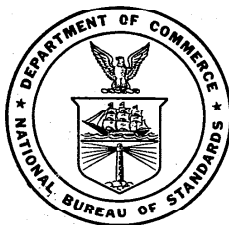


NBS MISC. PUBL. **260-4**

Standard Reference Materials:

SOURCES OF INFORMATION



U.S. Department of Commerce
National Bureau of Standards

THE NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards is a principal focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. Its responsibilities include development and maintenance of the national standards of measurement, and the provisions of means for making measurements consistent with those standards; determination of physical constants and properties of materials; development of methods for testing materials, mechanisms, and structures, and making such tests as may be necessary, particularly for government agencies; cooperation in the establishment of standard practices for incorporation in codes and specifications; advisory service to government agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; assistance to industry, business, and consumers in the development and acceptance of commercial standards and simplified trade practice recommendations; administration of programs in cooperation with United States business groups and standards organizations for the development of international standards of practice; and maintenance of a clearinghouse for the collection and dissemination of scientific, technical, and engineering information. The scope of the Bureau's activities is suggested in the following listing of its four Institutes and their organizational units.

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Institute for Materials Research. Analytical Chemistry. Polymers. Metallurgy. Inorganic Materials. Reactor Radiations. Cryogenics.** Office of Standard Reference Materials.

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Institute for Applied Technology. Textiles and Apparel Technology Center. Building Research. Industrial Equipment. Information Technology. Performance Test Development. Instrumentation. Transport Systems. Office of Technical Services. Office of Weights and Measures. Office of Engineering Standards. Office of Industrial Services.

* NBS Group, Joint Institute for Laboratory Astrophysics at the University of Colorado.

** Located at Boulder, Colorado.

UNITED STATES DEPARTMENT OF COMMERCE • Luther H. Hodges, *Secretary*
NATIONAL BUREAU OF STANDARDS • A. V. Astin, *Director*

Standard Reference Materials:

Sources of Information

Compiled by
John L. Hague, Thomas W. Mears, and Robert E. Michaelis

**Institute for Materials Research
National Bureau of Standards
Washington, D.C.**



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PREFACE

Within the framework of the NBS Institute for Materials Research the area of standard reference materials is a broad and important one, including the preparation, characterization and distribution of a wide variety of materials in such diverse fields as metallurgy, polymers and inorganic materials. In carrying out such a program there is much interaction with representatives of industry and science, beginning with discussions as to which primary standard materials will do most to advance technology, the furnishing of materials and fabrication of samples, and the characterization and certification of the materials by cooperative efforts. The many groups participating in a standards program are very interested in detailed information on specific aspects of the program -- but to date there has been no publication outlet for such written discussions.

To meet this need, NBS Miscellaneous Publication 260 has been reserved for a series of papers in the general area of "standard reference materials" This series will present the results of studies and investigations undertaken within the Institute for Materials Research with emphasis on the preparation and characterization of standard reference materials. This subject-oriented series will provide a means for rapid dissemination of this detailed information and we hope will stimulate the use of standard reference materials in science and industry.

W. Wayne Meinke, Chief
Office of Standard Reference Materials.

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STANDARD REFERENCE MATERIALS: SOURCES OF INFORMATION

Compiled by

John L. Hague, Thomas W. Mears and Robert E. Michaelis

This annotated listing of sources of Standard Reference Materials is prepared with references to all types of materials used to standardize analytical, physico-chemical and engineering methods. The range of Standard Reference Materials included runs from high-purity substances and carefully analyzed metals, alloys and rocks to materials of indefinitely-known composition for standardizing a single phenomenon.

INTRODUCTION

The term "Standard Reference Materials" encompasses a wide spectrum of well-characterized materials which can be used to calibrate a measurement system or to produce scientific data that can be referred readily to a common base. These materials insure uniformity of the nation's measurement systems.

Instruments and techniques need to be related to reliable reference materials if measurements are to be accurate. Analytical laboratories require composition standards in which the amounts of certain chemical constituents have been certified. The apparatus for measurement of physical properties must be calibrated against similarly certified reference materials.

Few standard reference materials of the type described here have true legal status in the United States. Rather these standards owe their acceptance to (1) the reputation of the certifying organization, (2) mutual agreement between buyer and vendor, and (3) acceptance within a given industry.

Often the availability of required reference materials is not generally known. This compilation attempts to bring together current sources of information in this general field and has been assembled largely from the files of the three Analytical Standards Coordinators at the National Bureau of Standards. Emphasis has been placed on breadth of coverage. Often where one publication refers to a number of other information sources, only the one broad publication is included.

It is anticipated that this compilation will be revised from time to time as needed. Information on additional sources would be appreciated to provide a more complete coverage. These revisions will be issued as NBS Miscellaneous Publication 260-4 (Revised).

In preparing this list, it has been necessary to make reference to many diverse sources of materials. Such mention should in no case, however, be considered as representing a recommendation or endorsement by the National Bureau of Standards.

1. Air Products and Chemicals, Inc.
Specialty Gas Department
Allentown, Pennsylvania

Lists a series of analyzed-certified mixtures of gases in range from ppm up to 50% of the minor constituent. Also given is information on "ultra-pure" gases and blends available on request.

2. Alloyd Electronics Company
35 Cambridge Parkway
Cambridge 42, Massachusetts

Provides a variety of stainless steel standards intended primarily for x-ray spectrochemical analysis.

3. Aluminum Company of America
Research Laboratories
New Kensington, Pennsylvania

Supplies a variety of aluminum-base standards. Some magnesium standards also are available, but the preparation of these has been discontinued. (Primarily spectrochemical.)

4. Aluminium Laboratories Limited
Analytical Division
P.O. Box 645
Arvida, Quebec, Canada

Supplies a variety of aluminum-base standards. (Primarily spectrochemical.)

5. American Instrument Company
Material Evaluation Laboratory
Attn: Mr. H. M. Rootare
8030 Georgia Avenue
Silver Spring, Maryland

Provides surface area standards for measurement by the BET method.

6. American Petroleum Institute
Petroleum Research Laboratory
Attn: Beveridge J. Mair
Carnegie Institute of Technology
Pittsburgh, Pennsylvania 15213

"American Petroleum Institute Standard Samples"

Lists API Standard Samples of hydrocarbons, organic sulfur compounds and organic nitrogen compounds. Also lists certified reference standards for density, refractive index and heat of combustion.

7. American Society for Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103

"Report on Available Standard Samples, Reference Samples, and High-Purity Materials for Spectrochemical Analysis (1963)" by R. E. Michaelis. ASTM Special Technical Publication No. 58-E. Price: \$4.50 (\$3.15 to members).

Provides ready reference by text and tables to the availability and sources in the world of 2,851 standard samples, 1,200 reference samples, and more than 1,000 high-purity materials. Although prepared primarily for use in spectrochemical methods of analysis, the listing provides information of value for application to any analytical method for metals and alloys, and inorganic materials.

8. Apex Smelting Company
Division of American Metal Climax, Inc.
2537 W. Taylor Street
Chicago 12, Illinois

Offers aluminum- and zinc-base standards.
(Primarily spectrochemical.)

9. Applied Research Laboratories, Inc.
Box 1710
Glendale 5, California

Offers copper-base and ceramic standards. Also supplies semiquantitative standards for spectrochemical analysis. (Primarily spectrochemical.)

10. Applied Science Laboratories, Inc.
State College, Pennsylvania

Offers phosphoglyceride standards and some pure branched-chain fatty acids.

11. Atlas Testing Laboratories, Inc.
1225 East 63rd Street
Los Angeles, California

Provides a limited number of stainless steel spectrochemical standards.

12. United States Atomic Energy Commission
New Brunswick Laboratory
Attn: C. J. Rodden, Director
P.O. Box 150
New Brunswick, New Jersey

Supplies a number of analyzed uranium ores, counting standards, uranium, thorium, and beryllium metal, metal products and oxide for chemical and spectrographic analysis.

13. Battelle Memorial Institute
Defense Materials Information Center
Columbus, Ohio

"Production and Availability of Some High-Purity Metals", Memorandum No. 76 (revision in press). Also available as PB No. 162226 for fifty cents from Office of Technical Services, U.S. Department of Commerce, Washington, D.C. 20234.

Lists both methods of preparation and availability of high-purity metals.

14. The British Drug House, Ltd.
B.D.H. Laboratory Chemical Division
Poole, England

(U.S. Distributor: The Ealing Corporation, 2225 Massachusetts Avenue, Cambridge, Massachusetts 02140)

Offers "Organic Analytical Standards" which comply with the specifications of the Society for Analytical Chemistry. [See The Analyst 87, 304-316 (1962)]

15. British Pharmacopoeia Commission
Attn: T. C. Denston, Secretary
General Medical Council Office
44 Hallam Street
London, W.1 England

"British Pharmacopoeia Commission's Authentic Specimens"

Lists reference standards of drugs, steroids, hormones, etc. The substances available are among those referred to by the Pharmacopoeia for infrared identification or limitation of steroids in certain corticosteroids.

16. Brookfield Engineering Laboratories, Inc.
Stoughton 85, Massachusetts

Lists standard viscosity liquids ranging from 10 to 100,000 centipoise.

17. Bundesanstalt für Materialprüfung
Berlin-Dahlem
Unter den Eichen 87
Berlin, Germany

Provides a limited number of high-purity copper standards for the globular-arc technique of spectrochemical analysis.

18. Bureau of Analysed Samples, Ltd.
Newham Hall
Middlesbrough
Yorkshire, England

"British Chemical Standards and Spectrographic Standards"

Offers a great variety of chemical and spectrochemical reference standards. Among these are carbon steels, low-alloy steels, mild steel, low-tungsten steel, cast iron, iron and steel, ferroalloys, magnesium-base alloys, lead-base alloys, tin-base alloys, copper-base alloys, nickel-base alloys, ores, slags, silica brick, fire brick, sillimanite. Benzoic acid for calorimetric and acidimetric standards, and pure metals for the calibration of pyrometers also are available.

19. Bureau of Naval Weapons -- Materials Advisory Board
Code RRMA-23
Washington, D.C.

Prepared unalloyed tungsten and one alloy each of Nb (FS-85), Ta (T-111), and Mo (TZM), for round robin testing by Department of Defense contractors. The results are expected to be published in appropriate reports. The materials are listed for information only and they are not generally available for further distribution.

20. Calorimetry Conference
Attn: D. D. Wagman
National Bureau of Standards
Washington, D.C. 20234

Supplies standard n-heptane and alumina for high and low temperature heat capacity calorimetry.

21. Canadian Association for Applied Spectroscopy
Copper and Copper Alloy Spectrographic Standards Committee
Mineral Science Division, Mines Branch
Department of Mines and Technical Surveys
555 Booth Street
Ottawa, Ontario, Canada

Offers copper-base standards. (Primarily spectrochemical.)

22. Canadian Association for Applied Spectroscopy
Nonmetallic Standards Committee
Attn: G. R. Webber
Department of Geological Sciences
McGill University
Montreal, Quebec, Canada

Offers analyzed samples of sulfide ore and syenite rock.

23. Centre National de la Recherche Scientifique
Centre de Recherches Petrographiques et Geochimiques
de l'Université de Nancy
B.P. 682
Nancy, France

Offers analyzed rock standard of alkali-calcium granite.

24. Dow Chemical Company
Magnesium Sales Department
Midland, Michigan

Supplies a variety of magnesium-base standards.
(Primarily spectrochemical.)

25. Eastman Organic Chemicals
Distillation Products Industries
Rochester 3, New York

"Liquids for Refractive Index Determination",
Eastman Information Bulletin I 16863.

Lists materials of known refractive index from
1.269 to 1.835.

26. Eastman Organic Chemicals
Distillation Products Industries
Rochester 3, New York

"Eastman Organic Chemicals"

Contains a listing of vitamins and related products
that are considered to be of high purity and are
intended solely for use as reference standards and
experimental work where a compound of known purity is
required.

27. Electronics and Alloys, Inc.
435 Victoria Terrace
Ridgefield, New Jersey

Provides standards for 17-7 and 17-4 PH stainless
steels. (Primarily spectrochemical.)

28. Enjay Company, Inc.
Attn: E. P. Meyer
15 West 55th Street
New York, New York 10020

Supplies primary knock-test isooctane reference
fuel.

29. Food and Drug Administration
Division of Antibiotics and Insulin Certification
Bureau of Scientific Standards and Evaluation
330 Independence Avenue, SW
Washington, D.C.

Offers a wide selection of official antibiotic standards.

30. United States Geological Survey
Attn: Francis J. Flanagan
Analytical Laboratories
Washington, D.C. 20234

Offers a chemically analyzed rock standard with several more in preparation.

31. Goldsmith Bros. Smelting and Refining Co.
1300 W. 59th Street
Chicago 36, Illinois

Provides a variety of lead-base spectrochemical standards.

32. Hilger and Watts, Ltd.
98 Pancras Way
Camden Road
London, N.W. 1, England

Lists several sets of semiquantitative rod samples designed primarily for the Spekter Steeloscope.

33. Hopkins and Williams, Ltd.
Chadwell Heath
Essex, England

Offers "Micro-analytical Standards" which comply with the specifications of the Society for Analytical Chemistry [See The Analyst 87, 304-316 (1962)].

34. Humphrey-Wilkerson Corporation
201 Devine Street
North Haven, Connecticut

Supplies primary diesel reference fuels, n-hexadecane and 2,2,4,4,6,8,8-heptamethylnonane.

35. Indium Corporation of America
1076 Lincoln Avenue
P.O. Box 269
Utica 4, New York

Provides a limited number of semiquantitative reference samples of indium metal. (Primarily spectrochemical.)

36. Institute of Gas Technology
Attn: Mr. Duane Kniebes
Illinois Institute of Technology
Chicago, Illinois

Supplies standard reference heating-value gas (gas-calorimeter standard).

37. International Nickel Company
Inco Nickel Alloys Department
Huntington, West Virginia

Offers nickel-base standards. (Primarily spectrochemical.)

38. Iowa State University
Ames, Iowa

"High Purity Materials Available from American Producers" by H. A. Wilhelm and R. E. McCarley. U.S. Atomic Energy Commission Rept. ISC-1029 (Revised). Available for \$1.00 from Office of Technical Services, U.S. Department of Commerce, Washington, D.C. 20234.

This bulletin is a compilation of the availability of high-purity materials. (Primarily inorganic.)

39. Jarrell-Ash Company
590 Lincoln Street
Waltham, Massachusetts 02154

Provides several standards for spectrographic analysis of AISI 300 series stainless steels.

40. Johnson, Matthey and Company, Ltd.
Hatton Garden
London, England

Offers aluminum-, copper- and lead-base standards. Also supplies semiquantitative standards for spectrochemical analysis. (Primarily spectrochemical.)

41. Laboratorium für Alterbestimmungen
Mineralogisch-petrographische Institut
Sahlstrasse 6
Bern, Switzerland

Offers two standard minerals (Biotite and Muscovite)
for K-Ar and Rb-Sr age determinations.

42. The Matheson Company, Inc.
P.O. Box 85
East Rutherford, New Jersey

"Compressed Gases and Fluid Controls"

Catalogue lists a wide selection of gases and
mixtures of gases.

43. Michigan State College
Attn: A. L. Kenworthy
Horticultural Dept.
East Lansing, Michigan

Provides several standards of tree leaves.
(Primarily for spectrochemical analysis.)

44. Morris P. Kirk and Son, Inc.
2717 South Indiana Street
Los Angeles 23, California

Supplies aluminum-, zinc-, lead- and tin-base
standards. (Primarily spectrochemical.)

45. National Bureau of Standards
Washington, D.C. 20234

"Isotope Abundance Ratios Reported for Reference
Standards Stocked by the National Bureau of Standards"
by Fred L. Mohler. NBS Technical Note 51. Available
for fifty cents from Office of Technical Services,
U.S. Department of Commerce, Washington, D.C. 20234.

Lists stock of reference samples of natural isotopic
abundance maintained at NBS along with results received
on measurements on these samples.

46. National Bureau of Standards
Washington, D.C. 20234

"Standard Materials Issued by the National Bureau of Standards". NBS Miscellaneous Publication 241. Available for thirty cents from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Lists a wide variety of materials for chemical and spectroscopic analysis in disc, rod, and powder form. Metallic standards include iron and steel, white cast iron, stainless steel, tool steel, high-temperature alloys, nickel oxide, titanium-base alloys, zirconium-base alloys, metallo-organic materials, gas-in-metal standards, radioactivity standards, magnesium-base alloys, lead-base alloys, cobalt-base alloys, nickel-base alloys, and steel-making alloys. Also listed are non-metallic materials such as ores, refractories, cement, clay, glasses, glass sand, phosphate rock, limestone, titanium oxide, silica brick, burned magnesite, portland cement, and silicon carbide. A variety of organic materials are also listed as standard reference substances. These include analytical standards (liquid-hydrocarbon blends, metallo-organic, and microchemical), pH standards, and temperature standards. Standard materials are also available, certified for acidimetry, calorimetry, density, oxidation and reduction, refractive index, saccharimetry and viscosity.

47. National Formulary Reference Standards
American Pharmaceutical Association
2215 Constitution Avenue, N.W.
Washington, D.C. 20007

"National Formulary XI Reference Standards"

Lists a series of standard drugs and pharmaceutical products.

48. National Institute of Hygienic Sciences
Attn: Dr. Kakuma Nagasawa
Department of Biological Chemistry and Reference Standards
Tamagawayoga-machi, Setagaya-ku
Tokyo-to, Japan

Supplies drugs and pharmaceuticals defined as Japanese Pharmaceutical Standards, and National Institute of Hygienic Sciences Standards. Also lists series of compounds certified for melting point standards.

49. National Spectrographic Laboratories, Inc.
6300 Euclid Avenue
Cleveland 3, Ohio

Offers diesel oil contaminant and metallo-organic compound standards. Also offers semiquantitative standards for spectrochemical analysis.

50. Oak Ridge National Laboratory
Research Materials Information Center
Oak Ridge, Tennessee

"RMIC Bulletin", U.S. Atomic Energy Commission
Rept. ORNL-RMIC-2.

51. Pechiney-Service, D.I./CA-M
23 Rue Balzac
Paris (8^e), France

Supplies a variety of aluminum-base standards.
(Primarily spectrochemical.)

52. Phillips Petroleum Company
Chemical Department
Special Products Division
Bartlesville, Oklahoma

"Phillips Hydrocarbons and Petro-sulfur Compounds"

Lists research grade hydrocarbons as primary reference standards, liquids for hydrometer standards, BTU grade methane for calorimeter standard, gaseous and/or liquid hydrocarbon mixtures, natural gas standard blends, primary knock-test fuels and flash-point check standard.

53. Schweizerische Arbeitsgemeinschaft für Steine und Erden
Attn: Prof. Dr. T. Hugi
Mineralogisch-petrographische Institut
Sahlstrasse 6
Bern, Switzerland

"Liste der Referenzproben der Chemischen Abteilung
der Technischen Stelle Holderbank der Bestimmung des
Mineral-bestandes."

Offers a wide variety of rocks and minerals:
feldspars, silicate minerals, amphiboles, pyroxenes,
chlorites and chrysolites, micas, hydrated micas,
candites, smektite, carbonates, hydrated oxide
minerals, calcium silicate and other portland cement
clinker materials, and others.

54. Smith & Underwood (Thorn Smith, Chemist)
Research Laboratory
1847 North Main Street
Royal Oak, Michigan

Provides a wide variety of analyzed samples.
(Primarily for student use in universities, colleges
and high schools.)

55. G. Frederick Smith Chemical Company
P.O. Box 23344
Columbus 23, Ohio

Offers analyzed samples of limestone and dolomite
for reference work.

56. Société Zinc et Alliages
32 Rue Collange
Lavallois-Perret
Seine, France

Offers a variety of zinc-base standards. (Primarily
spectrochemical.)

57. Spex Industries, Inc.
3880 Park Avenue
Metuchen, New Jersey

Provides a wide variety of semiquantitative
standards for spectrochemical analysis.

58. Trans-Sonics, Inc.
Dept. 18
Burlington, Massachusetts

Offers water triple-point thermometer cells.

59. U.S.P. Reference Standards
46 Park Avenue
New York, New York 10016

"U.S.P. Reference Standards"

Lists many U.S.P. Reference Standard drugs and pharmaceuticals and a series of standard melting point compounds.

60. World Health Organization
Attn: Mr. P. D. Blanc, Chief
Pharmaceutical Section
WHO Secretariat
Palais des Nations
Geneva, Switzerland

"WHO Centre for Authentic Chemical Substances",
WHO Chemicke 17, 381 (1963).

Lists 8 authentic substances (drugs etc.) and a series of materials for melting point standards.

61. Wieland Werke Ag.
Metallwerke
Ulm-Donau
Postfach 636
West Germany

Offers a variety of aluminum- and copper-base standards. (Primarily spectrochemical.)

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OTHER NBS PUBLICATIONS OF INTEREST

NBS Miscellaneous Publication 260-1, Preparation of NBS White Cast Iron Spectrochemical Standards, June 1964. 30 cents.*

NBS Miscellaneous Publication 260-2, Preparation of NBS Copper-Base Spectrochemical Standards, October 1964. 35 cents.*

NBS Miscellaneous Publication 241, Standard Materials Issued by the National Bureau of Standards: A Descriptive List with Prices, March 1962. 30 cents.* Up-to-date Supplementary Insert Sheets to Misc. Publ. 241 list new, renewal, out-of-stock, and discontinued standards. These sheets are available without charge directly from the Standard Sample Clerk, National Bureau of Standards, Washington, D.C. 20234.

NBS Miscellaneous Publication 250, Calibration and Test Services of the National Bureau of Standards, November 1963. 70 cents.*

NBS Monograph 54, Analytical Standards for Trace Elements in Petroleum Products, October 1962. 25 cents.*

NBS Technical Note 51, Isotope Abundance Ratios Reported for Reference Standards stocked by the National Bureau of Standards, May 1960. 50 cents. (Available from Office of Technical Services, U. S. Department of Commerce, Washington, D.C. 20234.)

* Send orders with remittance to: Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Remittances from foreign countries should include an additional one-fourth of the purchase price for postage.