SRM consists of three neutral density glass filters. The filters have transmittances of approximately 10, 20, and 30 percent. Each filter is individually certified for transmittance at wavelengths of 440, 465, 546.1, 590, and 635 nm.

SRM 931d: This SRM consists of three sets of four solutions—a blank solution and three concentrations of absorbing liquid. The net absorbances are certified for each concentration at wavelengths of 302, 395, 512, and 678 nm.

SRM 932: This SRM is an all quartz rectangular parallelepiped cuvette designed to fit the holder of conventional spectrophotometers. The cuvettes range in pathlength from 9.97 to 10.03 mm, and are certified for pathlength and parallelism of the windows to within ±0.0005 mm.

SRM 935: Solutions made with this SRM are certified for apparent specific absorbances at wavelengths of 235, 257, 313, 345, and 350 nm.

SRM 936: A solution made with this SRM is certified for its molecular emission spectrum over the wavelength range of 375 to 675 nm.

SRM's 2009 and 2010: The SRM's are for checking the wavelength scale between 400 and 760 nm for bandpasses between 1.5 and 10.5 nm. SRM 2009 is mounted in a standard cuvette-sized holder, and SRM 2010 is approximately 51 mm square.

SRM 2031: This SRM consists of three filters mounted in holders and an empty holder; all holders are equipped with shutters. Two of the filters have an evaporated layer of semitransparent metal sandwiched between two quartz plates assembled by optical contact. The third filter is a single quartz plate. Each filter is individually calibrated at 250, 280, 340, 360, 400, 465, 500, 546.1, 590, and 635 nm.

SRM 2032: Aqueous solutions made with this SRM are certified for specific absorbances from 240 to 280 nm for use as a stray light standard in the ultraviolet region.

SRM 2033: This SRM consists of the same material as SRM 2032 plus a reference beam attenuator for extending the dynamic range of the stray light test.

SRM 2034: This SRM is a solution sealed in a non-fluorescent, fused-silica cuvette for checking the wavelength scale between 240 and 650 nm.

Spectrophotometric

SRM	Type	Wavelength Range (nm)	Unit
930D	Glass Filters, Transmittance	440–635	3 filters/4 holders
931d	Liquid Filters, Absorbance	302–678	Set: 12 vials
932	Quartz Cuvette, Pathlength	—	1 each
935	Potassium Dichromate, UV Absorbance	235–350	15 grams
936	Quinine Sulfate Dihydrate, Fluorescence	375–675	1 gram
2009	Didymium-oxide Glass, Wavelength	400–760	1 filter/1 holder
2010	Didymium-oxide Glass, Wavelength	400–760	1 filter, 51 mm^2
2031	Metal-on-Quartz Filters, Transmittance	250–635	3 filters/4 holders
2032	Potassium Iodide, Stray Light	240–280	25 grams
2033	Potassium Iodide with Attenuator	240–280	25 grams w/attenuator
2034	Holmium-oxide Solution, Wavelength	240–650	1 sealed cuvette

SRM 2034 is 4% holmium oxide in 10% perchloric acid in water, sealed in a non-fluorescent, fused-silica cuvette for use as a spectrophotometric wavelength SRM.

Reflectance

These SRM's are for calibrating the reflectance scale of integrating sphere reflectometers used to evaluate materials for solar energy collectors and to calibrate reflectometers used in evaluating the appearance of polished metals and metal plated objects.

Specular Spectral Reflectance

SRM	Type	Wavelength Range (nm)	Size
2003	First Surface, Aluminum on Glass	250–2500	5.1 cm D
2011	First Surface, Gold on Glass	600–2500	5.1 cm D
2023	Second Surface, Aluminum on Fused Quartz	250–2500	5.1×5.1 cm
2024	Second Surface, Aluminum on Fused Quartz	250–2500	2.5×10.2 cm
2025	Second Surface, Aluminum on Fused Quartz with wedge	250–2500	2.5×10.2 cm

Directional-Hemispherical Reflectance

SRM	Type	Wavelength Range (nm)	Size
2015	Opal Glass	400–750	2.5×5.0×0.64 cm
2016	Opal Glass	400–750	10×10×0.64 cm
2019b	White Ceramic Tile	350–2500	5.1×5.1×0.81 cm
2020	White Ceramic Tile	350–2500	3.8×7.6×0.81 cm
2021	Black Porcelain Enamel	280–2500	5.1×5.1×0.20 cm

Refractive Index

SRM's 211c, 217c, 2211, 2212, 2213 are certified for refractive index at 20, 25, and 30 °C, from 435.8 to 667.8 nm for seven wavelengths.

SRM's 1820 and 1822 are certified for refractive index at thirteen wavelengths from 404.7 nm to 706.5 nm. These SRM's are designed for calibrating refractometers and certifying refractive index immersion liquids. They consist of two rectangular glass slabs: one slab has polished faces and is to be used to check the performance of a refractometer; the second slab is unpolished and can be broken into fragments to certify the refractive index of immersion liquids by microscope methods.

SRM 1823 consists of two silicone liquids that are miscible and span the refractive index range of a variety of glasses and glass fibers. The liquids are suitable for calibrating refractometers and are certified for refractive index at ten wavelengths from 435.8 to 667.8 nm, at temperatures of 20, 40, 60, and 80 °C.

SRM	Type	n^{20}	Unit Size
211c	Toluene	1.497	5 mL
2211	Toluene	1.497	8 mL
2212	Toluene	1.497	25 mL
217c	2,2,4-Trimethylpentane (*Iso*octane)	1.391	5 mL
2213	2,2;4-Trimethylpentane (*Iso*octane)	1.391	25 mL
1820	Glass (Borosilicate)	1.488	Set: 2 slabs
1822	Glass (Soda-Lime)	1.518	Set: 2 slabs
1823-I	Silicone Liquid (I)	1.518	60 mL
1823-II	Silicone Liquid (II)	1.559	60 mL

Optical Rotation

These SRM's are intended for use in calibrating or checking polarimetric apparatus. In aqueous solution the optical rotation of SRM 17c is certified at three wavelengths, while that of SRM 41c is certified at two wavelengths. SRM 41c is also certified at one wavelength in a dimethyl sulfoxide solution.

SRM	Type	Optical Rotation In Aqueous Solution	Unit Size
17d	Sucrose	(712 mrad)	60 g
41c	Dextrose	931.8 mrad	70 g

Pam Hodge of the Radioactivity group provides information on the availability, scheduling, and license requirements for radioactivity SRM's.

RADIOACTIVITY

These SRM's are shipped express or air freight (shipping charges collect). The amount of a radionuclide in an SRM, at a specified time, is stated as (1) the number of atoms (or the mass, for radium SRM's), (2) the activity, or "decays per second," or (3) the emission rate of a particular radiation, depending on the method of calibration or the intended use. For solution SRM's, the quantity is usually specified per gram of liquid. The active portion of gamma-ray "point-source" standards is usually restricted to the central few millimeters of a low-mass, low-Z support to minimize scattering. Alpha-particle-emitting radionuclides are deposited or plated on metal backings.

The unit for activity has traditionally been the curie (Ci), but simpler relations between activity, emission rate, and counting rate result if the current SI (International System of Units) unit "1 per second" is used. This is symbolized as "s^{-1}" and has been given the special name becquerel (Bq). The relationship between the curie and the bequerel is:

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

Many SRM's are measured and certified in terms of emission rate. In this catalog, αs^{-1}, $\beta^{-}s^{-1}$, $\beta^{+}s^{-1}$, Kxs^{-1}, and γs^{-1} are used for the emission rates of alpha particles, negatrons, positrons, K x-rays, and gamma rays, respectively.

The SRM's without an asterisk (*) may be ordered singly, without a license, under the general licensing provisions of the Atomic Energy Act of 1954. Those marked by an asterisk are available only under the special licensing provisions of the Atomic Energy Act of 1954.

NOTE: Certain radionuclides are not economical to maintain in stock because of short half lives or low demand. When sufficient demand exists, based on letters of inquiry, these materials are prepared and those who have expressed interest are notified of their availability. If you need any radionuclide not listed, write the Radioactivity Group, Room C114 Radiation Physics Building, National Bureau of Standards, Gaithersburg, MD 20899; or telephone (301) 921-2665.

In addition, chemically stable solutions of most radionuclides may be submitted to NBS for calibration as described in National Bureau of Standards Calibration Services User Guide, NBS Special Publication 250 (1986, ed.). Requests for these test should be submitted, with full source information for approval of suitability to the Radioactivity Group.

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

SRM	Radionuclide	Approximate activity, per gram, at time of calibration (month/year) (Bq g^{-1})		Approx. Mass of Solution (g)	Overall Uncertainty (%)
4332B*	Americium-243	89	11/83	5	1.4
4251B*	Barium-133	5×10^5	1/82	5	1.4
4222B	Carbon-14	4.9×10^4	7/83	3.5	1.3
4250B*	Cesium-134	2×10^6	4/82	5	1.2
4233B*	Cesium-137, Barium-137m	7×10^5	8/79	5.1	1.4
4943*	Chlorine-36	1×10^4	12/84	3	2.3
4408LD*	Cobalt-57	5×10^6	7/84	5	1.0
4915D*	Cobalt-60	3×10^5	2/84	5	0.8
4329*	Curium-243	70	6/84	5	1.4
4926C	Hydrogen-3	3×10^3	9/78	18	0.6
4927C	Hydrogen-3	6×10^5	3/85	3	0.6
4947	Hydrogen-3	1×10^5	9/78	4	1.0
4361	Hydrogen-3	1.3	9/78	490	0.9
4949B	Iodine-129	7×10^3	1/82	1	1.9
4929D	Iron-55	4×10^4	9/85	5	3.0
4932F*	Mercury-203	4×10^5	12/85	5	1.0
4226*	Nickel-63	1×10^6	12/84	4.1	1.0
4327*	Polonium-208	77	6/84	1.1	1.4
4338*	Plutonium-240	18	4/80	5	1.0
4940C	Promethium-147	1.4×10^4	9/85	5	1.0
4919E*	Strontium-90	3.4×10^3	3/85	5	1.4
4928C	Sulfur-35	4×10^5	8/85	4	0.4
4288*	Technetium-99	4×10^4	11/82	5	1.6
4328*	Thorium-229	884	5/84	2	1.5
4324*	Uranium-232	83	2/84	5	1.5
4276B*	Long-Lived Mixed Radionuclide:		6/83	5	
	Antimony-125	1.2×10^4			
	Europium-154	1.5×10^4			
	Europium-155	7×10^3			

*License certification is required by NBS for these radionuclides.

Alpha-Particle Point-Sources

These SRM's consist of a practically weightless deposit of the nuclide on a thin platinum foil cemented to a monel disk.

SRM	Radionuclide	Approx. α-particle-emission rate into 2π geometry and/or approx. activity at time of calibration (month/year)		Overall uncertainty (%)
4904G*	Americium-241	30 to $1.3\times10^{4}s^{-1}$	2/82	1.0 to 1.3

*License certification is required by NBS for these radionuclides.

Radiocarbon Dating and Ground Water Studies

Contemporary Standard for Carbon-14 Dating Laboratories

SRM	Material	Description
4990C	Oxalic Acid	One-half pound of oxalic acid taken from specially prepared material for use as a common contemporary standard against which world-wide measurements can be compared.

Low-Level Tritiated-Water Standard

SRM	Material	Description
4361	Hydrogen-3	Contains 490 grams of $^{3}H\text{-}H_2O$ in a flame-sealed bottle. The radioactivity concentration was 1.312 Bq g^{-1}, as of the date of the most recent gas-counting measurement—September 3, 1978. The total uncertainty in this value is 0.85%.

Gaseous Materials

SRM	Radionuclide	Approximate activity or radioactivity concentration at time of calibration (month/year)		Approx. Vol. (cm^3)	Approx. Pressure (atm)	Overall Uncertainty (%)
4935C	Krypton-85	5×10^{7} Bq mol^{1}	3/74	10	1	0.9
4235*	Krypton-85	1×10^{7} Bq	11/74	3	1	1.2
4308C	Krypton-85	1.6×10^{6} Bq	11/79	30	0.3	3.1
4415LJ*	Xenon-133	1.5×10^{8} Bq	time of dispatch	5	0.1	1.5

*License certification is required by NBS for these radionuclides.

Gamma-Ray and X-Ray Point-Sources

These SRM's are usually prepared by depositing the radioactive material and sealing it between two layers of polyester tape, mounted on an aluminum ring, exceptions are americium and thorium. SRM 4213, Americium-241, is prepared by electroplating americium onto a 0.010-cm thick platinum foil, which is covered with a 0.005-cm thick aluminum foil. The aluminum-covered source is sandwiched between two layers of 0.036-cm thick polyurethane film tape. SRM 4206c, Thorium-228, is prepared by depositing and sealing the radionuclide between two layers of gold foil and this sandwich is then sealed between two double layers of polyurethane-film tape.

SRM	Radionuclide	Principal Photon Energy (MeV)	Approximate activity, Bq, at time of calibration (except MRN) (month/year)		Overall Uncertainty (%)
4213*	Americium-241	0.060	3×10^5	2/70	2.8
4241B*	Barium-133	0.081	8×10^4	1/81	1.4
4200B	Cesium-137, Barium-137m	0.662	4×10^4	9/79	1.6
4207	Cesium-137, Barium-137m	0.662	3×10^5	9/79	1.6
4214B	Cobalt-57	0.122	4×10^5	2/83	0.8
4203D*	Cobalt-60	1.173–1.332	2×10^4 to 2×10^5	3/84	0.9
4218E*	Europium-152	0.122 to 1.408	5×10^4 to 5×10^5	11/82	1.5
4201B	Niobium-94	0.702 to 0.871	5×10^3	4/70	1.5
4206C*	Thorium-228	2.615	8×10^4	11/80	2.0
Long-Lived Mixed Radionuclide					
4275B	Antimony-125, Tellurium-125m	0.027 to 1.274	5×10^4	5/83	
	Europium-154		6×10^4		
	Europium-155		3×10^4		

*License certification is required by NBS for these radionuclides.

Low-Energy-Photon Point-Sources

These SRM's consist of a thin-layer deposit of the radionuclide on a thin stainless steel or platinum foil cemented to a monel disk.

SRM	Radionuclide	Principal Photon Energy (MeV)	Approx. emission rate at time of calibration (month/year)		Overall Uncertainty (%)
4260C	Iron-55	0.0059	2×10^4 Kxs^{-1} steradian^{-1}	11/82	1.8
4264B	Tin-121m, Antimony-121	0.0372	4×10^2 γs^{-1}	11/82	3.0
4267	Niobium-93m	0.016	8×10^2 Kxs^{-1}	11/85	3.0

Radium-226 Solutions

Radon Analysis

These samples are contained in flame-sealed glass ampoules.

SRM	Nominal Radium Content (g)	(month/year)	Approx. Mass of Solution (g)	Overall Uncertainty (%)
4952B	Blank Solution	8/76	20	68
4953D	4×10^{-9}	6/84	5	1.2
4951C	8×10^{-12}	4/78	10	1.5
4950E	4×10^{-10}	6/84	5	1.3

Gamma-Ray Solutions

These samples are contained in flame-sealed glass ampoules.

SRM	Nominal Radium Content (g)	(month/year)	Approx. Mass of Solution (g)	Overall Uncertainty (%)
4956	2×10^{-7}	9/67	5.1	4.4
4957	5×10^{-7}	9/67	5.1	1.8
4958	1×10^{-6}	9/67	5.1	1.8
4959	2×10^{-6}	9/67	5.1	1.3
4960	5×10^{-6}	9/67	5.1	1.3
4961	1×10^{-5}	9/67	5.1	1.1
4962	2×10^{-5}	9/67	5.1	1.1

Environmental Natural Matrix Materials for Traceability Tests

SRM 4350B—Columbia River Sediment
This material was collected from a river downstream from a nuclear reactor facility. Concentrations of fission and activation products are elevated over typical world-wide levels. $^{239/240}$Pu and ^{241}Am are very homogenously distributed through the sample and are in soluble chemical forms. Inhomogeneity does not exceed 3 percent for other radionuclides.

SRM 4351—Human Lung
This material contains radioactivity concentrations on the order of 10^{-4} Bq g^{-1}. It has been freeze-dried, cryogenically ground, homogenized, and packed in a glass bottle under vacuum. There is significant inhomogeneity in $^{239/240}$Pu which is unavoidable because plutonium was taken into the lungs in particulate form. Assessments of accuracy of measurement technique can be improved by averaging over several samples.

SRM 4352—Human Liver
This material contains radioactivity concentrations on the order of 10^{-4} Bq g^{-1}. It has been freeze-dried, cryogenically ground, homogenized, and packed in a glass bottle under vacuum.

SRM 4353—Rocky Flats Soil Number 1
This material was collected within 13 centimeters of the soil surface at Rocky Flats, Co. ^{239} Pu and ^{241} Am concentrations are about an order of magnitude higher than typical world-wide levels. Approximately 10 percent of the plutonium is in a refractory chemical state. The material also contains "hot" particles and a statistical method is provided for dealing with these. Inhomogeneities, excluding hot particles, do not exceed 3 percent.

SRM 4355—Peruvian Soil
This material, which has been the subject of a trace-element study, has non-measurable radioactivity concentrations for many fallout radionuclides and can be used as a blank or for sensitive tests of radioanalytical procedures at low-radioactivity concentrations for other radionuclides. The results of the trace-element study are given for 57 elements.

RM 45B—River Sediment
This material contains radioactivity concentrations of roughly an order of magnitude greater than SRM 4350B. The values, however, are uncertified although the inhomogeneity does not exceed 3 percent for all radionuclides. This material can be used for routine checking for reproducibility of results after tests have been performed with SRM 4350B.

Radiopharmaceuticals

SRM	Radionuclide (5 mL solution)	Half Life		Approximate Radioactivity at Time of Dispatch (Bq g^{-1})	Overall Uncertainty
4400LF*	Chromium-51	27.702	d	1×10^{6}	1.8
4408LD*	Cobalt-57	271.7	d	8×10^{5}	1.6
4416LF*	Gallium-67	3.261	d	3×10^{6}	1.7
4421L*	Gold-195	183	d	5×10^{5}	2.3
4405LB*	Gold-198	2.696	d	4×10^{6}	1.7
4417LE*	Indium-111	2.805	d	3×10^{6}	1.3
4414LC*	Iodine-123	13.221	hr	6×10^{7}	1.5
4407LI*	Iodine-125	59.6	d	8×10^{5}	2.0
4401LL*	Iodine-131	8.021	d	1×10^{6}	1.7
4411LB*	Iron-59	44.51	d	8×10^{5}	1.5
4420LB*	Lead-203	51.88	hr	3×10^{6}	1.7
4418L*	Mercury-203	46.60	d	1×10^{6}	1.0
4412LJ*	Molybdenum-99, Technetium-99m	65.92	hr	2×10^{6}	1.8
4406LH*	Phosphorus-32	14.29	d	1×10^{6}	1.4
4409LD*	Selenium-75	119.8	d	1×10^{6}	2.5
4403LB*	Strontium-85	64.85	d	1×10^{6}	1.4
4410HJ*	Technetium-99m	6.007	hr	2×10^{9}	1.8
4404LG*	Thallium-201	72.91	hr	2×10^{6}	2.0
4402LC*	Tin-113, Indium-113m	115.08	d	8×10^{5}	3.1
4415LJ*	Xenon-133 (5 mL gas)	5.243	d	5×10^{8} s^{-1} total	1.4
4419LB*	Ytterbium-169	32.03	d	2×10^{6}	2.5

*License certification is required by NBS for these radionuclides.

Special Nuclear Material Packaging

SRM	Type	Description
9910	Special Nuclear Material Package	Lead Container, 2½×6 inches

NOTE: This material may be necessary to fill your order, depending upon Department of Energy, Department of Transportation, and Nuclear Regulatory Commission shipping requirements.

Metallurgical

SRM's 485a, 486, 487, and 488 are for calibrating of x-ray diffraction equipment used in determining the amount of retained austenite in ferrous materials. SRM 493 is for calibrating x-ray diffraction and Mössbauer equipment to determine the relative amounts of iron carbide in steel.

SRM	Type	Form
485a	Austenite in Ferrite 5%	Disk: 21 mm dia.×2.4 mm thick
486	Austenite in Ferrite 15%	Disk: 21 mm dia.×2.4 mm thick
487	Austenite in Ferrite 30%	Disk: 21 mm dia.×2.4 mm thick
488	Austenite in Ferrite 2%	Disk: 21 mm dia.×2.4 mm thick
493	Spheroidized Iron Carbide (Fe_3C) in Ferrite	Wafer: 29×29×2.4 mm

Abrasive Wear

SRM 1857 is for use in the dry sand/rubber wheel abrasion test per ASTM G65, Procedure A.

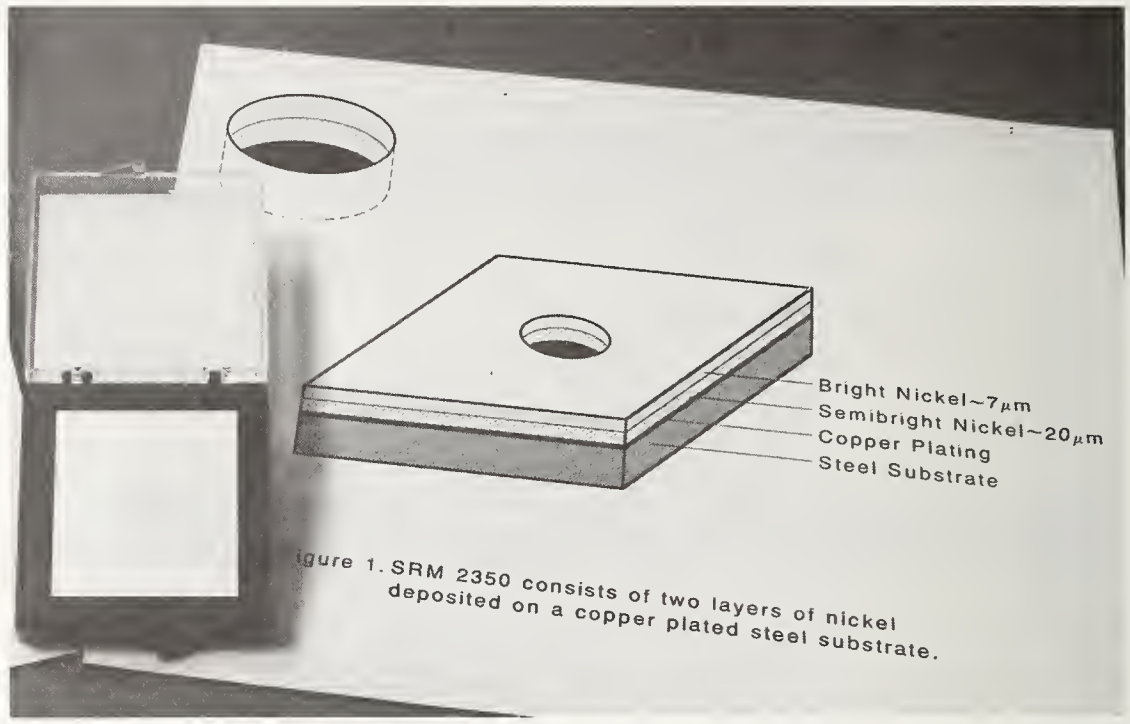
SRM	Type	Form
1857	D-2 Tool Steel	2 blocks: 7.8×25×76 mm

Corrosion

Electrochemical Potential and Thickness

This SRM is for determining the reliability of step test measurements of electrochemical and thickness of multilayered nickel deposits. It consists of a 50×50 mm plate of copper-plated steel over which a duplex nickel coating has been deposited.

SRM	Type	Step Test Potential (mV)	Nickel Thicknesses (micrometers)		
			Total	Bright	Semibright
2350	Nickel Step Test Standard	110–150	27	(7)	(20)



igure 1. SRM 2350 consists of two layers of nickel deposited on a copper plated steel substrate.

Pitting or Crevice Corrosion

These SRM's are for use in evaluating the pitting or crevice corrosion of surgical implant materials per ASTM F746.

SRM	Type	Form
1890	316L Stainless Steel Rod and Teflon Collar	4 sets: 6.4 mm D, 25.4 mm long
1891	Co-Cr-Mo Alloy Rod and Teflon Collar	2 sets: 6.4 mm D, 25.4 mm long

X-ray Fluorescent Emission Target

This SRM is intended for use in determining the detector window absorption in semiconductor x-ray spectrometers according to ANSI-IEEE Standard STO 759. When excited by a ^{55}Fe source this glass target will emit fluorescent x-rays in the range 1.0 to 5.2 keV.

SRM	Type	Form	Unit Size
477	Glass Fluorescence Source	Disk	2×25 mm D

X-ray Diffraction

SRM's 640a, 674, and 675 are powdered materials to be used as internal standards for powder diffraction measurements. SRM 674 is a set of five oxides for use in the quantitative analysis (intensity measurement) of materials. See also: SRM's 485a–488, 493 (p. 109), and SRM 1878 (p. 65).

SRM	Type	Lattice Parameter (25.0°C)	Unit Size
640a	Silicon Powder	5.430825 Å	10g
674	Powder Diffraction Intensity		
	Al_2O_3 (α-alumina)	4.75893 Å	10g
	CeO_2	5.41129 Å	10g
	Cr_2O_3	4.95916 Å	10g
	TiO_2 (Rutile)	4.59365 Å	10g
	ZnO	3.24981 Å	10g
675	Powder Diffraction (Mica)	9.98104 Å	5g

Gas Transmission

SRM 1470 is for use in the measurement of gas transmission rates using a volumetric method (ASTM D1434), manometric method (ASTM D1434), or coulometric method (ASTM D3985) of measurement. The permeances of nitrogen, oxygen, carbon dioxide, and helium through this polyester film at 296.15 K are 0.0421, 0.352, 1.722, and 13.79 pmol-s^{-1}·Pa^{-1}, respectively.

SRM	Type	Unit Size
1470	Polyester Plastic Film for Gas Transmission	15 sheets, 23 cm square

Reference Fuel

SRM's 1815a and 1816a are high purity liquids intended for use in maintaining the integrity of the octane rating of motor and aviation fuels as specified in the ASTM Manual for Rating Motor, Diesel and Aviation Fuels.

SRM	Type	Purity, %	Unit Size
1815a	n-Heptane	99.987	100 mL
1816a	*Iso*octane (2,2,4-Trimethylpentane)	99.987	100 mL

Electrical Resistivity and Conductivity

Metals

These materials are for evaluating methods of measuring electrical resistance over wide temperature ranges.

SRM	Type	Temperature Range	Resistivity at 293 K	Form
1460	Stainless Steel	5 to 1200 K	80.5 μΩ·cm	Rod: 6.4 mm D, 50 mm long
1461	Stainless Steel	5 to 1200 K	80.5 μΩ·cm	Rod: 12.7 mm D, 50 mm long
1462	Stainless Steel	5 to 1200 K	80.5μΩ·cm	Rod: 34.0 mm D, 50 mm long
8420	Iron	6 to 1000 K	10.1 μΩ·cm	Rod: 6.4 mm D, 50 mm long
8421	Iron	6 to 1000 K	10.1 μΩ·cm	Rod: 31.7 mm D, 50 mm long
8422	Tungsten	4 to 3000 K	5.4 μΩ·cm	Rod: 3.2 mm D, 50 mm long
8423	Tungsten	4 to 3000 K	5.4 μΩ·cm	Rod: 6.4 mm D, 50 mm long

Silicon

SRM's 1521, 1522, and 1523 are for calibrating four-probe and eddy-current test equipment; SRM's 2526, 2527, 2528, and 2529 are for two-probe test equipment.

SRM	Type	Resistivity	Form
1521	111 p-Type Silicon	0.1 and 10 Ω·cm	2 wafers, 51 mm D
1522	111 n-Type Silicon	25, 75, and 180 Ω·cm	3 wafers, 51 mm D
1523	100 and 111 p-Type Silicon	0.01 and 1 Ω·cm	2 wafers, 51 mm D
2526	111 p-Type Silicon, Spreading Resistance	0.001 to 200 Ω·cm	16 slices
2527	111 n-Type Silicon, Spreading Resistance	0.001 to 200 Ω·cm	16 slices
2528	100 p-Type Silicon, Spreading Resistance	0.001 to 200 Ω·cm	16 slices
2529	100 n-Type Silicon, Spreading Resistance	0.001 to 200 Ω·cm	16 slices

Residual Resistivity Ratio

This SRM is a set of five aluminum rods that are intended for use in checking four-terminal dc and eddy current decay techniques. The residual resisitivity ratio, $\rho(273\ K)/\rho(4\ K)$, is a sensitive indicator of purity and of the mechanical state of a material.

SRM	Type	RRR Values	Form
769	Aluminum	130, 683, 1205, 2650, and 11,000	6.4 mm D, 52 mm long

Eddy Current

These SRM's are intended for use in the calibration of eddy current conductivity meters and of secondary electrical conductivity standards. Eddy current measurements are used in nondestructive inspection of conducting materials and in the sorting of alloys for composition and heat treatment.

SRM	Type	Conductivity	Form
1860	Aluminum	60% IACS	44×44×9.5 mm
1862	Aluminum-Magnesium Alloy	41% IACS	44×44×9.5 mm
1864	Copper (IN PREP)		
1865	Titanium Alloy (6Al-4V) (IN PREP)		

Superconducting Critical Current

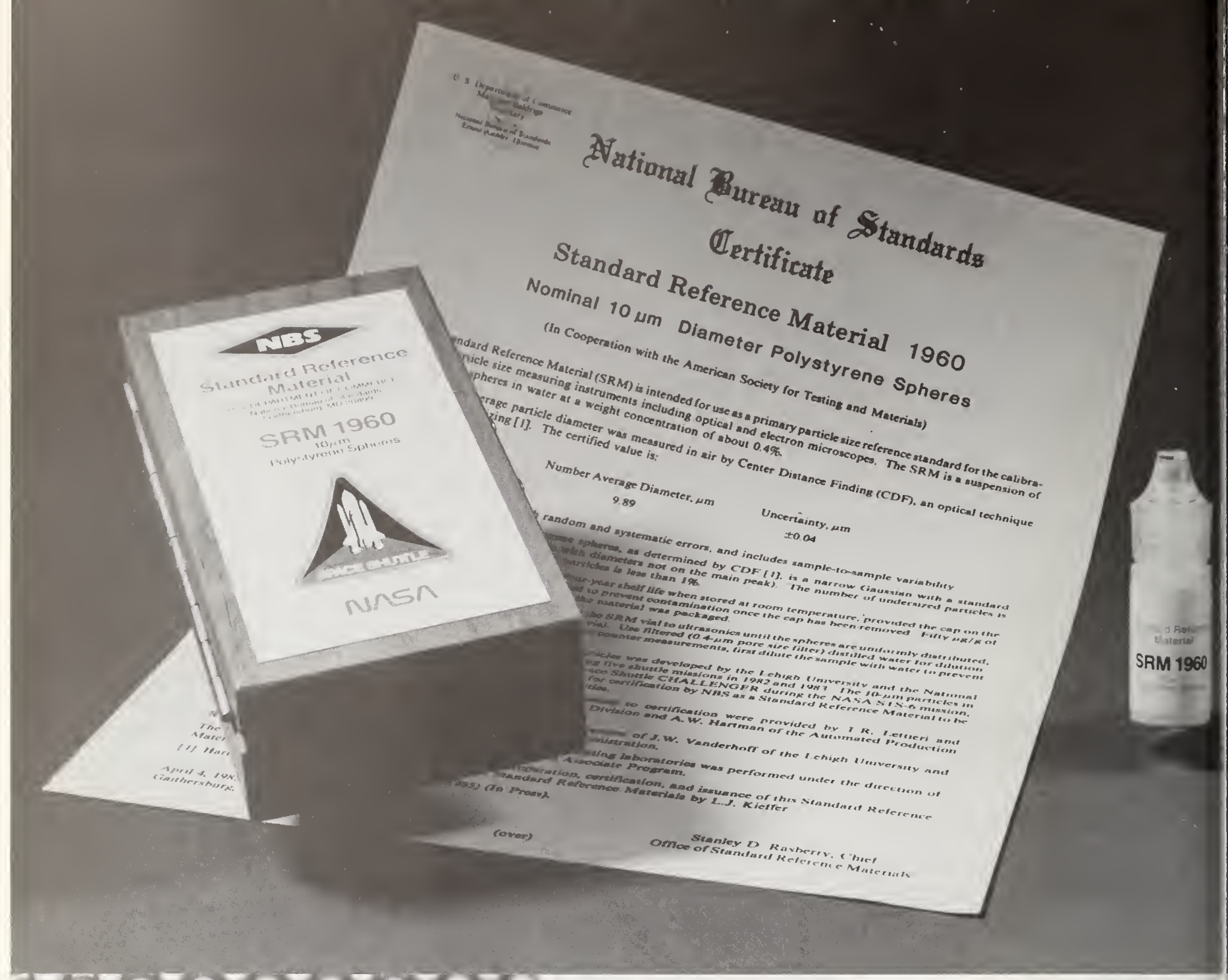
This SRM is for checking the performance of measurement systems used in superconductor technology. It consists of 2.2 m of a multifilamentary niobium titanium, copper stabilized superconducting wire wound in a single layer onto a spool with a core diameter of 8.7 cm.

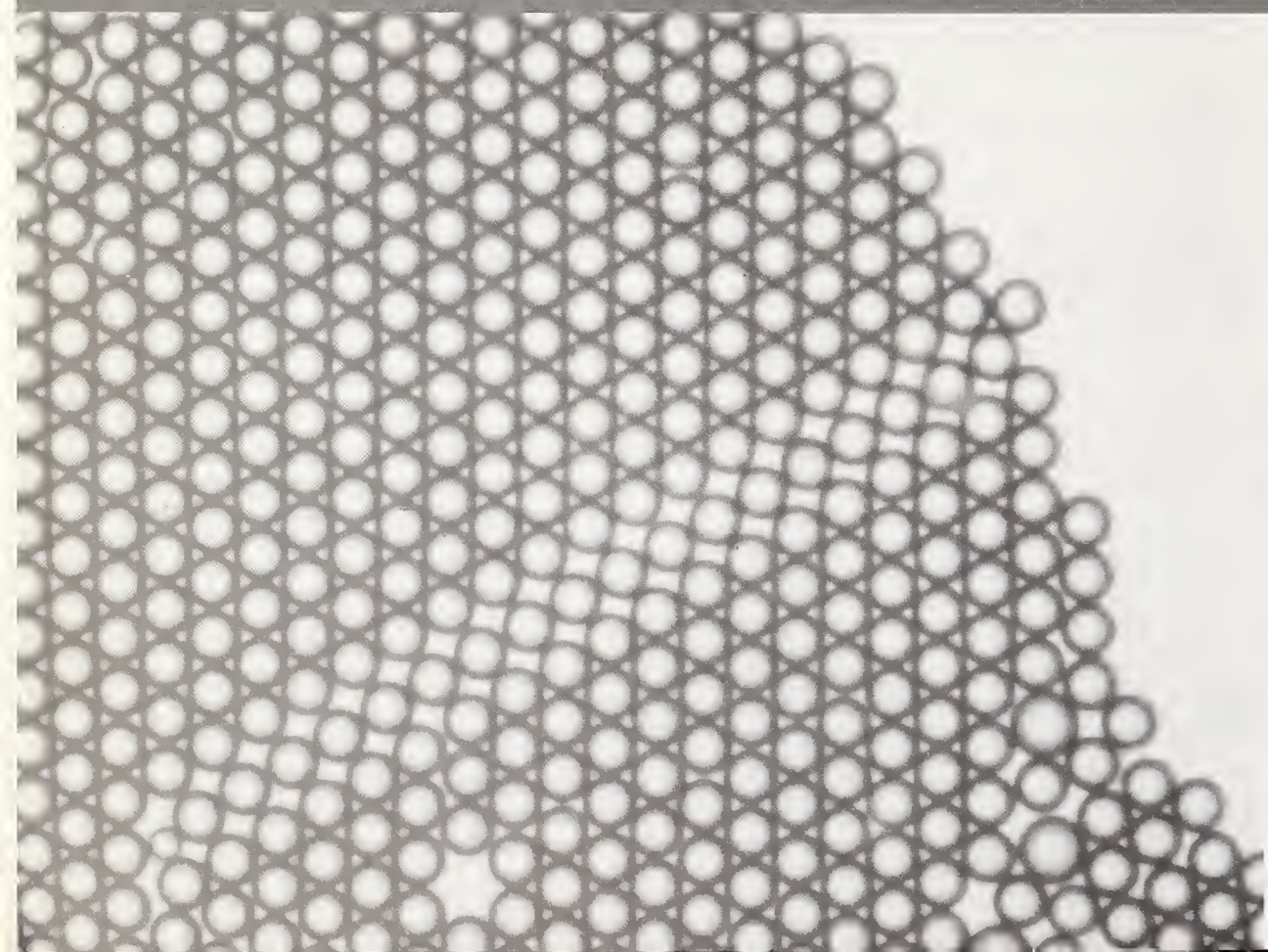
SRM	Type	Magnetic Field (T)	Critical Current (A)
1457	Nb-Ti Wire	2,000	293.30
		4,000	187.38
		6,000	124.72
		8,000	69.72

Dye Penetrant Test Blocks

These SRM's are for checking the performance of liquid dye penetrants and dye penetrant crack detection techniques. These test block have four synthetic cracks, approximately 0.2, 0.5, 1, and 2 μm wide.

SRM	Type	Surface	Unit Size
1850	Penetrant Test Block	Bright Finish	5 cm dia., 1 cm thick
1851	NDE Penetrant Test Block	Matte Finish	5 cm dia., 1 cm thick





Top: SRM 1960 package, certificate, and vial containing polystyrene spheres in solution. Left: Photomicrograph of first SRM made in space, aboard Space Shuttle Challenger during the NASA STS-6 mission.

Engineering Materials

Standard Rubbers and Rubber-Compounding Materials

These SRM's have been prepared to provide the rubber industry with standard materials for rubber compounding. They are useful for the testing of rubber and rubber-compounding materials in connection with quality control of raw materials and for the standardization of rubber testing.

Each material has been statistically evaluated for uniformity by mixing rubber and rubber compounds, and vulcanizing them in accordance with ASTM Designation D–15 and determining the stress-strain properties of the resulting vulcanizates. Certificates are issued for the rubbers because the properties of different lots are not the same. Replacement lots of rubber-compounding SRM's impart essentially the same characteristics to rubber vulcanizates so that Certificates are not issued for these SRM's.

Rubbers

SRM	Type	Wt/Unit	Pounds
386j	Styrene-butadiene 1500	34 kg	75
388m	Butyl	34 kg	75
1495	Butyl (Low Viscosity)	34 kg	75

Rubber Compounding Materials

SRM	Type	Wt/Unit	Pounds
370e	Zinc Oxide	8 kg	17.6
371h	Sulfur	6 kg	13.2
372i	Stearic Acid	3.2 kg	7.1
375g	Channel Black	28 kg	61.6
378b	Oil Furnace Black	28 kg	61.6
382a	Gas Furnace Black	32 kg	70.6
383a	Mercaptobenzothiazole	3.2 kg	7.1
384e	N-tertiary-Butyl-2-benzothiazolesulfenamide	3.2 kg	7.1

Sizing

Particle Size

SRM's 1003a, 1690, 1691, and 1960 can be used to calibrate various types of particle size measuring instruments including both light and electrical zone flow-through counters. SRM's 1004, 1017a, 1018a, and 1019a are for calibrating test sieves.

SRM	Type	Size (μm)	Sieve No.	Wt/Unit
1003a	Glass Spheres	8–58	—	25 g
1004	Glass Spheres	34–120	400–140	63 g
1017a	Glass Spheres	100–310	140–50	84 g
1018a	Glass Spheres	225–780	60–25	74 g
1019a	Glass Spheres	760–2160	20–10	200 g
1690	Polystyrene Spheres (0.5% wt. concentration in water)	0.9	—	5 mL vial
1691	Polystyrene Spheres (0.5% wt. concentration in water)	0.3	—	5 mL vial
1960	Polystyrene Spheres (0.4% wt. concentration in water)	10.00	—	5 mL vial

Cement Turbidimetric and Fineness

This SRM is available to calibrate the Blaine fineness meter according to the latest issue of Federal Test Method Standard 158, Method 2101 or ASTM Designation C204; to calibrate the Wagner turbidimeter according to ASTM Designation C115; and to determine sieve residue according to ASTM Designation C430. Each set consists of twenty sealed vials, each containing approximately 10 grams of cement.

SRM	Type	Properties Certified	Unit
114n	Portland Cement	Residue on 45 μm, electroformed sieve wet method	Set of 20 vials
		Surface area (Wagner turbidimeter)	
		Surface area (Air-permeability)	

SRM 2083, Socketed Ball Bar.

Surface Area of Powders

These materials are for calibrating and checking instruments used to determine the secific surface area of powders by BET. RM's 8005 through 8008 have been certified by the National Physical Laboratory, Teddington, U.K. (and meet the ISO definition for CRM's); RM's 8570, 8571, and 8572 are issued by NBS in cooperation with ASTM, but are not certified.

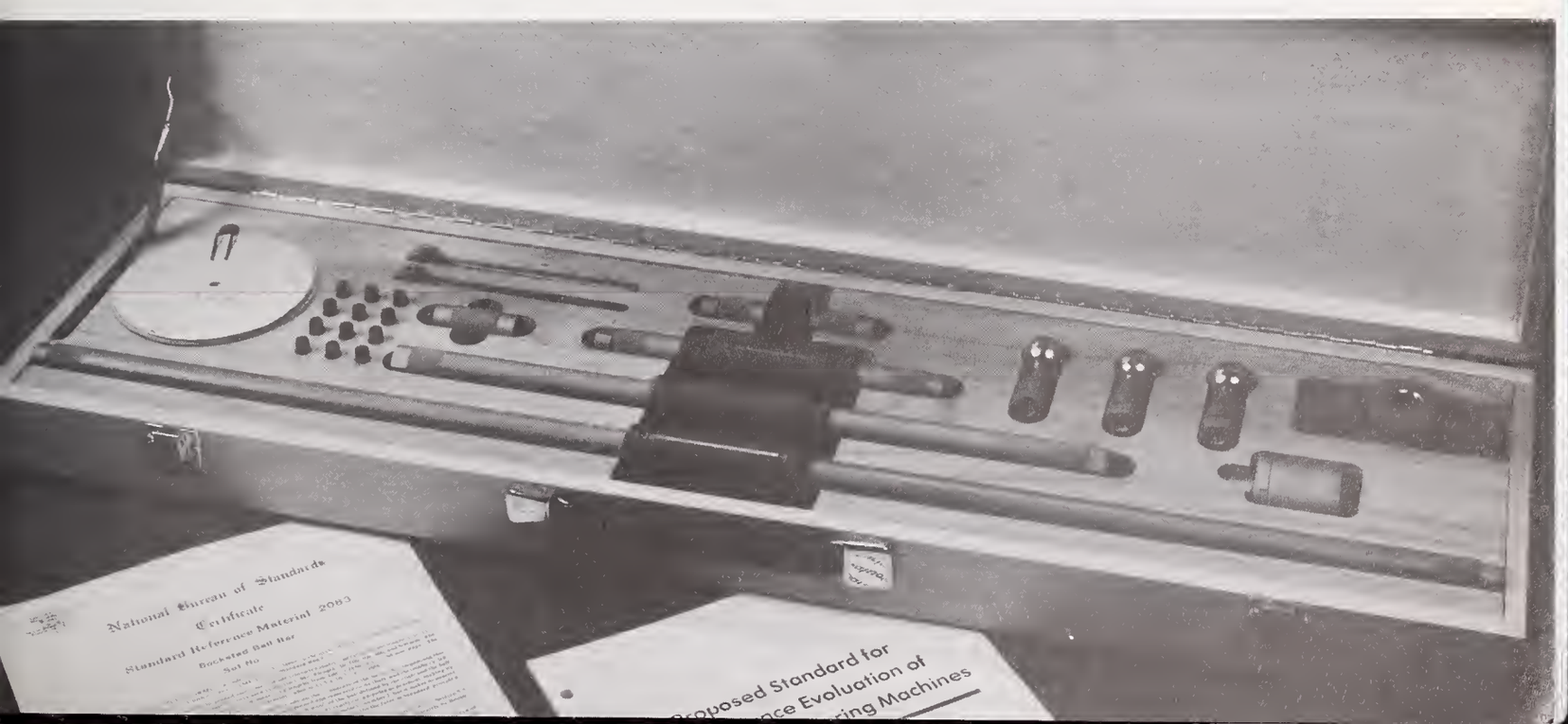
RM	Type	Surface Area	Unit Size
8005	Alpha Alumina	2.1 m^2/g	50 g
8006	Alpha Alumina	0.3 m^2/g	50 g
8007	Alpha Alumina	0.1 m^2/g	50 g
8008	Alpha Alumina	0.8 m^2/g	50 g
8570	Calcined Kaolin	(11) m^2/g	10 g
8571	Alumina	(160) m^2/g	10 g
8572	Silica-Alumina	(286) m^2/g	10 g

PERFORMANCE STANDARDS

Socketed Ball Bar

This SRM is for measuring the performance of coordinate measuring machines (CMM's) as per ASME Standard B89.1.12. It consists of a set of three precision balls pinned and cemented onto threaded shafts, one table-mount magnetic socket, one ram-mount magnetic socket, and 5 partially insulated extension tubes—50, 100, 200, 400, and 800 mm long.

SRM	Type	Measuring Lengths (50 mm steps)	Unit
2083	Socketed Ball Bar	100 to 1650 mm	Set



Radiographic Image Quality

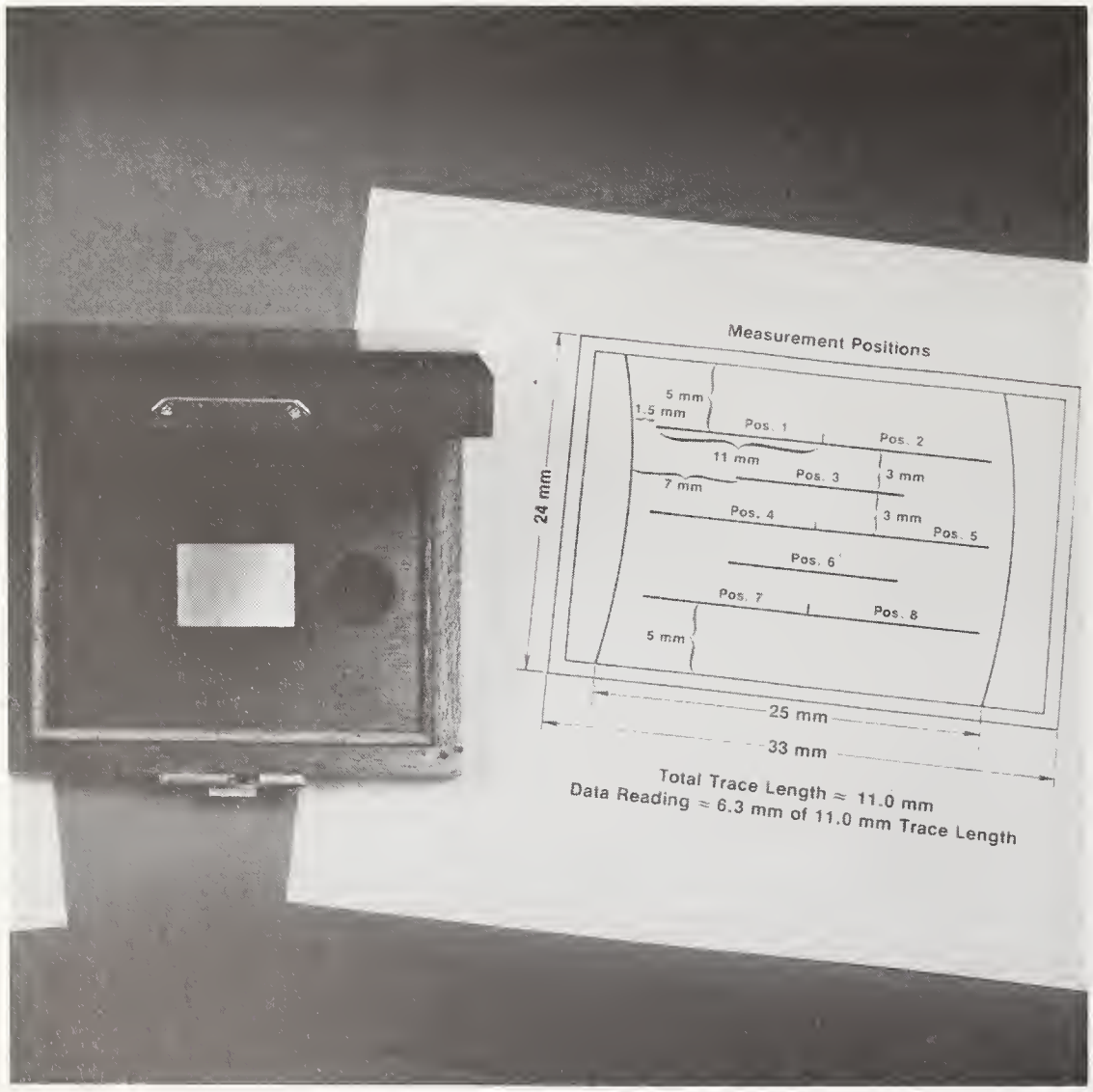
This SRM is for determining the radiographic image quality of x-ray radiographic systems, or x-ray system components such as film.

SRM	Type	Unit of Issue
1844	Radiographic Quality Image Indicator	Set of 4 plates

Surface Roughness

These SRM's are for calibrating stylus instruments that measure surface roughness. These electroless-nickel coated steel blocks have a sinusoidal roughness profile machined on the top surface.

SRM	Type	Roughness	Unit of Issue
2071	Sinusoidal Roughness	0.3μm	IN PREP
2072	Sinusoidal Roughness	1.0μm	IN PREP
2073	Sinusoidal Roughness	3.0μm	Block, 24$\times$33 mm



SRM 2073, Sinusoidal Roughness specimen with a diagram of measurement positions.

Color

These SRM's are available to illustrate a characteristic color for each of the ISCC-NBS color-name blocks in NBS Special Publication 440, COLOR: Universal Language and Dictionary of Names. SRM 2106 consists of 251 color chips on 18 constant-hue centroid color charts, and constitutes a supplement to SP 440. SRM 2107 combines SRM 2106 with SP 440 to form a complete color kit. The centroid colors represent a systematic sampling of the whole color solid. Note: The color chips were re-measured in 1984 and are issued with the new data as an addendum. This addendum is available upon request.

SRM	Type	Unit of Issue
2106	Centroid Color Charts	Set: 18 Charts
2107	Color Kit	Set: SRM 2106 and SP 440

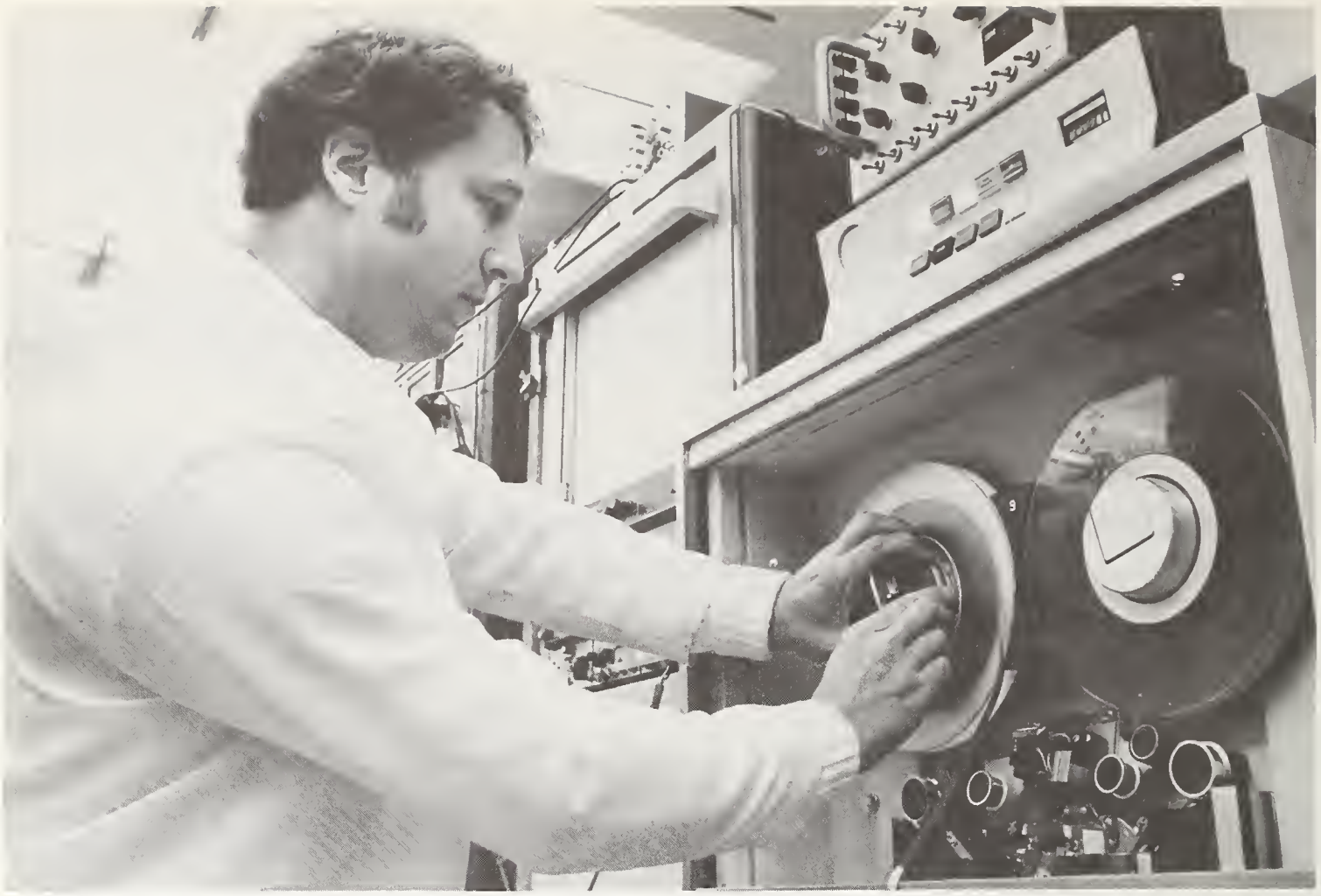
X-ray and Photographic

SRM 1001 is a calibrated x-ray film step tablet of 17 steps that cover the optical density range from 0 to 4; it has a blue tint and emulsion on both sides. SRM 1008 is a calibrated photographic step tablet of 21 steps that cover the optical density range from 0 to 4; it has a black tint and emulsion on a single side.

SRM 1010a, Microcopy Resolution Test Charts, is used to test the resolving power of cameras or of whole microcopying systems. SRM 1010a consists of five charts printed photographically on paper, which have 26 high-contrast five-line patterns ranging in spatial frequency from one cycle per millimeter to 18 cycles per millimeter. Instructions for the use of the charts are supplied with each order.

SRM 2061 is a calibrated reflection step tablet having 12 steps that cover the optical density range from 0 to 2 on gray scale paper from white to black. It is intended primarily for use in photographic applications requiring color balance or separation.

SRM	Type	Unit
1001	X-ray Film Step Tablet (0–4)	1 tablet, 17 steps
1008	Photographic Step Tablet (0–4)	1 tablet, 21 steps
1010a	Microcopy Resolution Test Chart	Set of 5 charts
2061	Reflection Step Tablet	1 tablet, 12 Steps



Lloyd Gilmore of the Computer Storage Media Group mounts a tape SRM for exercising; all tape SRM's are exercised by winding and rewinding several times before shipment to customers. Upon receipt, customers should exercise such SRM's before each use.

Magnetic Computer Storage Media

These SRM's are for evaluating the performance of magnetic computer storage media and systems, and for maintaining control over their production. Each SRM is individually calibrated and certified.

SRM	Description	Unit of Issue
3200	Secondary Standard Magnetic Tape—12.7 mm (½ in) wide tape, certified for signal amplitude outputs relative to the NBS Standard Reference Amplitudes at 8, 32, and 126 flux transitions per millimeter (200, 800, 3200 flux transitions per inch).	Open Reel
6250	Secondary Standard High Density Magnetic Tape—12.7 mm (½ in) wide tape, certified for signal amplitude output relative to the NBS Standard Reference Amplitude at 356 flux transitions per millimeter (9042 flux transitions per inch).	Open Reel
1600	Secondary Standard Magnetic Tape Cassette—3.8 mm (0.15 in) wide tape, certified for signal amplitude output relative to the NBS Standard Reference Amplitude at 63 flux transitions per millimeter (1600 flux transitions per inch).	Cassette
3216	Secondary Standard Magnetic Tape Cartridge—6.3 mm (¼ in) wide tape, certified for signal amplitude output relative to the NBS Standard Reference Amplitude at 126 flux transitions per millimeter (3200 flux transitions per inch).	Cartridge
3217	Secondary Standard High Density Magnetic Tape Cartridge—6.3 mm (¼ in) wide tape, certified for signal amplitude outputs relative to the NBS Standard Reference Amplitudes at 252 and 394 flux transitions per millimeter (6400 and 10000 flux transitions per inch).	Cartridge
3210	Secondary Standard Magnetic Flexible Disk Cartridge (FDC)—200 mm (8 in) FDC, certified on Side 0 for signal amplitude outputs relative to the NBS Standard Reference Amplitudes at 250,000 and 500,000 flux transitions per second on tracks 00 and 76, respectively.	FDC

These RM's are certified by the Physikalisch-Technische Bundesantalt (PTB), Federal Republic of Germany, for signal amplitude, overwrite, and resolution. The RM numbers correspond to the ISO standard number, and the materials conform to relevant ANSI, ISO, and ECMA standards for flexible disk cartridges.

RM	Description	Unit/Size
5654	Flexible Disk Cartridge	200 mm (8 in)
6596	Flexible Disk Cartridge	130 mm (5.25 in)
7487	Flexible Disk Cartridge	130 mm (5.25 in)
8630	Flexible Disk Cartridge	130 mm (5.25 in)

Jim Park and Lloyd Gilmore examine SRM 3216, Secondary Standard Magnetic Tape Cartridge. Two SRM 6250's and a 3210 are on the table.

CENTERLINE DRAWINGS FOR OPTICAL CHARACTER RECOGNITION STYLE—B CHARACTERS

This SRM is an exact copy of the centerline drawings that uniquely define each printed character shape and size used in constant strokewidth Style B Size I Optical Character Recognition (OCR-B) applications in accordance with one or more of the following standards: American National Standard X3.49–1975 (R 1982), Character Set for Optical Character Recognition (OCR-B); Federal Information Processing Standards Publication (OCR), European Computer Manufacturers Association Standard ECMA–11 for the Alphanumeric Character Set OCR-B for Optical Recognition, 3rd Edition, 1976 and International Standard ISO 1073/II-1976, Alphanumeric Character Sets for Optical Recognition Part II: Character Set OCR-B.

This Standard Reference Material contains information on the shape, size, strokewidth, and position relative to the base line of the OCR-B characters.

SRM	Characters	Sheets	Size	Sheet Size
1901	118	118	OCR-B I	32×44×0.01 cm

SRM 1901 consists of individual centerline drawings for each of the OCR–B size I characters illustrated here.

FIRE RESEARCH

Surface Flammability

SRM 1002c, Hardboard Sheet, is issued for checking the operation of radiant panel test equipment in accordance with the procedures outlined in ASTM Standard E162–78.

SRM	Type	Certification	Unit of Issue
1002c	Hardboard Sheet	Flame Spread Index, I=153 Heat Evolution Factor, Q=36.5	Set of 4: 6×18×¼ inch

Smoke Density Chamber

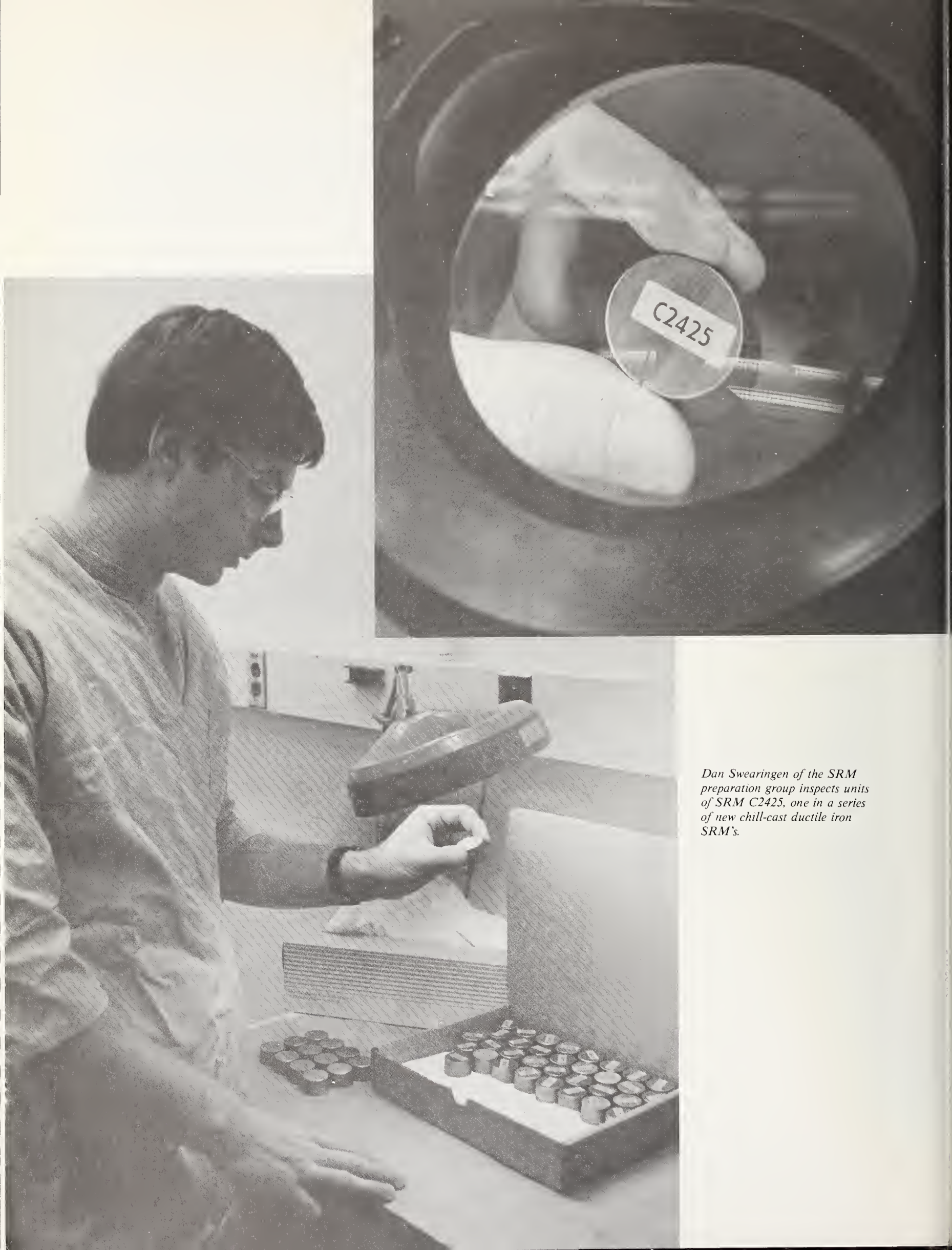
These SRM's are certified for maximum specific optical density and are issued for performing operational checks of smoke density chambers.

SRM	Type	Maximum Specific Optical Density	Unit of Issue
1006b	Non-flaming Exposure Condition (α-cellulose)	Dm (corr.)=183	3 sheets
1007a	Flaming Exposure Condition (plastic)	Dm (corr.)=17850(t)-132	3 sheets

Flooring Radiant Panel

This SRM consists of three sheets of kraft paperboard. It is for checking the operation of flooring radiant panel test apparatus used to measure critical radiant flux as per ASTM E648.

SRM	Type	Critical Radiant Flux	Unit Size (cm)
1012	Flooring Radiant Panel	0.36 W/cm^2	104.1×25.4×0.305



Dan Swearingen of the SRM preparation group inspects units of SRM C2425, one in a series of new chill-cast ductile iron SRM's.

Additional Information

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* Send order with remittance to Superintendent of Documents, US Government Printing Office, Washington, DC 20402. Remittance from foreign countries should include an additional one-fourth of the purchase price for postage.

** May be ordered from: National Technical Information Services (NTIS), Springfield, Virginia 22161.

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End Standards	G. Chaconas	(301) 921-2216
Gage Blocks	G. Chaconas	(301) 921-2216
Hydrometers	J. R. Whetstone	(301) 921-3281
Line Standards	T. D. Dóiron	(301) 921-2216
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631	Zinc Spelter (mod)	Nov 81	36
633	Portland Cement, red	Dec 83	76
634	Portland Cement, gold	Dec 83	76
635	Portland Cement, blue	Dec 83	76
636	Portland Cement, yellow	Dec 83	76
637	Portland Cement, pink	Dec 83	76
638	Portland Cement, green	Dec 83	76
639	Portland Cement, clear	Dec 83	76
640a	Silicon X-ray Diffraction	Dec 82	111
641	Ti-Base Alloy, 8Mn (A)	Oct 81	35
642	Ti-Base Alloy, 8Mn (B)	Oct 81	35
643	Ti-Base Alloy, 8Mn (C)	Oct 81	35
644	Ti-Base 2Cr–2Fe–2Mo (A)	Jan 60	35
646	Ti-Base 2Cr–2Fe–2Mo (C)	Jan 60	35
650	Titanium	Nov 85	35
651	Titanium	Nov 85	35
652	Titanium	Nov 85	35
654a	Titanium Alloy 6A1–4V	Oct 81	35
668	Steels, Set 661–665	Sep 81	20
670	Ore, Rutile	Jun 85	71
671	Nickel Oxide 1	Dec 60	34
672	Nickel Oxide 2	Dec 60	34
673	Nickel Oxide 3	Dec 60	34

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SRM	SRM Description	Certificate Date	Page
674	Intensity X-ray Diffraction Set	Jun 83	111
675	Mica X-ray Diffraction	Jun 82	111
680a	Platinum, High Purity	Mar 77	39
681	Platinum, Doped	Mar 77	39
682	Zinc, High Purity	Jul 68	39
683	Zinc, Pure	Oct 81	39
685	Gold, High Purity	Oct 81	39
688	Basalt Rock	Aug 81	73
689	Ferrochromium Silicon	Feb 82	25
690	Ore, Iron (Canada)	Oct 78	70
691	Reduced Iron Oxide	Apr 82	70
692	Ore, Iron (Labrador)	Oct 82	70
693	Ore, Iron (Nimba)	Oct 78	70
694	Phosphate Rock (Western)	Jun 84	68, 71
696	Bauxite (Surinam)	Aug 79	71
697	Bauxite (Dominican)	Aug 79	71
698	Bauxite (Jamaican)	Aug 79	71
699	Alumina, Reduction Grade	Aug 81	71
705	Polystyrene 179k mol wt	Nov 78	91, 93
706	Polystyrene 258k mol wt	Feb 79	91
708	Glasses, Stress Optical Coefficient	Sep 73	89
709	Glass, Extra Dense Lead	Jun 74	88, 89
710a	Glass, Soda Lime-Silica	*	88
711	Glass, Lead-Silica	Jul 64	88
712	Glass, Alkali Lead-Silica	Oct 66	88
713	Glass, Dense Barium Crown	Oct 66	88
714	Glass, Alkali Alumina Silica	Oct 66	88
715	Glass, Alkali-free Alumina	Sep 66	88
716	Glass, Neutral	Sep 66	88
717	Glass, Borosilicate	Nov 69	88
718	Alumina Elasticity	Apr 72	89
720	Synthetic Sapphire	Apr 82	93
723a	Tris(hydroxymethyl) aminomethane, Basimetric	Apr 81	43
724a	Tris(hydroxymethyl) aminomethane, Calorimetric	Sep 73	93
726	Selenium, Inter-Purity	Jan 67	39
728	Zinc-Intermediate Purity	Oct 81	39
731	Glass, Borosilicate	Jul 72	99
737	Tungsten	May 76	99
739	Fused Silica	May 71	99
740	Zinc Freezing Point	Feb 70	96
741	Tin Freezing Point	Jul 72	96
742	Alumina Melting Point	Jul 70	96
743	Mercury, Triple Point	Apr 76	96
745	Gold, Vapor Pressure	May 69	98
746	Cadmium, Vapor Pressure	Aug 70	98
748	Silver, Vapor Pressure	Aug 70	98
763	Aluminun, Magnetic Susceptibility	Apr 73	99
764	Platinum, Magnetic Susceptibility	Apr 73	99
765	Palladium, Magnetic Susceptibility	Apr 73	99
766	Manganese Fluoride, Mag Suscept	Apr 73	99
767a	Thermometric Fix Point Device	Jun 83	95
768	Thermometric Fix Point Device (Low)	Dec 78	95
769	Electrical "RRR" Set	Nov 82	113
772	Nickel, Magnetic Moment	Oct 78	99
773	Glass, Liquidus Temperature	Nov 80	89
774	Glass, Dielectric Constant	Jul 82	88
781	Molybdenum, Heat Capacity	Apr 77	93
853	Aluminum Alloy 3004	May 85	29
854	Aluminum Alloy 5182	May 85	29
855	Aluminum Casting Alloy 356	Jan 80	29
856	Aluminum Casting Alloy 380	Jan 80	29
858	Aluminum Alloy 6011 (mod)	Jun 80	29
859	Aluminum Alloy 7075	Jun 80	29
864	Inconel 600	May 84	33
865	Inconel 625	May 84	33
866	Incoloy 800	May 84	33
867	Incoloy 825	May 84	33
871	Phosphor Bronze, CDA 521	Aug 79	30
872	Phosphor Bronze, CDA 544	Aug 79	30
874	Cupro-Nickel, 10 (CDA 706) (pure)	Jan 78	30
875	Cupro-Nickel, 10 (CDA 706) (doped)	Jan 78	30
879	Nickel Silver, CDA 762	Jun 79	30
880	Nickel Silver, CDA 770	Jun 79	30
882	Ni-Cu Alloy (65Ni 31Cu 3Al)	Aug 79	33
890	Iron, HA White Cast(HC-250+V)	Apr 82	26
891	Iron, HA White Cast(Ni-Hard I)	Apr 82	26
892	Iron, HA White Cast(Ni-Hard IV)	Apr 82	26
897	Tracealloy A	Aug 83	34
898	Tracealloy B	Aug 83	34
899	Tracealloy C	Aug 83	34
900	Antiepilepsy Drug Level Assay	Apr 79	46, 47
909	Human Serum	Mar 85	46
910	Sodium Pyruvate	May 81	46
911a	Cholesterol	Mar 80	46
912a	Urea	Nov 79	46
913	Uric Acid	Nov 73	46
914a	Creatinine	*	46
915	Calcium Carbonate	Nov 73	46
916	Bilirubin	Mar 71	46
917	D-Glucose (Dextrose)	Sep 73	46
918	Potassium Chloride	Nov 73	46
919	Sodium Chloride	Nov 73	46
920	D-Mannitol	Nov 73	46
921	Cortisol (Hydrocortisone)	Dec 73	46
922	Tris(hydroxymethyl) aminomethane, pH	Aug 76	46, 83
923	Tris(hydroxymethyl) aminomethane hydrochloride, pH	Aug 76	46, 83
924	Lithium Carbonate	Nov 73	46
925	4-Hydroxy-3-methoxy-dl-mandelic Acid (VMA)	Dec 73	46
926	Bovine Serum Albumin (Total Protein)	Jul 77	46
927a	Bovine Serum Albumin (7% Solution, Total Protein)	*	46
928	Lead Nitrate	May 76	46
929	Magnesium Gluconate Dihydrate	Apr 79	46
930D	Glass Filters for Spectrophotometry (Visible)	Aug 84	100
931d	Liquid Absorbance Filters for UV and Visible Spectrophotometry	*	100
932	Quartz Cuvette for Spectrophotometry	Dec 80	100
934	Clinical Laboratory Thermometer	Oct 74	97
935	Crystalline Potassium Dichromate for UV Absorbance	Jun 77	100
936	Quinine Sulfate Dihydrate	Apr 79	100
937	Iron Metal	Jun 78	46
938	4-Nitrophenol	May 81	46
945	Plutonium Metal Matrix	Jan 73	78
946	Plutonium Isotopic (12%)	Aug 82	78
947	Plutonium Isotopic (18%)	Aug 82	78
948	Plutonium Isotopic (8%)	Aug 82	78
949f	Plutonium Metal	Sep 82	78
950b	Uranium Oxide	Mar 78	79
951	Boric Acid	Oct 71	43, 81
952	Enriched Boric Acid	Oct 71	81
953	Neutron Density Monitor Wire	Mar 69	80
955	Lead in Blood	Dec 84	46
960	Uranium Metal	May 72	43, 79

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961	Fission Track Glass (U–500 ppm)	Jun 74	80
962a	Fission Track Glass (U–50 ppm)	Feb 84	80
963a	Fission Track Glass (U–1 ppm)	Feb 84	80
969	Uranium Oxide—Gamma Spectrometry	Jun 85	79
975	Chlorine, Isotopic	Mar 65	81
977	Bromine, Isotopic	Mar 65	81
978a	Silver, Isotopic	Sep 84	81
979	Chromium, Isotopic	May 66	81
980	Magnesium, Isotopic	Jan 67	81
981	Lead, Common Isotopic	Apr 73	81
982	Lead, Equal-Atom Isotopic	Jun 68	81
983	Lead, Radiogenic Isotopic	Jun 68	81
984	Rubidium Chloride, Assay & Isotopic	Jul 70	81
985	Potassium, Assay & Isotopic	Aug 79	81
987	Strontium, Assay & Isotopic	Oct 82	43, 81
989	Rhenium, Assay & Isotopic	Feb 74	81
990	Silicon, Assay & Isotopic	Aug 75	81
991	Lead-206 Spike, Assay & Isotopic	Mar 76	81
993	Uranium-235 Spike, Assay & Isotopic	Jun 75	79
994	Gallium, Isotopic	Dec 85	81
995	Uranium-233 Spike, Assay & Isotopic	Aug 80	79
996	Plutonium-244 Spike, Assay & Isotopic	Jun 81	78
997	Thallium, Isotopic	Jan 86	81
998	Angiotensin I (Human)	Jan 83	46
999	Potassium Chloride (Primary)	Sep 72	43
1001	X-Ray Film Step Tablet (0–4)	Mar 85	119
1002c	Surface Flammability	Dec 78	123
1003a	Glass Spheres (8–58 μm)	Sep 84	116
1004	Glass Beads (34–120 μm)	Apr 72	116
1006b	Smoke Density, Nonflame (cellulose)	Apr 83	123
1007a	Smoke Density, Flame (ABS plastic)	Feb 76	123
1008	Photographic Step Tablet (0–4)	Mar 85	119
1010a	Microcopy Resolution Test Charts	Jun 82	119
1012	Flooring Radiant Panel	Sep 84	123
1017a	Glass Beads (100–310 μm)	Sep 71	116
1018a	Glass Beads (225–780 μm)	May 73	116
1019a	Glass Spheres (0.76–2.16 mm)	Oct 84	116
1034	Unalloyed Copper	Feb 82	30
1035	Leaded-Tin Bronze Alloy	Feb 82	30
1036	Steel, Low Carbon Silicon	Sep 82	16
1051b	Barium Metallo-organic	Jul 15	66
1052b	Vanadium Metallo-organic	Mar 68	66
1053a	Cadmium Metallo-organic	Jan 70	66
1055b	Cobalt Metallo-organic	Jul 68	66
1057b	Tin Metallo-organic	Aug 68	66
1059c	Lead Metallo-organic	*	66
1060a	Lithium Metallo-organic	Apr 64	66
1061c	Magnesium Metallo-organic	Oct 81	66
1062b	Manganese Metallo-organic	Apr 76	66
1065b	Nickel Metallo-organic	Nov 67	66
1066a	Silicon Metallo-organic	Apr 69	66
1069b	Sodium Metallo-organic	Feb 69	66
1070a	Strontium Metallo-organic	Apr 64	66
1071b	Phosphorus Metallo-organic	Feb 76	66
1073b	Zinc Metallo-organic	Jul 67	66
1074a	Calcium Metallo-organic	May 66	66
1075a	Aluminum Metallo-organic	Oct 67	66
1077a	Silver Metallo-organic	Feb 68	66
1078b	Chromium Metallo-organic	Jul 72	66
1079b	Iron Metallo-organic	Feb 69	66
1080a	Copper Metallo-organic	Feb 69	66

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1083	Wear-Metals in Lube Oil (Base Oil)	Jul 85	67
1084	Wear-Metals in Lube Oil (100 ppm)	Jul 85	67
1085	Wear-Metals in Lube Oil (300 ppm)	Jul 85	67
1086	Hydrogen in Titanium	Jun 80	34
1087	Hydrogen in Titanium	Jun 80	34
1088	Hydrogen in Titanium	Jun 80	34
1089	Gasometric Set (1095—1099)	Set	34
1090	Oxygen in Ingot Iron	Oct 85	34
1091a	Oxygen in Stainless Steel (AISI 431)	Oct 85	34
1093	Oxygen in Valve Steel	Nov 84	34
1094	Oxygen in Maraging Steel	Nov 84	34
1103	Brass, Free Cutting, A	Aug 65	31
1106	Brass, Naval, A	Nov 81	31
C1106	Brass, Naval, A	Nov 81	31
1107	Brass, Naval, B	Nov 81	31
C1107	Brass, Naval, B	Nov 81	31
1108	Brass, Naval, C	Nov 81	31
C1108	Brass, Naval, C	Nov 81	31
C1109	Brass, Red, A	Oct 81	31
C1110	Brass, Red, B	Oct 81	31
1111	Brass, Red, C	Oct 81	31
C1111	Brass, Red, C	Oct 81	31
1112	Gilding Metal, A	Oct 81	31
C1112	Gilding Metal, A	Oct 81	31
1113	Gilding Metal, B	Oct 81	31
C1113	Gilding Metal, B	Oct 81	31
1114	Gilding Metal, C	Oct 81	31
C1114	Gilding Metal, C	Oct 81	31
1115	Bronze, Commercial, A	Nov 81	31
C1115	Bronze, Commercial, A	Nov 81	31
1116	Bronze, Commercial, B	Nov 81	31
C1116	Bronze, Commercial, B	Nov 81	31
1117	Bronze, Commercial, C	Nov 81	31
C1117	Bronze, Commercial, C	Nov 81	31
1118	Brass, Aluminum, A	Dec 81	31
C1119	Brass, Aluminum, B	Jul 82	31
C1121	Beryllium-Copper CABRA 165–170	Dec 81	31
C1123	Beryllium-Copper CABRA 10–75	Dec 81	31
1131	Solder (40Sn–60Pb)	Oct 81	33
1132	Bearing Metal, Pb–Base	Jan 70	33
1134	Steel, High-Silicon	Apr 70	20
1135	Steel, High-Silicon	Jul 72	20
1136	Steel, High-Sulfur	Aug 73	20
C1137a	Iron, White Cast	Jan 84	27
1138a	Steel, Cast, 1	Jan 77	27
1139a	Steel, Cast, 2	Jan 77	27
1144a	Iron, Blast Furnace, 2a	Dec 76	27
1145	Iron, White Cast	May 78	27
C1146a	Iron, White Cast	Oct 83	27
C1150a	Iron, White Cast	Dec 85	27
C1151	Stainless Steel (23Cr–7Ni)	Jan 80	23
C1152	Stainless Steel (18Cr–11Ni)	Jan 80	23
C1153	Stainless Steel (17Cr–9Ni)	Jan 80	23
C1154	Stainless Steel (19Cr–13Ni)	Jan 80	23
1155	Stainless Steel (AISI 316)	Aug 69	23
1157	Steel, Tool (AISI M2)	Aug 73	24
1158	Steel, High-Nickel (36Ni)	Dec 77	24
1160	Electronic and Magnetic Alloy	Aug 81	33
1169b	Steel, Lead-bearing	Apr 82	20
1170b	Steel, Selenium-bearing	Jan 74	23
1171	Stainless Steel (AISI 321)	Jul 71	23
1172	Stainless Steel (AISI 348)	Jul 71	23
1173	Steel, Ni–Cr–Mo–V	May 83	27
C1173	Steel, Cast 3	Feb 81	27
1199	High Temperature Alloy—L605	Aug 74	24
1200	High Temperature Alloy—S816	Aug 74	24
1207–2	High Temperature Alloy, Waspaloy	Aug 81	24
1217	Steel, Nickel (SAE 4820)	Nov 84	20
1218	Steel, Silicon, Low C & S	Nov 84	20

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1219	Stainless Steel (AISI 413)	*	23
C1221	Steel, Resulfurized/Rephosphorized	Jan 82	20
1222	Steel, Cr-Ni-Mo (AISI 8640)	Oct 78	20
1223	Stainless Steel, High S (AISI 416)	Sep 85	23
1224	Steel, Carbon (AISI 1078)	Feb 81	20
1225	Steel, Low-Alloy (AISI 4130)	Mar 83	20
1226	Steel, Low-Alloy (HY 130)	Dec 82	20
1227	Steel, BOH 1.0 C	Mar 83	20
1228	Steel, BOH 0.1 C	Sep 82	20
1233	Steel, Valve	*	24
1234	Zirconium A	Nov 80	37
1235	Zirconium B	Nov 80	37
1236	Zirconium C	Nov 80	37
1237	Zircaloy-4 D	Nov 80	37
1238	Zircaloy-4 E	Nov 80	37
1239	Zircaloy-4 F	Nov 80	37
1240	Aluminum Alloy 3004	Jul 85	29
1241	Aluminum Alloy	*	29
1244	Inconel 600	May 84	24
1245	Inconel 625	May 84	24
1246	Inconel 800	May 84	24
1247	Inconel 825	May 84	24
C1251	Phosphorized Copper (Cu VIII)	Sep 80	32
C1252	Phosphorized Copper (Cu IX)	Sep 80	32
C1253	Phosphorized Copper (Cu X)	Sep 80	32
1254	Steel, Silicon (Ca only)	Apr 82	20
1255a	Aluminum Casting Alloy 356	Jan 80	29
1256a	Aluminum Casting Alloy 380	Jan 80	29
1257	High Purity Aluminum	*	29
1258	Aluminum Alloy 6011 (mod)	May 78	29
1259	Aluminum Alloy 7075	May 78	29
1261a	Steel, AISI 4340	Feb 81	20
1262a	Steel, AISI 94B17 (mod)	Feb 81	20
1263a	Steel, Cr-V (mod)	Feb 81	20
1264a	Steel, High Carbon (mod)	Feb 81	20
1265a	Iron, Electrolytic	Feb 81	20
1267	Stainless Steel (AISI 446)	Jan 78	23
1269	Steel (AISI 1526) Line Pipe (mod)	Jun 81	20
1270	Steel, A336 (F-22) 2.3Cr-1Mo	Jun 81	20
1275	Cupro-Nickel (CDA 706)	Mar 80	31
C1285	Steel, A242 (mod)	Jun 82	20
1286	Steel, Low Alloy (HY 80)	Jun 82	20
C1287	Steel, ACI HK (AISI 310 mod)	Jun 81	23
C1288	Steel, ACI CN-7M (A-743)	Aug 81	23
C1289	Steel, ACI CA-6NM (AISI 414 mod)	Jun 81	23
C1290	Iron, White Cast (HC-250+V)	Jan 85	27
C1291	Iron, White Cast (Ni-Hard, Type I)	Jan 85	27
C1292	Iron, White Cast (Ni-Hard, Type IV)	Jan 85	27
1357	Cu-Cr Coating (nonmagnetic) on Steel	Aug 84	86
1358	Cu-Cr Coating (nonmagnetic) on Steel	Aug 84	86
1359	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1360	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1361a	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1362a	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1363a	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1364a	Cu-Cr Coating (nonmagnetic) on Steel	May 84	86
1365a	Nickel (magnetic) on Steel	May 84	86
1366a	Nickel (magnetic) on Steel	May 84	86
1379	Ultra-thin Gold on Nickel 0.35 mg	May 84	87
1380	Ultra-thin Gold on Nickel 0.55 mg	May 84	87
1387	Gold Coating on Nickel 2.2 mg	Sep 85	87
1398a	Gold Coating on Fe-Ni-Co Alloy (set)	May 84	87
1399b	Gold Coating on Nickel (set)	May 84	87
1411	Soft Borosilicate Glass	Aug 85	75
1412	Multicomponent Glass	Aug 85	75
1413	Glass Sand, High Alumina	Aug 85	72
1450b	Thermal Resistance, Fibrous Glass Board	May 85	98
1451	Thermal Resistance, Fibrous Glass Blanket	May 85	98
1457	Superconducting Critical Current Nb-Ti Wire	June 84	113
1460	Thermal Conductivity and Electrical Resistivity, Stainless Steel	May 84	98, 112
1461	Thermal Conductivity and Electrical Resistivity, Stainless Steel	May 84	98, 112
1462	Thermal Conductivity and Electrical Resistivity, Stainless Steel	May 84	98, 112
1470	Gas Transmission, Polyester Film	Feb 82	111
1475	Linear Polyethylene (52k mol wt)	Dec 78	91, 93
1476	Branched Polyethylene (viscosity)	Nov 69	91
1478	Polystyrene, (37k mol wt)	Jan 79	91
1479	Polystyrene, (1M mol wt)	Mar 81	91
1482	Linear Polyethylene (13k mol wt)	Oct 76	91
1483	Linear Polyethylene (32k mol wt)	Mar 76	91
1484	Linear Polyethylene (119k mol wt)	Oct 76	91
1490	Polyisobutylene Solution in Cetane, Rheology	Dec 77	92
1495	Rubber, Isobutylene-Isoprene (Butyl) (Low Mooney Viscosity)	Mar 81	115
1514	Thermal Analysis Purity (DSC)	Jul 84	94
1521	Boron-doped Silicon Slices for Resistivity (0.1 & 10 ohm·cm)	Feb 85	112
1522	Silicon Power Device Level Resistivity (25, 75, & 180 ohm·cm)	Sep 84	112
1523	Silicon Resistivity for Eddy Current Testers (0.01 & 1.0 ohm·cm)	Feb 85	112
1543	GC/MS System Performance	Aug 84	62
1549	Non-Fat Milk Powder	Jul 85	48
1566a	Oyster Tissue	Feb 83	48
1567	Wheat Flour	Jan 78	48
1568	Rice Flour	Jan 78	48
1569	Brewers Yeast (Cr only)	Sep 76	48
1572	Citrus Leaves	Dec 82	49
1573	Tomato Leaves	Oct 76	49
1575	Pine Needles	Oct 76	49
1577a	Bovine Liver	Feb 85	48
1579	Powdered Lead-Based Paint (Pb only)	Jan 73	54
1580	Organics in Shale Oil	Nov 80	59
1581	Polychlorinated Biphenyls in Oil	Jan 82	59

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1582	Petroleum Crude Oil	Jan 84	59
1583	Chlorinated Pesticides in 2,2,4–Trimethylpentane	Feb 85	59
1584	Priority Pollutant Phenols in Methanol	Apr 84	59
1585	Chlorinated Biphenyls	*	59
1586	Isotopically Labeled and Unlabeled Priority Pollutants in Methanol	Oct 84	59
1587	Nitrated Polycyclic Aromatic Hydrocarbons in Methanol	Jun 85	59
1590	Stabilized Wine	Dec 80	49
1595	Tripalmitin	Jul 83	46
1599	Anticonvulsant Drug Level Assay	Aug 82	46
1600	Secondary Standard Magnetic Tape Cassette (Computer Amplitude)	Mar 74	120
1614	Dioxin in *Iso*octane	*	59
1616	Sulfur in Kerosene	*	56
1617	Sulfur in Kerosene	*	56
1618	V and Ni in Residual Fuel Oil	May 85	54
1619	Sulfur in Residual Fuel Oil (0.7%)	Dec 81	56
1620a	Sulfur in Residual Fuel Oil (4.5%)	Dec 81	56
1621b	Sulfur in Residual Fuel Oil (0.9%)	Dec 81	56
1622b	Sulfur in Residual Fuel Oil (1.9%)	Dec 81	56
1623a	Sulfur in Residual Fuel Oil (0.2%)	Dec 81	56
1624a	Sulfur in Distillate (Diesel) Fuel Oil (0.1%)	Dec 81	56
1625	Sulfur Dioxide Permeation Tube, 10 cm	Jan 73	54
1626	Sulfur Dioxide Permeation Tube, 5 cm	Aug 71	54
1627	Sulfur Dioxide Permeation Tube, 2 cm	Aug 71	54
1629a	Nitrogen Dioxide Perm Device, 10 cm	Apr 81	54
1630	Trace Mercury in Coal	Aug 79	54
1632b	Trace Elements in Coal (Bituminous)	Jun 85	57
1633a	Trace Elements in Coal Fly Ash	Jan 85	57
1634b	Trace Elements in Fuel Oil	*	57
1635	Trace Elements in Coal (Subbituminous)	Aug 79	57
1636a	Lead in Reference Fuel	Feb 80	54
1637a	Lead in Reference Fuel	Feb 80	54
1638b	Lead in Reference Fuel	*	54
1639	Halocarbons (in methanol) for Water Analysis	Apr 83	59
1641b	Mercury in Water (μg/mL)	Apr 83	54
1642b	Mercury in Water (ng/mL)	Jun 82	54
1643b	Trace Elements in Water	May 84	57
1644	Generator Columns for Polynuclear Aromatic Hydrocarbons	Apr 81	59
1645	River Sediment	May 82	57
1646	Estuarine Sediment	Jun 82	57
1647	Priority Pollutant Polynuclear Aromatic Hydrocarbons	Dec 81	59
1648	Urban Particulate Matter	May 82	57
1649	Urban Dust/Organics	Apr 82	59
1650	Diesel Particulate Matter	Feb 85	59
1651	Heat-Source Powder for Calorimetry Zirconium-Barium Chromate, 1460	Nov 68	93
1652	Heat-Source Powder for Calorimetry Zirconium-Barium Chromate, 1632	Nov 68	93
1653	Heat-Source Powder for Calorimetry Zirconium-Barium Chromate, 1762	Nov 68	93
1655	Potassium Chloride for Solution Calorimetry	Mar 81	93
1656	Thianthrene, Combustion Calorimetry	Jan 85	92
1657	Synthetic Refuse-Derived Fuel, Combustion Calorimetry	Mar 85	92
1658a	Methane in Air, 1ppm	Mar 81	51
1659a	Methane in Air, 10ppm	Mar 81	51
1660a	Methane (4) and Propane (1) in Air	Mar 81	51
1661a	Sulfur Dioxide in Nitrogen, 500ppm	Mar 81	51
1662a	Sulfur Dioxide in Nitrogen, 1000ppm	Mar 81	51
1663a	Sulfur Dioxide in Nitrogen, 1500ppm	Mar 81	51
1664a	Sulfur Dioxide in Nitrogen, 2500ppm	Mar 81	51
1665b	Propane in Air, 3ppm	Jan 80	52
1666b	Propane in Air, 10ppm	Jan 80	52
1667b	Propane in Air, 50ppm	Jan 80	52
1668b	Propane in Air, 100ppm	Jan 80	52
1669b	Propane in Air, 500ppm	Jan 80	52
1670	Carbon Dioxide in Air, 330ppm	Dec 82	52
1671	Carbon Dioxide in Air, 340ppm	Dec 82	52
1672	Carbon Dioxide in Air, 350ppm	Dec 82	52
1674b	Carbon Dioxide in Nitrogen, 7%	Jan 80	52
1675b	Carbon Dioxide in Nitrogen, 14%	Jan 80	52
1677c	Carbon Monoxide in Nitrogen, 10ppm	Jan 80	52
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Ruth Meyer, in addition to processing foreign orders, maintains supplies of extra certificates for SRM's.

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PHOTO CREDITS

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