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January 2023

SRM

NIST Standard Reference Materials®
2023 Catalog

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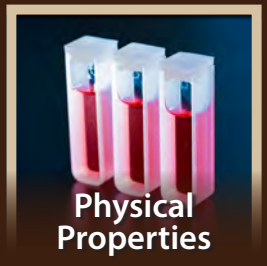

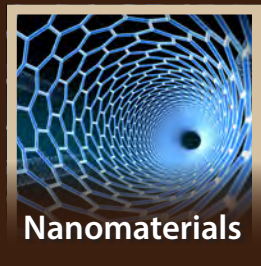

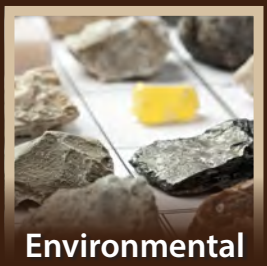

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January 2023

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NIST Standard Reference Materials® (SRMs) are used by industry, government, and academia to ensure the highest quality measurements. This catalog lists over 1200 individual reference materials produced and sold by NIST, each with carefully assigned values for chemical composition and physical properties.

SRMs find use in calibrating instruments and in assuring the long-term integrity of quality assurance programs. They are also key mechanisms for verifying important measurement results and in developing new measurement methods. SRMs provide users with tools to assist in establishing traceability of measurement results to the International System of Units (SI). Each SRM comes carefully packaged with documentation containing assigned values with stated uncertainties, and a material safety data sheet, if applicable.

For further information and prices, contact us at:

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PLEASE NOTE: The tables are presented to facilitate comparisons among a family of materials to help customers select the best SRM for their needs. For specific values and uncertainties, the certificate is the only official source.

The data given in this catalog is constantly being revised. For the most up-to-date information, please consult our websites at https://www.nist.gov/srm and https://shop.nist.gov/.

Chemical Composition

Physical Properties

Engineering Materials

Standard Reference Materials for Chemical Composition

Ferrous Metals

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Ferrous Metals

These SRMs are for checking optical emission and X-ray fluorescence spectrometric methods and for other methods of chemical analysis. They consist of steel alloys selected to provide a wide range of analytical values for elements. They are furnished as chips (small metal turnings), rods, disks, pins or powders from selected portions of commercial ingots. A "C" preceding the SRM number indicates a chill cast sample. Certificates are available on the website with information regarding specific alloy composition.

Plain Carbon Steels (chip form)

SRM	Description	Unit of Issue
8k	Bessemer Steel (Simulated), 0.1 % Carbon	150 g
12h	Basic Open-Hearth Steel, 0.4 % Carbon	150 g
13g	0.6 % Carbon Steel	150 g
14g	Carbon Steel (AISI 1078)	150 g
16f	Basic Open-Hearth Steel, 1 % Carbon	150 g
19h	Basic Electric Steel, 0.2 % Carbon	150 g
20g	AISI 1045 Steel	150 g
152a	Basic Open-Hearth Steel, 0.5 % Carbon (Tin Bearing)	150 g
178	0.4C Basic Oxygen Furnace Steel	150 g
368	Carbon Steel (AISI 1211)	150 g

See Table 101.1 on the website for more information.

Special Low Alloy Steels (chip and pin forms)

SRM	Description	Unit of Issue
361	AISI 4340 Steel (chip form)	150 g
363	Chromium-Vanadium Steel (Modified) (chip form)	150 g
2160	Low-Alloy Steel (pin form)	200 g
2161	Low Alloy Steel (chip form)	150 g
2162	Low Alloy Steel (chip form)	150 g
2163	Low Alloy Steel (chip form)	150 g
2164	Low Alloy Steel (chip form)	150 g
2165	Low Alloy Steel (chip form)	150 g
2166	Low Alloy Steel (chip form)	150 g
2167	Low Alloy Steel (chip form)	150 g
2168	High-Purity Iron (chip form)	150 g

See Table 101.3 on the website for more information.

Low Alloy Steels (chip form)

SRM	Description	Unit of Issue
30f	Cr-V Steel (SAE 6150)	150 g
32e	Carbon Low Alloy Steel (SAE 3140)	150 g
33e	Nickel Steel	150 g
72g	Low Alloy Steel (AISI 4130)	150 g
100b	Manganese Steel	150 g
125b	LA Steel, High Silicon	100 g
129c	LA Steel, High Sulfur (SAE 112)	150 g
131h	Refined Cast Iron	100 g
139b	Chromium-Nickel-Molybdenum Steel	150 g
155	Chromium-Tungsten Steel	150 g
163	Chromium Steel	100 g
179	LA Steel, High Silicon	150 g
291	Cr-Mo Steel (ASTM A-213)	150 g
293	Cr-Ni-Mo Steel (AISI 8620)	150 g
2171	LA Steel, (HSLA 100)	150 g

See Table 101.2 on the website for more information.

Ferrous Metals

Low Alloy Steels (disk and rod forms)

SRM	Description	Unit of Issue
663	Chromium-Vanadium Steel (Modified)	5 rods
1134	Low-Alloy High-Silicon Steel	disk
1135	LA Steel, High Silicon	disk
1218	LA Steel, High Silicon	disk
1224	LA Steel, Carbon (AISI 1078)	disk
1225	LA Steel (AISI 4130)	disk
1226	LA Steel	disk
1227	LA Steel, Basic Open Hearth, 1 % C	disk
1228	LA Steel, 0.1 % C	disk
1264a	LA Steel, High Carbon (Modified)	disk
1265a	Electrolytic Iron	disk
1269	Line Pipe (AISI 1526 Modified)	disk
1270	LA Steel, Cr-Mo (A336) (F-22)	disk
1271	LA Steel (HSLA-100)	disk
C1285	LA Steel (A242) (Modified)	disk
1286	Low Alloy Steel (HY 80)	disk
1761a	Low Alloy Steel	disk
1762b	Low Alloy Steel	disk
1763b	Low Alloy Steel	disk
1764a	Low Alloy Steel	disk
1765	Low Alloy Steel	disk
1766	Low Alloy Steel	disk
1767	Low Alloy Steel	disk
1768	High-Purity Iron	disk

See Table 101.8 on the website for more information.

High Alloy Steels (chip form)

SRM	Description	Unit of Issue
126c	High-Nickel Steel (Nominal Mass Fraction 36 % Ni)	150 g
344	15 Chromium-7 Nickel Steel (Mo Precipitation Hardening)	150 g
345b	Fe-Cr-Ni Alloy UNS J92180	150 g
346a	Valve Steel	150 g
862	High-Temperature Alloy L 605	100 g
868	High-Temperature Alloy (Fe-Ni-Co)	100 g

See Table 101.4 on the website for more information.

High-Temperature Alloys (chip and disk forms)

SRM	Description	Unit of Issue
866	Incoloy 800 (chip form)	100 g
867	Ni-Fe-Cr Alloy UNS N08825 (chip form)	100 g
1230	High-Temperature Alloy A286	disk
1246	Incoloy 800	disk
1247	Ni-Fe-Cr Alloy UNS N08825	disk
1250	High-Temperature Alloy Fe-Ni-Co	disk
C2400	Fe-Cr-Ni Alloy UNS J92180	disk

See Table 101.9 on the website for more information.

Ferrous Metals

Stainless Steels (chip and powder form)

SRM	Description	Unit of Issue
101g	18 Cr-10 Ni Steel (AISI 304L) (powder form)	100 g
123c	Stainless Steel, Cr-Ni-Nb (AISI 348) (chip form)	150 g
133b	Chromium-Molybdenum Steel (chip form)	150 g
160b	Stainless Steel, Cr 18-Ni 12-Mo 2 (AISI 316) (chip form)	150 g
166c	Stainless Steel, Low-Carbon (AISI 316L) (chip form)	100 g
339	17 Chromium-9 Nickel-0.2 Selenium Steel (chip form)	150 g
893	Stainless Steel (SAE 405) (chip form)	150 g
895	Stainless Steel (SAE 201) (chip form)	150 g

See Table 101.6 on the website for more information.

Stainless Steels (disk form)

SRM	Description	Unit of Issue
C1151a	Stainless Steel, 23Cr-7Ni	disk
C1152a	Stainless Steel, 18Cr-11Ni	disk
C1153a	Stainless Steel, 17Cr-9Ni	disk
C1154a	Stainless Steel, 19Cr-13Ni	disk
1155a	Stainless Steel, Cr 18 Ni 12 Mo 2 (AISI 316)	disk
1171	Stainless Steel, Cr 17-Ni 11-Ti 0.3 (AISI 321)	disk
1172	Stainless Steel, Cr 17-Ni 11-Nb 0.6 (AISI 348)	disk
1219	Stainless Steel, Cr16 - Ni2 (AISI 431) (disk form)	disk
1223	Chromium Steel	disk
1295	Stainless Steel (SAE 405)	disk
C1296	Stainless Steel	disk
1297	Stainless Steel (SAE 201)	disk

See Table 101.10 on the website for more information.

Tool Steels (chip form)

SRM	Description	Unit of Issue
50c	Tungsten-Chromium-Vanadium Steel	150 g
132b	Tool Steel (AISI M2)	150 g
134a	Molybdenum-Tungsten-Chromium-Vanadium Steel	150 g

See Table 101.7 on the website for more information.

Steelmaking Alloys (powder form)

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

SRM	Description	Unit of Issue
57b	Silicon Metal	40 g
58a	Ferrosilicon (73 % Si Regular Grade)	75 g
59a	Ferrosilicon Grade E1	50 g
64c	Ferrochromium High-Carbon	100 g
68c	High-Carbon Ferromanganese	100 g
90	Ferrophosphorus	75 g
195	Ferrosilicon (75 % Si-High Purity Grade)	75 g
196	Ferrochromium Low-Carbon	100 g
689	Ferrochromium Silicon	100 g

See Table 101.12 on the website for more information.

Ferrous Metals

Specialty Steels (disk form)

SRM	Description	Unit of Issue
1157	Tool Steel (AISI M2)	disk
1158	High-Nickel Steel (Nominal Mass Fraction 36 % Ni)	disk
1772	Tool Steel (S-7)	disk

See Table 101.11 on the website for more information.

Gases in Ferrous Metals (rod and disk forms)

These SRMs are for determining oxygen and nitrogen by vacuum fusion, inert gas fusion, and neutron activation methods.

SRM	Description	Unit of Issue
1089†	Steels, Set (consists of SRMs 1095, 1096, 1097, 1098 and 1099)	5 rods
1090	Oxygen in Ingot Iron	rod
1091a	Oxygen in Stainless Steel (AISI 431)	rod
1093	Oxygen in Valve Steel	rod
1094	Oxygen in Maraging Steel	rod
1755	Nitrogen in Low Alloy Steel	disk

† These SRMs are sold only as a set designated SRM 1089.

See Table 101.5 on the website for more information.

Cast Steels, White Cast Irons, and Ductile Irons (disk and block forms)

These SRMs are for analysis of cast steels and cast irons by rapid instrumental methods.

SRM	Description	Unit of Issue
C1137a	White Cast Iron	disk
1138a	Cast Steel Standard	block
C1145a	White Cast Iron	disk
1173	Ni-Cr-Mo-V Steel	disk
C1173	Cast Steel 3	disk
C1290	High-Alloy White Cast Iron (HC-250+V)	disk
C1291	High-Alloy White Cast Iron (Ni-Hard, Type I)	disk
C1292	High-Alloy White Cast Iron I (Ni-Hard, Type IV)	disk
C2424	Ductile Iron C	disk

See Table 101.14 on the website for more information.

Cast Irons (chip form)

SRM	Description	Unit of Issue
4l	Cast Iron	150 g
5m	Cast Iron	150 g
6g	Cast Iron	150 g
107c	Cast Iron (Ni-Cr-Mo)	150 g
115a	Copper-Nickel-Chromium Cast Iron	150 g
122i	Cast Iron	150 g
334	Gray Cast Iron	150 g

See Table 101.13 on the website for more information.

New SRMs/RMs

Check out our SRM website (www.nist.gov/srm) for news regarding SRMs/RMs.

This includes information about newly released SRMs, RMs, Renewals and Revisions. It also has links to available resources for questions or ordering SRMs.

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Standard Reference Materials for Chemical Composition

Nonferrous Metals

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Nonferrous Metals

These SRMs are intended for optical emission, X-ray fluorescence spectrometric methods, and for other methods of chemical analysis. They consist of alloys selected to provide a wide range of analytical values for elements. They are furnished as chips (small metal turnings), rods, disks, pins or powders from selected portions of commercial ingots. A "C" preceding the SRM number indicates a chill cast sample. Certificates are available on the website with information regarding specific alloy composition.

Aluminum Base Alloys (chip and disk forms)

These SRMs are intended for analyses of aluminum alloys by chemical and instrumental methods. SRM 2426 is a hot-dip coating alloy for sheet steel applications.

SRM	Description	Unit of Issue
87a	Silicon-Aluminum Alloy (chip form)	75 g
853a	Aluminum Alloy 3004 (chip form)	40 g
854a	Aluminum Alloy 5182 (chip form)	40 g
855a	Aluminum Casting Alloy 356 (chip form)	30 g
856a	Aluminum Casting Alloy 380 (chip form)	30 g
858	Aluminum Alloy 6011 (chip form)	35 g
1240c	Aluminum Alloy 3004	disk
1241c	Aluminum Alloy 5182	disk
1255b	Aluminum Alloy 356	disk
1256b	Aluminum Alloy 380	disk
1258-I	Aluminum Alloy 6011 (Modified)	disk
1259	Aluminum Alloy 7075	disk
2426	55 % Aluminum-Zinc Alloy	40 g

See Table 102.1 on the website for more information.

Cobalt Base Alloys (chip and disk forms)

SRM	Description	Unit of Issue
862	High-Temperature Alloy L 605 (chip form)	100 g
1242	High Temperature Alloy L 605	disk
1775	Refractory Alloy MP-35-N	disk
2175	Refractory Alloy MP-35-N (chip form)	150 g

See Table 102.2 on the website for more information.

Copper Base Alloys (chip, granule, and rod forms)

SRM	Description	Unit of Issue
158a	Silicon Bronze (chip form)	150 g
458	Beryllium-Copper (17510) (chip form)	50 g
459	Beryllium-Copper (17200) (chip form)	50 g
460	Beryllium-Copper Alloy (chip form)	50 g
871	Phosphor Bronze (CDA 521) (chip form)	100 g
872	Phosphor Bronze (CDA 544) (chip form)	100 g
874	Cupro-Nickel, 10 % (CDA 706) "HIGH-PURITY" (chip form)	100 g
875	Cupro-Nickel, 10 % (CDA 706) "DOPED" (chip form)	100 g
880	Nickel Silver (CDA 770) (granular form)	100 g
1034	Unalloyed Copper	rod
1035	Leaded-Tin Bronze Alloy (chip form)	50 g

See Table 102.3 on the website for more information.

Copper "Benchmark" (block, chip, and rod forms)

SRMs with a "C" prefix are chill-cast blocks approximately 32 mm square and 19 mm thick.

SRM	Description	Unit of Issue
399	Unalloyed Copper - Cu VI (chip form)	50 g
454	Unalloyed Copper XI (chip form)	35 g
457	Unalloyed Copper IV (solid)	rod
494	Unalloyed Copper I (solid)	rod
495	Unalloyed Copper II (solid)	rod
498	Unalloyed Copper V (solid)	rod
500	Unalloyed Copper - Cu VII	rod
C1251a	Phosphorus Deoxidized Copper - Cu VIII	block
C1252a	Phosphorus Deoxidized Copper - Cu IX	block

See Table 102.5 on the website for more information.

Nonferrous Metals

Copper Base Alloys (block and disk forms)

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

SRM	Description	Unit of Issue
1107	Naval Brass UNS 46400	disk
1110	Red Brass B	disk
1111	Red Brass Standard	disk
1112	Gilding Metal	disk
1113	Gilding Metal	disk
1114	Gilding Metal	disk
1115	Commercial Bronze Standard for Optical Emission and X-ray Spectroscopic Analysis	disk
C1115	Commercial Bronze A	block
1116	Commercial Bronze Standard for Optical Emission and X-ray Spectroscopic Analysis	disk
1117	Commercial Bronze Standard for Optical Emission and X-ray Spectroscopic Analysis	disk
C1117	Commercial Bronze C	block
1124	Free Cutting Brass (UNS C36000)	disk
C1251a	Phosphorus Deoxidized Copper - Cu VIII	block
C1252a	Phosphorus Deoxidized Copper - Cu IX	block
C1253a	Phosphorus Deoxidized Copper - Cu X	block

See Table 102.4 on the website for more information.

Lead-Base Alloys (disk and powder forms)

SRMs in the form of disks are approximately 50 mm in diameter and 16 mm thick. They are intended for use with optical emission spectrometric methods of analysis.

SRM	Description	Unit of Issue
53e	Lead-Base Bearing Metal (84Pb-10Sb-6Sn)	150 g
127b	Solder (40Sn—60Pb)	150 g
1129	Solder (63Sn—37Pb)	200 g
1131	Solder (40Sn—60Pb)	disk
1132	Lead-Base Bearing Metal (84Pb-10Sb-6Sn)	disk
C2415a	Battery Lead (UNS 52770)	disk
C2416	Bullet Lead	disk
C2417	Lead-Base Alloy	disk
C2418	High-Purity Lead	disk

See Table 102.10 on the website for more information.

Nickel Base Alloys (chip, disk, and granule forms)

SRM	Description	Unit of Issue
349a	Waspaloy (chip form)	150 g
861	Nickel-based Superalloy PWA 1484 (chip form)	50 g
864	Nickel Alloy UNS N06600 (chip form)	100 g
865	Inconel 625 (chip form)	150 g
882	Nickel-Copper Alloy (65Ni-31Cu-3Al) (chip form)	100 g
897	Tracealloy A (chip form)	35 g
899	Tracealloy C (chip form)	35 g
1159	Electronic and Magnetic Alloy Standard	disk
1160	Electronic and Magnetic Alloy Standard	disk
1243	Ni-Cr-Co Alloy UNS N07001	disk
1244	Nickel Alloy UNS N06600	disk
C1248	Nickel-Copper Alloy	disk
1249	Ni-Cr-Fe-Nb-Mo Alloy UNS N077178	disk
1775	Refractory Alloy MP-35-N	disk
2175	Refractory Alloy MP-35-N (chip form)	150 g

See Table 102.12 on the website for more information.

Nonferrous Metals

Tin Base Alloys (powder, block, and disk forms)

SRM	Description	Unit of Issue
54d	Bearing Metal (Tin Base) (powder)	75 g
1727	Anode Tin	block
1728	Tin Alloy (Sn-3Cu-0.5Ag)	disk
1729	Tin Alloy (97Sn-3Pb)	disk

See Table 102.15 on the website for more information.

Titanium Base Alloys (chip and disk forms)

SRM	Description	Unit of Issue
173c	Titanium Alloy UNS R56400 (chip form)	50 g
641	Spectroscopic Titanium-Base Standards Titanium Alloy, 8 Mn (A)	disk
643	Spectroscopic Titanium-Base Standards Titanium Alloy, 8 Mn (C)	disk
647	Titanium Alloy, Al-Mo-Sn-Zr (chip form)	50 g
648	Titanium-Base Alloy 5Al-2Sn-2Zr-4Cr-4Mo (chip form)	50 g
649	Titanium-Base Alloy (15V-3Al-3Cr-3Sn) (chip form)	50 g
654b	Titanium Alloy, Al-V	disk
1128	Titanium-Base Alloy (15V-3Al-3Cr-3Sn)	disk
2061	TiAl(NbW) Alloy for Microanalysis	cube
2431	Titanium-Base Alloy (6Al-2Sn-4Zr-6Mo) (chip form)	50 g
2432	Titanium-Base Alloy (10V-2Fe-3Al) (chip form)	50 g
2433	Titanium-Base Alloy (8Al-1Mo-1V) (chip form)	50 g
2452	Hydrogen In Titanium Alloy (Nominal Mass Fraction 60 mg/kg H) (chip form)	10 g
2453a	Hydrogen In Titanium Alloy (Nominal Mass Fraction 125 mg/kg H) (pin form)	10 g
2454a	Hydrogen In Titanium Alloy (Nominal Mass Fraction 200 mg/kg H) (chip form)	10 g

See Table 102.16 on the website for more information.

Zinc Base Alloys (block, chip, and disk forms)

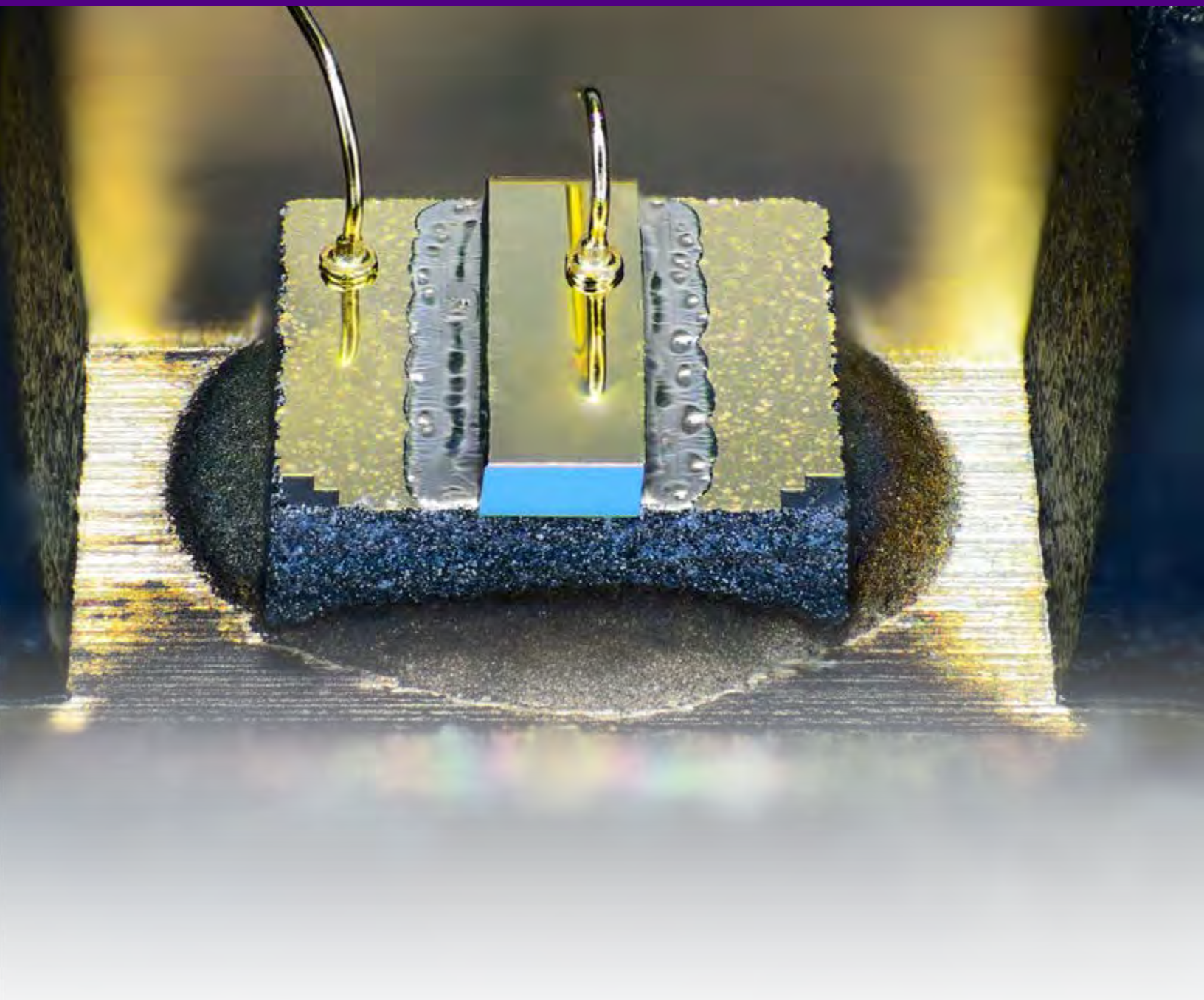
SRM 1738 through 1741 and SRM 2139 are specially prepared alloys primarily intended for use with spectrometric methods of analysis.

SRM	Description	Unit of Issue
625	Spectrographic Zinc-Base Die-Casting Alloy A	block
626	Spectrographic Zinc-Base Die-Casting Alloy B	block
627	Spectrographic Zinc-Base Die-Casting Alloy C	block
628	Spectrographic Zinc-Base Die-Casting Alloy D	block
629	Spectrographic Zinc-Base Die-Casting Alloy E	block
630	Spectrographic Zinc-Base Die-Casting Alloy F	block
631	Spectrographic Zinc Spelter (Modified)	block
1738	Zinc-Aluminum Alloy	disk
1740	Zinc-Aluminum Alloy	disk
1741	Zinc-Aluminum Alloy	disk
2139	Zinc-Aluminum Alloy (chip form)	100 g

See Table 102.17 on the website for more information.

Standard Reference Materials for Chemical Composition

Microanalysis



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Microanalysis

Metals (rod, wire, disk, and cube forms)

SRM	Description	Unit of Issue
480	Tungsten 20 % - Molybdenum Alloy Electron Microprobe Standard	disk
481	Gold-Silver Wires for Microprobe Analysis	set (6)
482	Gold-Copper Wires for Microprobe Analysis	set (6)
2061	TiAl(NbW) Alloy for Microanalysis	cube

See Table 103.1 on the website for more information.

Synthetic Glass for Microanalysis (rod and microsphere forms)

The glass SRM listed below is suitable for microanalysis, such as electron microprobe analysis (EMPA), secondary ion mass spectrometry (SIMS), and other methods that require high homogeneity.

SRM	Description	Unit of Issue
2066	K-411 Glass Microspheres	50 mg

See Table 103.2 on the website for more information.

Semiconductor Thin Film for the Composition of Thin Films

SRMs 2841 and 2842 are intended for use as a reference standard for analytical methods that measure the composition of thin films, such as electron microprobe analysis (EMPA), photoluminesence (PL), auger electron spectroscopy (AES), and X-ray photoelectron spectroscopy (XPS). The SRM consists of an epitaxial layer of $AL_xGa_{1-x}As$, 3µm thick, on a 1 cm x 1 cm square of GaAs substrate. The semiconductor chip is attached with carbon tape to a 2.5 cm diameter stainless steel disk for labeling and handling.

SRM	Description	Unit of Issue
2841	Semiconductor Thin Film: $Al_xGa_{1-x}As$ Epitaxial Layers (Al mole fraction *x* near 0.20)	disk
2842	Semiconductor Thin Film: $Al_xGa_{1-x}As$ Epitaxial Layers (Al mole fraction *x* near 0.30)	disk

See Table 103.4 on the website for more information.

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Standard Reference Materials for Chemical Composition

High-Purity Materials

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High-Purity Materials

High-Purity Metals (solid forms)

These SRMs are for determining impurity elements in high purity metals.

SRM	Description	Unit of Issue
682	High-Purity Zinc	block
683	Zinc Metal	block
728	Intermediate-Purity Zinc (pellet form)	450 g
885	Refined Copper (pin form)	200 g

See Table 104.1 on the website for more information.

Stoichiometry (powder form)

These SRMs are 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 % (Purity 99.98+ %).

Working Standard:
A commercially available substance of purity 100 % ± 0.05 % (Purity 99. 95+ %).

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

SRM	Description	Unit of Issue
17g	Sucrose Optical Rotation	60 g
84l	Potassium Hydrogen Phthalate	60 g
136f	Potassium Dichromate, (Oxidimetric Standard)	60 g
350c	Benzoic Acid (Acidimetric Standard)	30 g
351a	Sodium Carbonate (Acidimetric Standard)	50 g
723e	Tris(hydroxymethyl)aminomethane $(HOCH_2)_3CNH_2$ Acidimetric Standard	50 g
917c	D-Glucose (Dextrose)	50 g
973	Boric Acid Acidimetric Standard	100 g
999c	Potassium Chloride Primary Standard	30 g
8040a	Sodium Oxalate (Reductometric Standard)	60 g

See Table 104.3 on the website for more information.

Microchemistry (powder form)

SRM	Description	Unit of Issue
141e	Acetanilide	2 g
143d	Cystine (L-Cystine)	2 g
2141	Urea	2 g
2143	*p*-Fluorobenzoic Acid	2 g
2144	*m*-Chlorobenzoic Acid	2 g

See Table 104.4 on the website for more information.

Spectrometry, Single-Element Standard Solutions

These SRMs are intended as the primary calibration standards for the quantitative determinations of a single element, typically using inductively coupled plasma optical emission spectrometry and/or inductively coupled plasma mass spectrometry. They can also be used in conjunction with any other analytical technique or procedure where standard solutions are required. The SRM is a single-element solution of 50 mL with a nominal concentration of 10 mg/g and is provided as either a single high-density polyethylene bottle or in 5 x 10 mL borosilicate glass ampoules. Solutions may contain a nominal amount of acid, such as 10 % nitric acid or 10 % hydrochloric acid.

SRM	Description	Unit of Issue
3030	Monomethylarsonic Acid Standard Solution	2 x 5 mL
3031	Dimethylarsinic Acid Standard Solution	2 x 5 mL
3033	Arsenobetaine Standard Solution	2 x 5 mL
3034	Arsenocholine Standard Solution	2 x 5 mL
3036	Arsenic Acid (AsV) Standard Solution	2 x 10 mL
3037	Arsenous Acid (AsIII) Standard Solution	2 x 10 mL
3101a	Aluminum (Al) Standard Solution	5 x 10 mL
3102a	Antimony (Sb) Standard Solution	50 mL
3103a	Arsenic (As) Standard Solution	5 x 10 mL
3104a	Barium (Ba) Standard Solution	50 mL
3105a	Beryllium (Be) Standard Solution	5 x 10 mL
3106	Bismuth (Bi) Standard Solution	5 x 10 mL
3107	Boron (B) Standard Solution	50 mL
3108	Cadmium (Cd) Standard Solution	5 x 10 mL
3109a	Calcium (Ca) Standard Solution	5 x 10 mL
3110	Cerium (Ce) Standard Solution	5 x 10 mL

High-Purity Materials

SRM	Description	Unit of Issue
3111a	Cesium (Cs) Standard Solution	5 x 10 mL
3112a	Chromium (Cr) Standard Solution	5 x 10 mL
3113	Cobalt (Co) Standard Solution	5 x 10 mL
3114	Copper (Cu) Standard Solution	50 mL
3115a	Dysprosium (Dy) Standard Solution	5 x 10 mL
3116a	Erbium (Er) Standard Solution	5 x 10 mL
3117a	Europium (Eu) Standard Solution	5 x 10 mL
3118a	Gadolinium (Gd) Standard Solution	5 x 10 mL
3119a	Gallium (Ga) Standard Solution	5 x 10 mL
3120a	Germanium (Ge) Standard Solution	50 mL
3121	Gold (Au) Standard Solution	5 x 10 mL
3122	Hafnium (Hf) Standard Solution	50 mL
3123a	Holmium (Ho) Standard Solution	5 x 10 mL
3124a	Indium (In) Standard Solution	5 x 10 mL
3126a	Iron (Fe) Standard Solution	5 x 10 mL
3127a	Lanthanum (La) Standard Solution	5 x 10 mL
3128	Lead (Pb) Standard Solution	5 x 10 mL
3129a	Lithium (Li) Standard Solution	5 x 10 mL
3130a	Lutetium (Lu) Standard Solution	5 x 10 mL
3131a	Magnesium (Mg) Standard Solution	5 x 10 mL
3132	Manganese (Mn) Standard Solution	5 x 10 mL
3133	Mercury (Hg) Standard Solution	5 x 10 mL
3134	Molybdenum (Mo) Standard Solution	5 x 10 mL
3135a	Neodymium (Nd) Standard Solution	5 x 10 mL
3136	Nickel (Ni) Standard Solution	5 x 10 mL
3137	Niobium (Nb) Standard Solution	50 mL

SRM	Description	Unit of Issue
3138	Palladium (Pd) Standard Solution	5 x 10 mL
3139a	Phosphorus (P) Standard Solution	5 x 10 mL
3140	Platinum (Pt) Standard Solution	5 x 10 mL
3141a	Potassium (K) Standard Solution	5 x 10 mL
3142a	Praseodymium (Pr) Standard Solution	5 x 10 mL
3143	Rhenium (Re) Standard Solution	5 x 10 mL
3144	Rhodium (Rh) Standard Solution	5 x 10 mL
3145a	Rubidium (Rb) Standard Solution	5 x 10 mL
3147a	Samarium (Sm) Standard Solution	5 x 10 mL
3148a	Scandium (Sc) Standard Solution	5 x 10 mL
3149	Selenium (Se) Standard Solution	5 x 10 mL
3150	Silicon (Si) Standard Solution	50 mL
3151	Silver (Ag) Standard Solution	5 x 10 mL
3152a	Sodium (Na) Standard Solution	50 mL
3153a	Strontium (Sr) Standard Solution	5 x 10 mL
3154	Sulfur (S) Standard Solution	5 x 10 mL
3155	Tantalum (Ta) Standard Solution	50 mL
3156	Tellurium (Te) Standard Solution	5 x 10 mL
3157a	Terbium (Tb) Standard Solution	5 x 10 ml
3158	Thallium (Tl) Standard Solution	5 x 10 mL
3160a	Thulium (Tm) Standard Solution	5 x 10 mL
3161a	Tin (Sn) Standard Solution	50 mL
3162a	Titanium (Ti) Standard Solution	50 mL
3163	Tungsten (W) Standard Solution	50 mL
3164	Uranium (U) Standard Solution (Radioactive)	5 x 10 mL
3165	Vanadium (V) Standard Solution	5 x 10 mL
3166a	Ytterbium (Yb) Standard Solution	5 x 10 mL
3167a	Yttrium (Y) Standard Solution	5 x 10 mL
3168a	Zinc (Zn) Standard Solution	5 x 10 mL
3169	Zirconium (Zr) Standard Solution	50 mL
3177	Mercuric Chloride (H_gCl_2) Standard Solution	5 x 10 mL

See Table 104.5 on the website for more information.

High-Purity Materials

Arsenic Species Standard Solutions

These SRMs are intended as calibration standards to provide SI traceability in the measurement of total arsenic and arsenic species in food and clinical samples.

SRM	Description	Unit of Issue
3030	Monomethylarsonic Acid Standard Solution	2 x 5 mL
3031	Dimethylarsinic Acid Standard Solution	2 x 5 mL
3033	Arsenobetaine Standard Solution	2 x 5 mL
3034	Arsenocholine Standard Solution	2 x 5 mL
3036	Arsenic Acid (AsV) Standard Solution	2 x 10 mL
3037	Arsenous Acid (AsIII) Standard Solution	2 x 10 mL
3103a	Arsenic (As) Standard Solution	5 x 10 mL

See Table 104.6 on the website for more information.

Anion Chromatography (solution form)

These SRMs are single component solutions prepared gravimetrically for use in anion chromatography or any other technique that requires aqueous standard solutions for calibration or control materials.

SRM	Description	Unit of Issue
3180	Iodide Anion (I^-) Standard Solution	5 x 5 mL
3181	Sulfate Anion (SO_4^{2-}) Standard Solution	5 x 10 mL
3182	Chloride Anion (Cl^-) Standard Solution	5 x 10 mL
3183	Fluoride Anion (F^-) Standard Solution	50 mL
3184	Bromide Anion (Br^-) Standard Solution	5 x 10 mL
3185	Nitrate Anion (NO_3^-) Standard Solution	5 x 10 mL
3186	Phosphate Anion (PO_4^{3-}) Standard Solution	5 x 10 mL

See Table 104.8 on the website for more information.

Stable Isotopic Materials (solid and solution forms)

The isotopic composition of these SRMs has been determined by mass spectrometry. For light stable isotopic materials value assigned on an artifact based scale, see Light Stable Isotopic Materials.

SRM	Description	Unit of Issue
951a	Boric Acid Isotopic Standard	10 g
952	Enriched Boric Acid Standard	0.25 g
973	Boric Acid Acidimetric Standard	100 g
975a	Isotopic Standard for Chlorine	0.25 g
977	Isotopic Standard for Bromine	0.25 g
978a	Assay-Isotopic Standard for Silver	0.25 g
979	Chromium Isotopic Standard	0.25 g
980	Isotopic Standard for Magnesium	0.25 g
981	Common Lead Isotopic Standard (wire)	1 g
982	Equal-Atom Lead Isotopic Standard (wire)	1 g
983	Radiogenic Lead Isotopic Standard (wire)	1 g
984	Rubidium Chloride	0.25 g
986	Isotopic Standard for Nickel	0.5 g
987	Strontium Carbonate Isotopic Standard	1 g
994	Isotopic Standard for Gallium	0.25 g
997	Thallium Isotopic Standard	0.25 g
3230	Iodine-129 Isotopic Standard (Low Level)	5 x 5 mL
3231	Iodine-129 Isotopic Standard (High Level)	5 x 5 mL
8599	Henderson Molybdenite	10 g

See Table 104.9 on the website for more information.

Light Stable Isotopic Materials (gas, liquid, and solid forms)

These RMs are for calibration of isotope-ratio mass spectrometers and associated sample preparation systems. They are distributed by NIST on behalf of the International Atomic Energy Agency (IAEA). At the request of the IAEA, quantities of these materials are limited to one unit of each RM per laboratory every 3 years. The isotopic compositions are given in parts per thousand difference from isotope-ratio standards - Hydrogen and Oxygen: Vienna Standard Mean Ocean Water (VSMOW), Carbon: Vienna PeeDee Belemnite (VPDB), Nitrogen: atmospheric N_2 (Air), Silicon: NBS28 Silica Sand (optical), and Sulfur: Vienna Canyon Diablo Troilite (VCDT). RM 8545 (LSVEC) is also expressed as an absolute isotopic ratio.

SRM	Description	Unit of Issue
8301	Boron Isotopes in Marine Carbonate (Simulated Coral and Foraminifera Solutions)	6 x 4 mL
8529	IAEA-S-3 (Sulfur Isotopes in Silver Sulfide)	1 x 0.5 g
8535a	VSMOW2 Vienna Standard Mean Ocean Water (Hydrogen and Oxyen Isotopes in Water)	20 mL
8536	GISP-Water	20 mL
8537	SLAP-Water Light Stable Isotopic Standard	20 mL
8539	NBS22 Oil (Carbon and Hydrogen Isotopes in Oil)	1 mL
8540	IAEA-CH-7 (Carbon and Hydrogen Isotopes in Polyethylene Foil)	3.5 g
8541	USGS24 Graphite (Carbon Isotopes in Graphite)	0.8 g
8542	IAEA-CH-6 Sucrose (Carbon Isotopes in Sucrose)	1 g
8544	NBS 19 Limestone (Carbon and Oxygen Isotopes in Carbonate)	0.4 g
8545	LSVEC (Carbon, Oxygen, and Lithium Isotopes in Lithium Carbonate)	0.4 g
8546	NBS28 (Silicon and Oxygen Isotopes in Silica Sand)	0.4 g
8547	IAEA-N-1 (Nitrogen Isotopes in Ammonium Sulfate)	0.4 g
8548	IAEA-N-2 (Nitrogen Isotopes in Ammonium Sulfate)	0.4 g
8550	USGS25 (Nitrogen Isotopes in Ammonium Sulfate)	0.5 g
8551	USGS26 (Nitrogen Isotopes i n Ammonium Sulfate)	0.5 g
8552	NSVEC (Nitrogen Isotopes in Gaseous Nitrogen)	300 µmol
8553	IAEA-S-4 (Soufre De Lacq) (Sulfur Isotopes in Elemental Sulfur)	0.5 g
8554	IAEA-S-1 (Sulfur Isotopes in Silver Sulfide)	0.5 g
8555	IAEA-S-2 (Sulfur Isotopes in Silver Sulfide)	0.5 g
8557	NBS127 (Sulfur and Oxygen Isotopes in Barium Sulfate)	0.5 g
8558	USGS32 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
8562	CO_2-^{13}C-enriched, Paleomarine Origin (Carbon Dioxide)	set (2)
8563	CO_2-^{13}C-depleted, Petrochemical Origin (Carbon Dioxide)	set (2)
8564	CO_2-Biogenic, Modern Biomass Origin (Carbon Dioxide)	set (2)
8568	USGS34 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
8569	USGS35 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
8574	L-glutamic Acid USGS41 (Heavy Carbon and Nitrogen Isotopes in L-glutamic Acid)	0.5 g

See Table 104.10 on the website for more information.

NIST 2023 SRM EXHIBIT SCHEDULE

March 18-22, 2023
Pittcon Conference and Exposition
Philadelphia, PA

July 23–27, 2023
AACC Annual Scientific Meeting & Clinical Lab Exposition
Anaheim, CA

August 25-30, 2023
AOAC 137th Annual Meeting and Exposition
New Orleans, LA

Standard Reference Materials for Chemical Composition

Health & Industrial Hygiene

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Clinical Laboratory Materials (gas, liquid, and solid forms)

The following SRMs (Table 105.1) are intended for validating analytical methods used in clinical and pathology laboratories. Additional information on the serum materials is given in Table 105.2.

SRM	Description	Unit of Issue
909c	Frozen Human Serum	3 x 2 mL
911c	Cholesterol	2 g
912b	Urea-Clinical	25 g
913b	Uric Acid	10 g
914b	Creatinine	10 g
915b	Calcium Carbonate (Clinical Standard)	20 g
916b	Bilirubin	100 mg
917c	D-Glucose (Dextrose)	50 g
918c	Potassium Chloride (Clinical)	30 g
919b	Sodium Chloride (Clinical)	30 g
920	D-Mannitol	50 g
921a	Cortisol (Hydrocortisone)	1 g
924a	Lithium Carbonate	30 g
927f	Bovine Serum Albumin (7 %, solution) (Total Protein Solution)	10 x 2.2 mL
928	Lead Nitrate (Clinical)	30 g
929a	Magnesium Gluconate	5 g
937	Iron Metal (Clinical Standard)	50 g
955d	Toxic Metals and Metabolites in Frozen Human Blood	set (6)
956d	Electrolytes in Frozen Human Serum	set (6)
965b	Glucose in Frozen Human Serum	set (8)
967a	Creatinine in Frozen Human Serum	set (4)
968f	Fat-Soluble Vitamins in Frozen Human Serum	set (2)
971a	Hormones in Frozen Human Serum	set (2)
972a	Vitamin D Metabolites in Frozen Human Serum	set (4)
998	Angiotensin I (Human)	0.5 mg
1400	Bone Ash	50 g
1401	Trace Metals in Frozen Human Blood	set (4)
1486	Bone Meal	50 g
1595	Tripalmitin	2 g
1598a	Inorganic Constituents in Animal Serum	2 vials
1949	Frozen Human Prenatal Serum	set (8)
1950	Metabolites in Frozen Human Plasma	5 x 1 mL
1951c	Lipids in Frozen Human Serum	set (4)
1955	Homocysteine and Folate in Frozen Human Serum	set (3)
2365	BK Virus DNA Quantitative Standard	110 µL
2366a	Cytomegalovirus DNA (TowneΔ_{147} BAC) for DNA Measurements	150 µL
2378	Fatty Acids in Frozen Human Serum	set (3)
2389a	Amino Acids in 0.1 mol/L Hydrochloric Acid	5 x 1.2 mL
2668	Toxic Elements in Frozen Human Urine	set (10)
2669	Arsenic Species in Frozen Human Urine	set (10)
2921	Human Cardiac Troponin Complex	5 x 115 µL
2924	C-Reactive Protein Solution	3 x 1 mL
2925	Recombinant Human Serum Albumin Solution (Primary Reference Calibrator for Urine Albumin) (Frozen)	2 x 0.5 mL
2926	Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 0.25 mL
2927	^{15}N-Labeled Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 50 µL
2968	3-Epi-25-Hydroxvitamin D3 Calibration Solution	5 x 1.2 mL
2969	Vitamin D Metabolites in Frozen Human Serum (Total 25-Hydroxyvitamin D Low Level)	2 x 1 mL
2970	Vitamin D Metabolites in Frozen Human Serum (25-Hydroxyvitamin D2 High Level)	2 x 1 mL
2971	24R,25-Dihydroxyvitamin D3 Calibration Solution	5 x 1 mL
2972b	25-Hydroxyvitamin D Calibration Solutions	20 x 1.2 mL
2973	Vitamin D Metabolites in Frozen Human Serum (High Level)	2 x 1 mL
3030	Monomethylarsonic Acid Standard Solution	2 x 5 mL
3031	Dimethylarsinic Acid Standard Solution	2 x 5 mL
3033	Arsenobetaine Standard Solution	2 x 5 mL
3034	Arsenocholine Standard Solution	2 x 5 mL
3036	Arsenic Acid (AsV) Standard Solution	2 x 10 mL
3037	Arsenous Acid (AsIII) Standard Solution	2 x 10 mL
3655	Glycans in Solution (Frozen)	13 vials
3667	Creatinine in Frozen Human Urine	10 mL
3668	Mercury, Perchlorate, and Iodide in Frozen Human Urine	set (10)
3669	Arsenic Species in Frozen Human Urine (Elevated Levels)	5 x 1.5 mL
3671	Nicotine Metabolites in Human Urine (Frozen)	set (3)

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SRM	Description	Unit of Issue
3672	Organic Contaminants in Smokers' Urine (Frozen)	5 x 10 mL
3673	Organic Contaminants in Non-Smokers' Urine (Frozen)	5 x 10 mL
3949	Folate Vitamers in Frozen Human Serum	set (3)
3950	Vitamin B6 in Frozen Human Serum	set (2)
3951	Fatty Acid Species in Frozen Human Serum	3 x 1 mL
8321	Peptide Mixture of Proteomics	3 x 50 µL
8323	Yeast Protein Extract	3 x 0.2 mL
8461	Human Liver for Proteomics	0.5 g
8642a	FDA Saxitoxin Dihydrochloride Solution	5 x 1.2 mL
8671	NISTmAb, Humanized IgG1κ Monoclonal Antibody	1 x 800 µL

See Table 105.1 and Table 105.2 on the website for more information.

Toxic Substances in Urine (frozen form)

SRM	Description	Unit of Issue
2668	Toxic Elements in Frozen Human Urine	set (10)
2669	Arsenic Species in Frozen Human Urine	set (10)
3668	Mercury, Perchlorate, and Iodide in Frozen Human Urine	set (10)
3669	Arsenic Species in Frozen Human Urine (Elevated Levels)	set (5)

See Table 105.4 on the website for more information.

Ethanol Solutions

These SRMs are for use in the calibration of instruments and techniques for the determination of ethanol (ethyl alcohol) in breath and blood. SRM 1828c consists of six concentrations of ethanol-water solutions in ampoules.

SRM	Description	Unit of Issue
1828c	Ethanol-Water Solutions (Nominal Mass Fractions of 0.02 %, 0.04 %, 0.08 %, 0.1 %, 0.2 %, and 0.3 %,)	6 x 1.2 mL
2891	Ethanol-Water Solution (Nominal Mass Fraction 0.02 %)	5 x 1.2 mL
2892	Ethanol-Water Solution (Nominal Mass Fraction 0.04 %)	5 x 1.2 mL
2893a	Ethanol-Water Solution (Nominal Mass Fraction 0.08 %)	5 x 1.2 mL
2894	Ethanol-Water Solution (Nominal Mass Fraction 0.1 %)	5 x 1.2 mL
2895	Ethanol-Water Solution (Nominal Mass Fraction 0.2 %)	5 x 1.2 mL
2896	Ethanol-Water Solution (Nominal Mass Fraction 0.3 %)	5 x 1.2 mL
2897a	Ethanol Water Solution (Nominal Mass Fraction 2 %)	5 x 10 mL
2898a	Ethanol Water Solution (Nominal Mass Fraction 6 %)	5 x 10 mL
2899a	Ethanol-Water Solution (Nominal Mass Fraction 25 %)	5 x 10 mL
2900	Ethanol-Water Solution (Nominal Mass Fraction 95.6 %)	5 x 10 mL

See Table 105.3 on the website for more information.

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Drugs of Abuse, Smoking Metabolites and Contaminants (urine)

SRM	Description	Unit of Issue
1507b	11-Nor-Delta-9-Tetrahydrocannabinol-9-Carboxylic Acid in Freeze-Dried Urine	set (3)
2926	Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 0.25 mL
2927	^{15}N-Labeled Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 50 µL
3671	Nicotine Metabolites in Human Urine (Frozen)	3 x 10 mL
3672	Organic Contaminants in Smokers' Urine (Frozen)	5 x 10 mL
3673	Organic Contaminants in Non-Smokers' Urine (Frozen)	5 x 10 mL

See Table 105.7 on the website for more information.

Biomaterials (solid forms)

Biomaterials are found in medical devices that are in intimate contact with tissues and body fluids.

SRM	Description	Unit of Issue
2910b	Hydroxyapatite	2 g
8012	Gold Nanoparticles, Nominal 30 nm Diameter	2 x 5 mL
8013	Gold Nanoparticles, Nominal 60 nm Diameter	2 x 5 mL

See Table 105.9 on the website for more information.

Respirable Materials on Filter Media

These SRMs enable the determination of hazardous materials potentially found in industrial environments. SRMs 2676d, 2677a, and 3087a have been superseded by SRM 2783 Air Particulate on Filter Media.

SRM	Description	Unit of Issue
2783	Air Particulate on Filter Media (47 mm dia)	2 filters plus 2 blanks
2950a	Respirable Alpha Quartz on Filter Media (Nominal Mass of Alpha Quartz: 5 µg - 500 µg)	35 filters plus 35 blanks
2960	Respirable Cristobalite on Filter Media (Nominal Mass of Cristobalite: 5 µg - 250 µg)	30 filters plus 30 blanks
8785	Air Particulate Matter on Filter Media	3 filters
8786	Filter Blank for RM 8785	1 filter

See Table 105.10 on the website for more information.

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Biomanufacturing

SRM 3655 is intended primarily for use as a calibration standard for the measurement of enzymatically released N-linked glycans. Potential applications of SRM 3655 include the benchmarking and comparability of analytical techniques, as a material for ensuring system suitability, and for analytical method validation. This material may also be used to value-assign in-house calibrators or control materials. SRM 3655 consists of thirteen (13) aqueous solutions of glycans commonly associated with monoclonal antibody therapeutics. Each solution contains a purified free-reducing glycan at a certfied mass fraction.

RM 8634 is intended primarily for use in validating the counting, sizing, and morphological analysis of liquid-borne particles over an approximate size range of 1 µm to 30 µm. RM 8634 is a suspension of highly polydisperse particles of irregular morphology that closely mimic the optical properties of aggregated proteinaceous particles. Thus, it is useful in determining instrumental response for particle counters used in biomanufacturing applications.

RM 8671 is intended primarily for use in evaluating the performance of methods for determining physicochemical and biophysical attributes of monoclonal antibodies. It also provides a representative test molecule for development of novel technology for therapeutic protein characterization.

SRM	Description	Unit of Issue
3655	Glycans in Solution (Frozen)	13 vials
8230	*Saccharomyces cerevisiae* NE095 Cells for Cell Counting and DNA-based Detection (freeze-dried)	16 vials (12 yeast, 4 matrix)
8634	Ethylene Tetrafluoroethylene for Particle Size Distribution and Morphology	20 mL
8671	NISTmAb, Humanized IgG1κ Monoclonal Antibody	1 x 800 µL

See Table 105.6 on the website for more information.

Vitamin D Metabolites for Clinical Laboratory Materials (serum, plasma, and calibration solutions)

SRM	Description	Unit of Issue
968f	Fat-Soluble Vitamins in Frozen Human Serum	2 x 1 mL
972a	Vitamin D Metabolites in Frozen Human Serum	4 x 1 mL
1949	Frozen Human Prenatal Serum	8 vials (2 each)
1950	Metabolites in Frozen Human Plasma	5 x 1 mL
2968	3-Epi-25-Hydroxvitamin D3 Calibration Solution	5 x 1.2 mL
2969	Vitamin D Metabolites in Frozen Human Serum (Total 25-Hydroxyvitamin D Low Level)	2 x 1 mL
2970	Vitamin D Metabolites in Frozen Human Serum (25-Hydroxyvitamin D2 High Level)	2 x 1 mL
2971	24R, 25-Dihydroxyvitamin D3 Calibration Solution	5 x 1 mL
2972b	25-Hydroxyvitamin D Calibration Solutions	20 x 1.2 mL
2973	Vitamin D Metabolites in Frozen Human Serum (High Level)	2 x 1 mL

See Table 105.5 on the website for more information.

Serum, Plasma, Blood and Urine Clinical Laboratory Materials (frozen, liquid, and lyophilized forms)

These SRMs are intended serve a variety of clinical measurement needs.

SRM	Description	Unit of Issue
909c	Frozen Human Serum	3 x 2 mL
927f	Bovine Serum Albumin (7 %, solution) (Total Protein Solution)	10 x 2.2 mL
956d	Electrolytes in Frozen Human Serum	6 x 2 mL
965b	Glucose in Frozen Human Serum	set (8)
967a	Creatinine in Frozen Human Serum	set (4)
968f	Fat-Soluble Vitamins, Carotenoids, and Cholesterol in Human Serum	set (3)
971a	Hormones in Frozen Human Serum	2 x 2 mL
972a	Vitamin D Metabolites in Frozen Human Serum	4 x 1 mL
1401	Trace Metals in Frozen Human Blood	4 x 1.6 mL
1507b	11-Nor-Delta-9-Tetrahydrocannabinol-9-CarboxylicAcid in Freeze-Dried Urine	set (3)
1949	Frozen Human Prenatal Serum	8 x 1.8 mL
1950	Metabolites in Human Plasma	5 x 1 mL
1951c	Lipids in Frozen Human Serum	4 x 1 mL
1955	Homocysteine and Folate in Frozen Human Serum	set (3)
1957	Organic Contaminants in Non-Fortified Human Serum	5
1958	Organic Contaminants in Fortified Human Serum	5
2378	Fatty Acids in Frozen Human Serum	3 x 1 mL
2668	Toxic Elements in Frozen Human Urine	10 x 1.5 mL
2669	Arsenic Species in Frozen Human Urine	10 x 1.5 mL
2925	Recombinant Human Serum Albumin Solution (Primary Reference Calibrator for Urine Albumin) (Frozen)	2 x 0.5 mL
2969	Vitamin D Metabolites in Frozen Human Serum (Total 25-Hydroxyvitamin D Low Level)	2 x 1 mL
2970	Vitamin D Metabolites in Frozen Human Serum (25-Hydroxyvitamin D2 High Level)	2 x 1 mL
2973	Vitamin D Metabolites in Frozen Human Serum (High Level)	2 x 1 mL
3667	Creatinine in Frozen Human Urine	1 x 10 mL
3668	Mercury, Perchlorate, and Iodide in Frozen Human Urine	10 x 1.5 mL
3669	Arsenic Species in Frozen Human Urine (Elevated Levels)	10 x 1.5 mL
3671	Nicotine Metabolites in Human Urine (Frozen)	5 x 1.5 mL
3672	Organic Contaminants in Smoker's Urine (Frozen)	10 x 1.5 mL
3673	Organic Contaminants in Non-Smoker's' Urine (Frozen)	10 x 1.5 mL
3949	Folate Vitamers in Frozen Human Serum	3 x 1 mL
3950	Vitamin B6 in Frozen Human Serum	2 x 1 mL
3951	Fatty Acid Species in Frozen Human Serum	3 x 1 mL

See Table 105.2 on the website for more information.

Respirable Materials

SRMs 1878b and 1879b are crystalline silica materials with particle size in the respirable range. They are intended for use in determining, by x-ray diffraction, the levels of respirable silica in an industrial atmosphere according to National Institute for Occupational Safety and Health (NIOSH) Analytical Method 7500 or equivalent methods.

SRM	Description	Unit of Issue
1648a	Urban Particulate Matter	2 g
1649b	Urban Dust	2 g
1650b	Diesel Particulate Matter	200 mg
1877	Beryllium Oxide Powder	20 g
1878b	Respirable Alpha Quartz (Quantitative X-Ray Powder Diffraction Standard)	5 g
1879b	Respirable Cristobalite (Quantitative X-Ray Powder Diffraction Standard)	5 g
1975	Diesel Particulate Extract	4 x 1.2 mL
2583	Trace Elements in Indoor Dust (Nominal Mass Fraction of 90 mg/kg Lead)	8 g
2584	Trace Elements in Indoor Dust (Nominal Mass Fraction of 1% Lead)	8 g
2585	Organic Contaminants in House Dust	10 g
2786	Fine Atmospheric Particulate Matter (Mean Particle Diameter < 4 µm)	100 mg
2787	Fine Atmospheric Particulate Matter (Mean Particle Diameter < 10 µm)	100 mg
2975	Diesel Particulate Matter	1 g
8044	Common Commercial Asbestos: Chrysotile	2.6 g

See Table 105.12 on the website for more information.

DNA Profiling, Nucleic Acid Materials, and Monoclonal Antibody

Standard Reference Material (SRM) 2372a is intended primarily for use in the value assignment of human genomic deoxyribonucleic acid (DNA) forensic quantitation materials. SRM 2372a consists of three well-characterized human genomic DNA materials in pH 8.0 aqueous buffer. The components are derived from human buffy coat samples, and labeled A, B, and C. Component A consists of genomic DNA from a single male donor. Component B consists of genomic DNA from a single female donor. Component C consists of a gravimetric mixture of genomic DNA (1 part male donor to 3 parts female donor). SRM 2372a is certified for copy number and DNA concentration (ng/µL). A unit of the SRM consists of one sterile 0.5 mL vial of each component, each vial containing approximately 55 µL of DNA solution. Each of these vials is labeled and is sealed with a color-coded screw cap.

SRM 2392 is intended to provide quality control when performing the polymerase chain reaction (PCR) and sequencing of human mitochondrial DNA (mtDNA) for forensic identifications, medical diagnosis, or mutation detection. It may also be used as a control when amplifying (PCR) and sequencing any DNA. SRM 2392 Mitochondrial DNA Sequencing contains DNA extracted from two cell lines plus cloned DNA from a region that is difficult to sequence. The certificate accompanying the SRM details the base pair sequences of the DNA, and the sequences of 58 unique primer sets which permit the amplification and sequencing of any specific area or the entire human mitochondrial DNA (strand). SRM 2392 consists of three frozen components packaged in one box. For further information see: SP260-155.

RMs 8366, 8375, 8391, 8392, 8393, and 8398 are intended for assessing performance of human genome sequencing, including whole genome sequencing, whole exome sequencing, and more targeted sequencing such as gene panels. Specifically, the material can be used to obtain estimates of true positives, false positives, true negatives, and false negatives for variant calls.

Health & Industrial Hygiene

SRM	Description	Unit of Issue
2365	BK Virus DNA Quantitative Standard	1 vial
2366a	Cytomegalovirus DNA (Towne$_{\Delta 147}$ BAC) for DNA Measurements	1 vial
2367	JC Virus DNA Quantitative Standard	1 x 110 µL
2372a	Human DNA Quantitation Standard	set (3)
2373	Genomic DNA Standards for *HER2* Measurements	set (5)
2374	DNA Sequence Library for External RNA Controls	96 tubes
2391d	PCR-Based DNA Profiling Standard	5 vials
2392	Mitochondrial DNA Sequencing	set (3)
2393	CAG Repeat Length Mutation in Huntington's Disease	set (6)
2396	Oxidative DNA Damage Mass Spectrometry Standards	set (10)
2917	Plasmid DNA for Fecal Indicator Detection and Identification	set (6)
8230	*Saccharomyces cerevisiae* NE095 Cells for Cell Counting and DNA-based Detection (freeze-dried)	16 vials (12 yeast, 4 matrix)
8366	*EGFR* and *MET* Gene Copy Number Standards for Cancer Measurements	set (6)
8375	Microbial Genomic DNA Standards for Sequencing Performance Assessment (MG-001, MG-002, MG-003, MG-004)	set (4)

SRM	Description	Unit of Issue
8376	Microbial Pathogen DNA Standards for Detection and Identification	20 tubes
8391	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	1 vial
8391 (QTY 10)	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	10 vials of RM 8391
8392	Human DNA for Whole-Genome Variant Assessment (Trio of Eastern European Ashkenazi Jewish Ancestry) (HG-002, HG-003, HG-004)	3 vials
8393	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	1 vial
8393 (QTY 10)	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	10 vials of RM 8391
8398	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	1 vial
8398 (QTY 10)	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	10 vials of RM 8398

See Table 105.8 on the website for more information.

Health & Industrial Hygiene

Lead in Paint, Dust, and Soil (powder and sheet forms)

These SRMs and RM have been developed in conjunction with the U.S. EPA to monitor paint, soil, and dust sources of lead. SRMs 2570 through 2576 consist of one Mylar sheet per unit. Each sheet, 7.6 cm x 10.2 cm, is coated with a single uniform paint layer for use with portable x-ray fluorescence analyzers. SRMs 2580, 2581, 2582, and 2589 consist of paint that has been ground and homogenized into a powder, 99+% of which passes a 100 µm sieve. SRM 2583 and SRM 2584 consist of dust, 99+% of which passes a 100 µm sieve, that was collected in vacuum cleaner bags during cleaning of dwelling interiors. SRM 2583 and SRM 2584 are certified for arsenic, chromium, cadmium, lead, and mercury. SRMs 2584, 2586, and 2587 are dust or soil matrices containing lead from paint.

SRM	Description	Unit of Issue
1648a	Urban Particulate Matter	2 g
2569	Lead Paint Films for Children's Products	8 sheets
2570	Lead Paint Film for Portable X-Ray Fluorescence Analyzers - Blank (Color: White)	1 film
2571	Lead Paint Film for Building Surfaces (Nominal Pb 3.5 mg/cm2)(Color: Yellow)	1 + blank
2572	Lead Paint Film for Building Surfaces (Nominal Pb 1.6 mg/cm2)(Color: Orange)	1 + blank
2573	Lead Paint Film for Building Surfaces (Nominal Pb 1.0 mg/cm2)(Color: Red)	1 + blank
2574	Lead Paint Film for Building Surfaces (Nominal Pb 0.7 mg/cm2)(Color: Gold)	1 + blank
2575	Lead Paint Film for Building Surfaces (Nominal Pb 0.3 mg/cm2)(Color: Green)	1 + blank
2576	Lead Paint Film for Building Surfaces (Nominal Pb 5.6 mg/cm2)(Color: Blue)	1 + blank
2579a	Lead Paint Films For Building Surfaces (SRM 2570 through SRM 2575)	set (6)
2580	Powdered Paint (Nominal Mass Fraction 4 % Lead)	30 g
2581	Powdered Paint (Nominal Mass Fraction 0.5 % Lead)	35 g
2582	Powdered Paint (Nominal Mass Fraction 200 mg/kg Lead)	20 g
2583	Trace Elements in Indoor Dust (Nominal Mass Fraction of 90 mg/kg Lead)	8 g
2584	Trace Elements in Indoor Dust (Nominal Mass Fraction of 1% Lead)	8 g
2586	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction 500 mg/kg Lead)	55 g
2587	Trace Elements in Soil (Nominal Mass Fraction of 3000 mg/kg Lead)	55 g
2589	Powdered Paint (Nominal Mass Fraction 10% Lead)	35 g
2783	Air Particulate on Filter Media (47 mm dia)	2 + 2 Blank

See Table 105.13 on the website for more information.

Standard Reference Materials for Chemical Composition

Inorganics

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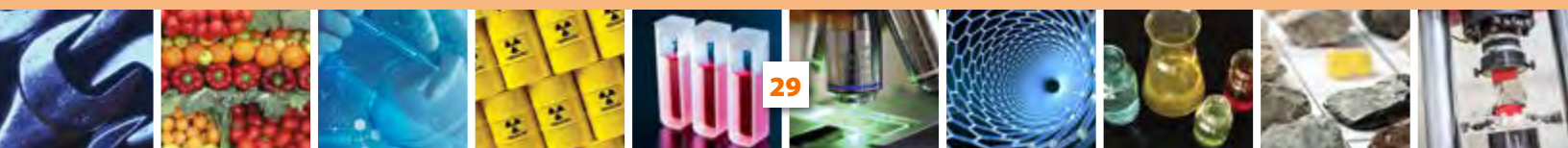

Inorganics

Metal (Inorganics) Constituents in Natural Matrices (liquid and solid forms)

These SRMs and RM are for analysis of materials of health or environmental interest.

SRM	Description	Unit of Issue
1640a	Trace Elements in Natural Water	250 mL
1641e	Mercury in Water	10 x 10 mL
1643f	Trace Elements in Water	250 mL
1646a	Estuarine Sediment	70 g
1648a	Urban Particulate Matter	2 g
1944	New York/New Jersey Waterway Sediment	50 g
1946	Lake Superior Fish Tissue	5 x 8 g
1947	Lake Michigan Fish Tissue	5 x 8 g
2385	Slurried Spinach	4 x 70 g
2387	Peanut Butter	3 x 170 g
2451	Fine Carbon (Activated) From Cyanide Ore Leaching	100 g
2583	Trace Elements in Indoor Dust (Nominal Mass Fraction of 90 mg/kg Lead)	8 g
2584	Trace Elements in Indoor Dust (Nominal Mass Fraction of 1 % Lead)	8 g
2586	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction 500 mg/kg Lead)	55 g
2587	Trace Elements in Soil (Nominal Mass Fraction of 3000 mg/kg Lead)	55 g
2696	Silica Fume (powder form)	70 g
2700	Hexavalent Chromium in Contaminated Soil (Low Level)	75 g
2701	Hexavalent Chromium in Contaminated Soil (High Level)	75 g
2702	Inorganics in Marine Sediment	50 g
2703	Sediment for Solid Sampling (Small Sample) Analytical Techniques	5 g
2706	New Jersey Soil, Organics and Trace Elements	50 g
2709a	San Joaquin Soil Baseline Trace Element Concentrations	50 g
2710a	Montana I Soil Highly Elevated Trace Element Concentrations	50 g
2711a	Montana II Soil Moderately Elevated Trace Element Concentrations	50 g
2780a	Hard Rock Mine Waste	50 g
2781	Domestic Sludge	40 g
2782	Industrial Sludge	70 g
2783	Air Particulate on Filter Media (47 mm dia)	2 + 2 Blank
2976	Trace Elements and Methylmercury in Mussel Tissue (Freeze-Dried)	25 g
8610	Mercury Isotopes in UM-Almaden Mono-Elemental Secondary Standard	4 x 5 mL
8704	Buffalo River Sediment	50 g
8785	Air Particulate Matter on Filter Media	3 filters
8786	Filter Blank for RM 8785	filter

See Table 106.1 on the website for more information.

Mercury in Activated Carbon

These SRMs are intended for use in the evaluation of chemical methods of analysis for mercury.

SRM	Description	Unit of Issue
2445	Mercury in Iodinated Activated Carbon	25 g
2448	Mercury in Brominated Activated Carbon	25 g
2451	Fine Carbon (Activated) - From Cyanide Ore Leaching	100 g

See Table 106.3 on the website for more information.

Environmental Matrices with Carbon Values

These materials are intended for use in evaluating analytical methods used to measure carbon.

SRM	Description	Unit of Issue
1632e	Trace Elements in Coal (Bituminous)	50 g
1944	New York/New Jersey Waterway Sediment	50 g
2718a	Green Petroleum Coke	50 g
2719	Calcined Petroleum Coke	50 g
2775	Sulfur in Foundry Coke	50 g
2776	Sulfur in Furnace Coke	50 g
8499	Trace Elements in Coal (Bituminous)	50 g
8704	Buffalo River Sediment	50 g
8785	Air Particulate Matter on Filter Media	3 filters
8786	Filter Blank for RM 8785	filter

See Table 106.4 on the website for more information.

Used Auto Catalysts (powder form)

These SRMs are intended for use in the evaluation of methods for the analysis of the platinum group metals and lead in auto catalysts. They were produced in cooperation with the International Precious Metals Institute and are issued as fine (74 µm, 200 mesh) powders.

SRM	Description	Unit of Issue
2556	Used Auto Catalyst (Pellets)	70 g
2557	Used Auto Catalyst (Monolith)	70 g

See Table 106.6 on the website for more information.

Zeolites (powder form)

These RMs are intended to provide a common source of zeolite materials for measurement comparisons. Additional reference and information values are provided for atomic ratios of Si to Al and Na to Al, trace element content, enthalpy of formation, unit cell parameters, and particle size distributions. Figures are provided showing spectra for NMR analyses, plots of particle size distribution, electron microscope images of particles and plots of variation in sample mass with change in ambient humidity.

SRM	Description	Unit of Issue
8850	Zeolite Y	35-40 g
8851	Zeolite A	35-40 g
8852	Ammonium ZSM-5 Zeolite	35-40 g

See Table 106.7 on the website for more information.

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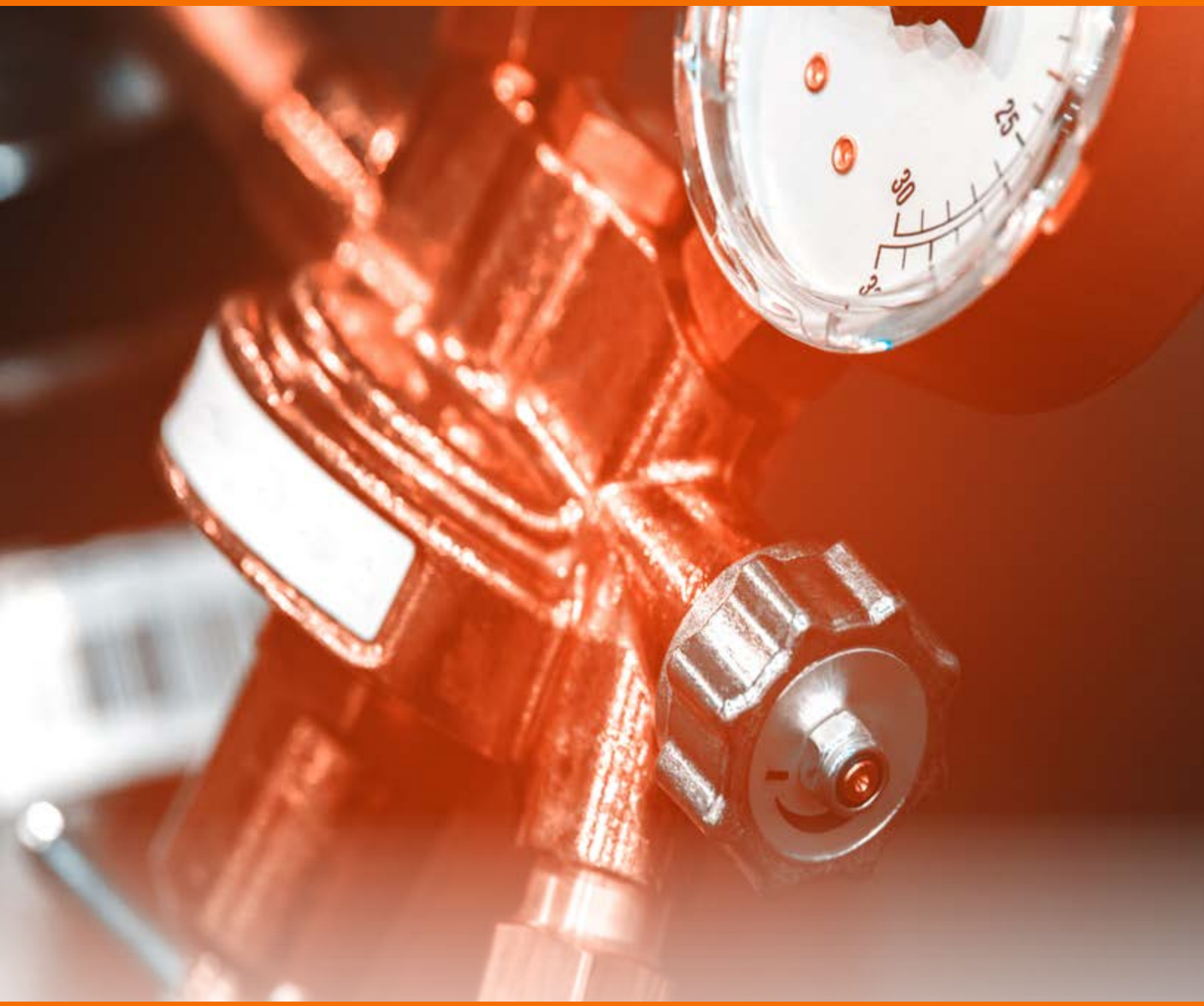
Standard Reference Materials
for Chemical Composition

Primary Gas Mixtures



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Primary Gas Mixtures

Primary Gas Mixtures

These SRMs are for calibrating equipment and apparatus used to measure various components of gas mixtures and atmospheric pollutants. The typical gas mixture is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a nominal pressure exceeding 12.4 mPa that provides the user with approximately 0.73 m^3 of usable mixture. Due to increasing customer demand, these primary gas mixtures are in short supply and may not be readily available for sale. In such cases, a NIST traceable reference gas described below may be substituted.

A NIST Traceable Reference Material (NTRM) is a reference material produced by a commercial supplier with a well-defined traceability to NIST measurement results. This traceability is established via criteria and protocols defined by NIST that are tailored to meet the needs of the metrological community to be served. The NTRM concept was established to allow NIST to respond to the increasing needs for high quality reference materials by leveraging its relatively fixed human and financial resources with secondary reference material producers. Reference material producers adhering to NIST defined protocol requirements are allowed to use the NTRM trademark to identify their product.

The gas NTRM program was established in 1992 in partnership with the U.S. EPA and specialty gas companies as a means for providing end-users with the wide variety of certified gas standards needed to implement the Emissions Trading provision of the 1990 Clean Air Act. Gas NTRMs are produced and distributed by specialty gas companies with NIST oversight of the production and maintenance, and direct involvement in the analysis. NTRMs can be developed for any pollutant, concentration, and balance gas combination for which a NIST primary standard or SRM exists. The gas standards prepared according to this program are related, within known limits of uncertainty, to specific gaseous primary standards maintained by NIST.

Carbon Monoxide in Air or Nitrogen

SRM	Description	Unit of Issue
1677c*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 µmol/mol)	6 L cylinder
1678c*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
1679c*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
1680b*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
1681b*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 µmol/mol)	6 L cylinder
2613a*	Carbon Monoxide in Air (Nominal Amount-of-Substance Fraction 20 µmol/mol)	6 L cylinder
2635a*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 25 µmol/mol)	6 L cylinder
2636a*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 250 µmol/mol)	6 L cylinder
2637a*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 2500 µmol/mol)	6 L cylinder
2638a*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 5000 µmol/mol)	6 L cylinder
2639a	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 1 % mol/mol)	6 L cylinder
2640a	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 2 % mol/mol)	6 L cylinder
2641a	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 4 % mol/mol)	6 L cylinder
2642a*	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 8 % mol/mol)	6 L cylinder
2740a	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 % mol/mol)	6 L cylinder
2741a	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 13 % mol/mol)	6 L cylinder

* The SRMs that are marked with * are also available as NTRMs from commercial suppliers.

See Table 107.1 on the website for more information.

Primary Gas Mixtures

Carbon Dioxide in Nitrogen

SRM	Description	Unit of Issue
1674b*	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 7 % mol/mol)	6 L cylinder
2617	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
2619a	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 0.5 % mol/mol)	6 L cylinder
2620a	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1 % mol/mol)	6 L cylinder
2621a	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1.5 % mol/mol)	6 L cylinder
2622a	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 2 % mol/mol)	6 L cylinder
2624a	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 3 % mol/mol)	6 L cylinder
2625a*	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 3.5 % mol/mol)	6 L cylinder
2745*	Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 16 % mol/mol)	6 L cylinder

* The SRMs that are marked with * are also available as NTRMs from commercial suppliers.

See Table 107.2 on the website for more information.

Continental and Oceanic Air

SRM	Description	Unit of Issue
1720	Northern Continental Air	30 L cylinder
1721	Southern Oceanic Air	30 L cylinder
1722	Halocarbons in Continental Air (Nominal Amount-of-Substance Fraction - Ambient)	29.5 L cylinder

See Table 107.3 on the website for more information.

Hydrogen Sulfide in Nitrogen

SRM	Description	Unit of Issue
2730	Hydrogen Sulfide in Nitrogen (Nominal Amount-of-Substance Fraction 5 µmol/mol)	6 L cylinder
2731	Hydrogen Sulfide in Nitrogen (Nominal Amount-of-Substance Fraction 20 µmol/mol)	6 L cylinder

See Table 107.4 on the website for more information.

Primary Gas Mixtures

Organic Components in Air or Nitrogen

SRM	Description	Unit of Issue
1658a	Methane in Air (Nominal Amount-of-Substance Fraction 1 µmol/mol)	6 L cylinder
1659a	Methane in Air (Nominal Amount-of-Substance Fraction 10 µmol/mol)	6 L cylinder
1665b	Propane in Air (Nominal Amount-of-Substance Fraction 3 µmol/mol)	6 L cylinder
1666b	Propane in Air (Nominal Amount-of-Substance Fraction 10 µmol/mol)	6 L cylinder
1667b	Propane in Air (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
1668b*	Propane in Air (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
1669b	Propane in Air (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
2644a	Propane in Nitrogen (Nominal Amount-of-Substance Fraction 250 µmol/mol)	6 L cylinder
2647a	Propane in Nitrogen (Nominal Amount-of-Substance Fraction 2500 µmol/mol)	6 L cylinder
2750	Methane in Air (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
2751	Methane in Air (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
2764	Propane in Air (Nominal Amount-of-Substance Fraction 0.25 µmol/mol)	6 L cylinder
2765	Propane in Air (Nominal Amount-of-Substance Fraction 100 nmol/mol)	6 L cylinder

See Table 107.5 on the website for more information.

Nitrogen Oxides in Air or Nitrogen

SRM	Description	Unit of Issue
1683b*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
1684b*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
1685b*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 250 µmol/mol)	6 L cylinder
1686b*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
1687b*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 µmol/mol)	6 L cylinder
1718	Nitrous Oxide in Air (Nominal Amount-of-Substance Fraction 1 µmol/mol)	6 L cylinder
2627a*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 5 µmol/mol)	6 L cylinder
2628a*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 µmol/mol)	6 L cylinder
2629a*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 20 µmol/mol)	6 L cylinder
2630*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 1500 µmol/mol)	6 L cylinder
2631a*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 3000 µmol/mol)	6 L cylinder
2660a*	Total Oxides of Nitrogen (NOx) in Air (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
2735	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 800 µmol/mol)	6 L cylinder
2737*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 nmol/mol)	30 L cylinder
2738*	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 nmol/mol)	30 L cylinder

* The SRMs that are marked with * are also available as NTRMs from commercial suppliers.

See Table 107.6 on the website for more information.

Primary Gas Mixtures

Oxygen in Nitrogen

SRM	Description	Unit of Issue
2657a*	Oxygen in Nitrogen (Nominal Amount-of-Substance Fraction 2 % mol/mol)	6 L cylinder
2658a*	Oxygen in Nitrogen (Nominal Amount-of-Substance Fraction 10 % mol/mol)	6 L cylinder
2659a*	Oxygen in Nitrogen (Nominal Amount-of-Substance Fraction 21 % mol/mol)	6 L cylinder

* The SRMs that are marked with * are also available as NTRMs from commercial suppliers.

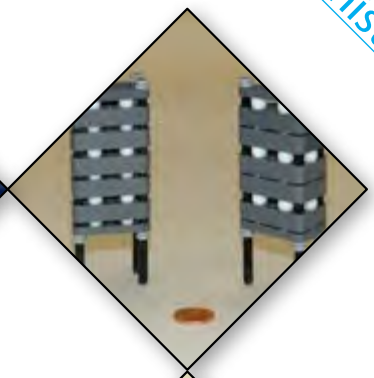
See Table 107.7 on the website for more information.

Sulfur Dioxide in Nitrogen

SRM	Description	Unit of Issue
1661a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
1662a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 µmol/mol)	6 L cylinder
1663a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1500 µmol/mol)	6 L cylinder
1664a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 2500 µmol/mol)	6 L cylinder
1689	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 5 µmol/mol)	6 L cylinder
1693a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
1694a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
1696a*	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 3500 µmol/mol)	6 L cylinder

* The SRMs that are marked with * are also available as NTRMs from commercial suppliers.

See Table 107.8 on the website for more information.



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Standard Reference Materials
for Chemical Composition

Fossil & Alternative Fuels

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Fossil & Alternative Fuels

Metal Constituents in Fossil Fuels (liquid forms)

These materials are intended for analysis of metal trace elements in fuel oil and reference fuels. [Also see Category 114.] SRM 1634c is a "No. 6" fuel oil in terms of viscosity but has a flash point of 43 °C.

SRM	Description	Unit of Issue
1634c	Trace Elements in Fuel Oil	100 mL
8505	Vanadium in Crude Oil	250 mL

See Table 108.2 on the website for more information.

Crude Oil

SRM	Description	Unit of Issue
2721	Crude Oil (Light-Sour)	5 x 10 mL
2722	Crude Oil (Heavy Sweet)	5 x 10 mL
2778	Mercury in Crude Oil	5 x 10 mL

See Table 108.3(1) on the website for more information.

Bituminous Coal

SRM	Description	Unit of Issue
1632e	Trace Elements in Coal (Bituminous)	100 mL
2683c	Bituminous Coal (Nominal Mass Fraction 2 % Sulfur)	50 g
2684c	Bituminous Coal (Nominal Mass Fraction 3 % Sulfur)	50 g
2685c	Bituminous Coal (Nominal Mass Fraction 5 % Sulfur)	50 g
2692c	Bituminous Coal (Nominal Mass Fraction 1 % Sulfur)	50 g
2693	Bituminous Coal (Nominal Mass Fraction 0.5 % Sulfur)	50 g
8499	Trace Elements in Coal (Bituminous)	5 x 20 mL
2720	Sulfur in Di-*n*-Butyl Sulfide	5 x 4.5 mL
2771	Sulfur in Diesel Fuel Blend Stock	100 mL

See Table 108.3(9) on the website for more infomration and additional resources.

Gasoline

SRM	Description	Unit of Issue
2298	Sulfur in Gasoline (High-Octane)	5 x 20 mL
2299	Sulfur in Gasoline (Reformulated)	5 x 20 mL

See Table 108.3(2) on the website for more information.

Subbituminous Coal

SRM	Description	Unit of Issue
1635a	Trace Elements in Coal (Subbitumimous)	50 g
2682c	Subbituminous Coal (Nominal Mass Fraction 0.5 % Sulfur)	50 g

See Table 108.3(8) on the website for more information.

Fossil & Alternative Fuels

Residual Fuel Oil

SRM	Description	Unit of Issue
1619b	Sulfur in Residual Fuel Oil (Nominal Mass Fraction 0.7 %)	100 mL
1622e	Sulfur in Residual Fuel Oil (Nominal Mass Fraction 2 %)	100 mL
1623d	Sulfur in Residual Fuel Oil (Nominal Mass Fraction 0.2 %)	100 mL
2717a	Sulfur in Residual Fuel Oil (Nominal Mass Fraction 3 %)	100 mL

See Table 108.3(6) on the website for more information.

Petroleum Coke

SRM	Description	Unit of Issue
2718a	Green Petroleum Coke	50 g
2719	Calcined Petroleum Coke	50 g

See Table 108.3(7) on the website for more information.

Metallurgical Coke

SRM	Description	Unit of Issue
2775	Sulfur in Foundry Coke	50 g
2776	Sulfur in Furnace Coke	50 g

See Table 108.3(10) on the website for more information.

Middle Distillates

SRM	Description	Unit of Issue
1616b	Sulfur in Kerosene (Low Level)	100 mL
1617b	Sulfur in Kerosine (High Level)	100 mL
1624d	Sulfur in Diesel Fuel Oil (Nominal Mass Fraction 0.4 %)	5 x 10 mL
2723b	Sulfur in Diesel Fuel Oil (Nominal Mass Fraction 10 mg/kg)	100 mL
2770	Sulfur in Diesel Fuel Oil (Nominal Mass Fraction 40 mg/kg)	10 x 10 mL

See Table 108.3(3) on the website for more information.

Moisture in Oils and Alcohols (liquid form)

SRM 2890 Water Saturated 1-Octanol is certified for water content and is intended for use in calibrating instruments, and validating the accuracy of analytical methods. Water concentration values for RMs 8506a and 8509 are not certified but represent the "best estimate" of the moisture content determined by NIST and are intended for use in developing, and validating methods for the determination of moisture in oil and similar matrices.

SRM	Description	Unit of Issue
2721	Crude Oil (Light-Sour)	5 x 10 mL
2722	Crude Oil (Heavy-Sweet)	5 x 10 mL
2890	Water Saturated 1-Octanol	5 x 2 mL
8506a	Moisture in Transformer Oil	5 x 9.5 mL
8509	Moisture in Methanol	5 x 5 mL

See Table 108.4 on the website for more information.

Fossil Fuel: Trace Elements (solid forms)

SRM	Description	Unit of Issue
1632e	Trace Elements in Coal (Bituminous)	50 g
1633c	Trace Elements in Coal Fly Ash	75 g
1635a	Trace Elements in Coal (Subbitumimous)	50 g
2429	Flue Gas Desulfurization Gypsum	200 g
2689	Coal Fly Ash	3 x 10 g
2690	Coal Fly Ash	3 x 10 g
2691	Coal Fly Ash	3 x 10 g
2718a	Green Petroleum Coke	50 g
2719	Calcined Petroleum Coke	50 g
8499	Trace Elements in Coal (Bituminous)	50 g

See Table 108.6 on the website for more information.

Biomass Constituents

SRM	Description	Unit of Issue
2790	Inorganic Constituents in Hardwood Biomass Material	2 x 30 g
2791	Inorganic Constituents in Softwood Biomass Material	2 x 30 g
8496	Eucalyptus Hardwood	10 sheets
8644	Dried Corn Biomass Intermediate Before Conversion	4 x 10 g
8645	Dried Corn Biomass Intermediate After Conversion	2 x 10 g

See Table 108.9 on the website for more information.

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Standard Reference Materials for Chemical Composition

Organics

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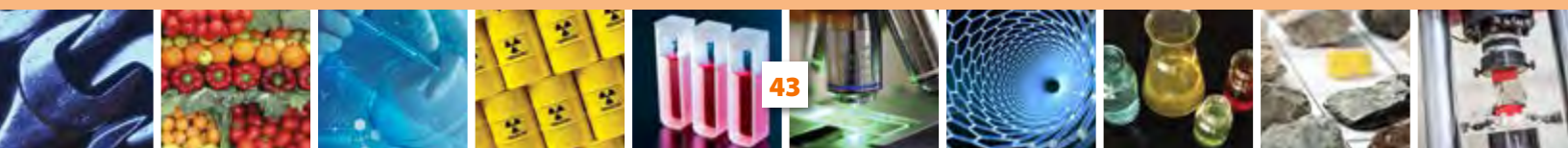

Organics

Organics

SRM	Description	Unit of Issue
869b	Column Selectivity Test Mixture for Liquid Chromatography	5 x 1.1 mL
870	Column Performance Test Mixture for Liquid Chromatography	5 x 1.1 mL
1491a	Methyl-Substituted Polycyclic Aromatic Hydrocarbons in Toluene	5 x 1.2 mL
1493	Polychlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
1494	Aliphatic Hydrocarbons in 2,2,4-Trimethylpentane	5 x 1.2 mL
1543	GC/MS System Performance Standard	4 x 1 mL
1588c	Organics in Fish Oil	5 x 1.2 mL
1647f	Priority Pollutant Polycyclic Aromatic Hydrocarbons in Acetonitrile	5 x 1.3 mL
1649b	Urban Dust	2 g
1650b	Diesel Particulate Matter	200 mg
1936	Great Lakes Sediment	50 g
1941b	Organics in Marine Sediment	50 g
1944	New York/New Jersey Waterway Sediment	50 g
1945	Organics in Whale Blubber	2 x 15 g
1946	Lake Superior Fish Tissue	5 x 7-9 g
1947	Lake Michigan Fish Tissue	5 x 8 g
1953	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL
1954	Organic Contaminants in Fortified Human Milk	5 x 5 mL
1957	Organic Contaminants in Non-Fortified Human Serum (Freeze Dried)	5 x 10.7 mL
1958	Organic Contaminants in Fortified Human Serum (Freeze Dried)	5 x 10.7 mL
1974c	Organics in Mussel Tissue (*Mytilus edulis*)	5 x 10 g
1975	Diesel Particulate Extract	4 x 1.2 mL
1991	Mix Coal Tar/Petroleum Extract in Methylene Chloride	5 x 1.2 mL
2257	PBDE Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
2258	BDE 209 in 2,2,4-Trimethylpentane	5 x 1.2 mL
2259	PCB Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
2260a	Aromatic Hydrocarbon in Toluene	5 x 1.2 mL
2261	Chlorinated Pesticides in Hexane (Nominal Mass Concentration 2 µg/mL)	5 x 1.2 mL
2262	Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane (Nominal Mass Concentration 2 µg/mL)	5 x 1.2 mL
2266	Hopanes and Steranes in 2,2,4 Trimethylpentane	5 x 1.2 mL
2269	Perdeuterated PAH-I Solution in Hexane/Toluene	5 x 1.2 mL
2270	Perdeuterated PAH-II Solution in Hexane/Toluene	5 x 1.2 mL
2274	PCB Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
2275	Chlorinated Pesticide Solution-II in 2,2,4-Trimethylpentane	5 x 1.2 mL
2585	Organic Contaminants in House Dust	10 g
2706	New Jersey Soil, Organics and Trace Elements	50 g
2777	Weathered Gulf of Mexico Crude Oil in Toluene	5 x 1.2 mL
2779	Gulf of Mexico Crude Oil	5 x 1.2 mL
2781	Domestic Sludge	40 g
2786	Fine Atmospheric Particulate Matter (<4 µm)	100 mg to 140 mg
2787	Fine Atmospheric Particulate Matter (<10 µm)	100 mg to 140 mg
2860	Phthalates in Polyvinyl Chloride	2 levels, 1 blank, 2 g each
2974a	Organics in Freeze-Dried Mussel Tissue (*Mytilus edulis*)	5 g
2975	Diesel Particulate Matter	1 g
3060	Monoester Phthalates in Acetonitrile	5 x 1.2 mL
3262	St. John's Wort (*Hypericum perforatum* L.) Aerial Parts	5 x 3.3 g
3672	Organic Contaminants in Smokers' Urine (Frozen)	5 x 10 mL
3673	Organic Contaminants in Non-Smokers' Urine (Frozen)	5 x 10 mL
8182	Fatty Acid Methyl Esters in 2,2,4-Trimethylpentane	5 x 1.2 mL
8446	Perfluorinated Carboxylic Acids and Perfluorooctane Sulfonamide in Methanol	4 x 1.2 mL
8447	Perfluorinated Sulfonic Acids in Methanol	3 x 1.2 mL

See Table 109.1 on the website for more information.

Organics

EPA: Organic Compounds

These SRMs are intended primarily for the calibration of instrumentation and validation of methods for volatile or semi-volatile organic compound determinations. Because of its miscibility with water, each SRM can also be used to fortify aqueous samples with known amounts of the organic compound. These SRMs were developed primarily to support the Chemical Calibration Providers of the Proficiency Testing Program with support by the U.S. Environmental Protection Agency (EPA).

SRM	Description	Unit of Issue
3074	Phthalates in Methanol	5 x 1.2 mL
3077	Aroclor 1242 in Transformer Oil	5 x 1.2 mL
3079	Aroclor 1254 in Transformer Oil	5 x 1.2 mL
3080	Aroclor 1260 in Transformer Oil	5 x 1.2 mL

See Table 109.3 on the website for more information.

Perfluorinated and Polyfluorinated Alkyl Substances (PFAS)

SRM	Description	Unit of Issue
1936	Great Lakes Sediment	50 g
1946	Lake Superior Fish Tissue	5 x 7-9 g
1947	Lake Michigan Fish Tissue	5 x 8 g
1950	Metabolites in Frozen Human Plasma	5 x 1 mL
1957	Organic Contaminants in Non-Fortified Human Serum (Freeze-Dried)	5 x 10.7 mL
1958	Organic Contaminants in Fortified Human Serum (Freeze-Dried)	5 x 10.7 mL
2585	Organic Contaminants in House Dust	10 g
2586	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction of 500 mg/kg Lead)	55 g
2781	Domestic Sludge	40 g
8446	Perfluorinated Carboxylic Acids and Perfluorooctane Sulfonamide in Methanol	4 x 1.2 mL
8447	Perfluorinated Sulfonic Acids in Methanol	3 x 1.2 mL

See Table 109.5 on the website for more information.

Crime Scene Investigations

SRM	Description	Unit of Issue
2460a	Standard Bullet Replica	each
2461	Standard Cartridge Case	each

See Table 109.4 on the website for more information.

Wild-Caught Coho Salmon (RM 8256), Aquacultured Coho Salmon (RM 8257), Wild-Caught Shrimp (RM 8258), Aquacultured Shrimp (RM 8259)

Four reference materials from NIST will help the U.S. Food and Drug Administration and Customs and Border Protection agencies assess whether imported salmon and shrimp are authentic. Food fraud, the intentional misrepresentation of a less expensive material for a more expensive one, is estimated to affect about 1% of the food industry worldwide and cost as much as $40 billion a year.

Salmon and shrimp are two of the three most-consumed seafoods in the U.S. (tuna is the third), and seafood is one of the most highly traded international commodities. Farmed, or aquacultured, salmon and shrimp are less expensive to produce, compared to salmon and shrimp netted in the wild from boats. Aquaculture facilities are either on shore or close to shore, so the catches require less fuel and lower labor costs. A producer who substitutes farmed seafood for wild-caught seafood can earn higher profits, if fraudulently. NIST developed two reference materials for each to help regulators and law enforcement agencies differentiate between farmed and wild-caught salmon and shrimp.

Genetic analysis can be used to determine the origin of shrimp, as wild-caught shrimp represent a different species than aquacultured shrimp. A definitive identification of salmon, however, requires an analysis of the ratios of Omega 3 to Omega 6 fatty acids in their flesh, which vary likely because of the different diets eaten by aquacultured and wild salmon. Aquacultured salmon has twice the amount of Omega 3 fatty acids, according to the NIST analysis. This can be used as a tell-tale marker for federal and other agencies testing the authenticity of salmon.

NIST provides values for fatty acids for all four reference materials so that they can also be used to assure the quality of measurements of nutrition. Values for crude protein are also provided for labs that wish to use these materials to assure the quality of tests to detect allergens.

NIST carefully sourced the shrimp and salmon for all four reference materials to be confident that they are as claimed. The National Oceanic and Atmospheric Administration Northwest Fisheries Science Center Forensic Laboratory provided expertise in identifying verified fisheries and facilities capable of providing authentic seafood products. Genetic analysis was conducted on all four materials to assist in verifying their source. In addition, because the final reference materials are intended to represent food items, only those portions of the shrimp and salmon typically consumed were included in the production of these reference materials.

A unit of each of these reference materials includes two glass jars, each containing approximately 6 g to 8 g (wet basis) of frozen tissue homogenate that has been stored at –80 °C or lower since preparation.

Learn more:

Ellisor DL, Place B, Phillips M, Yen J (2021) Analysis of Seafood Reference Materials: RM 8256, RM 8257, RM 8258, and RM 8259, Wild-Caught Coho Salmon (RM 8256), Aquacultured Coho Salmon (RM 8257), Wild-Caught Shrimp (RM 8258), Aquacultured Shrimp (RM 8259). (National Institute of Standards and Technology, Gaithersburg, MD) NIST Special Publication (SP) 260-214 https://doi.org/10.6028/NIST.SP.260-214.

Standard Reference Materials for Chemical Composition

Food & Agriculture

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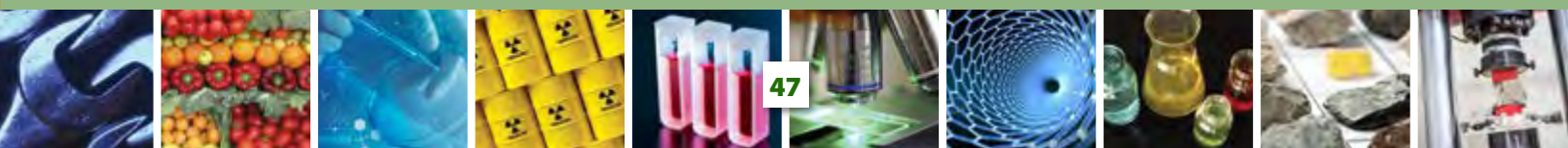


Food & Agriculture

Foods and Beverages - Macro and Micronutrients

These SRMs are for validation of analytical procedures and calibration of apparatus used in the analysis of trace elements and other analytes in foods and related products.

SRM	Description	Unit of Issue
1546a	Meat Homogenate	4 cans x 85 g
1548b	Typical Diet	2 x 5 g
1549a	Whole Milk Powder	5 pouches x 10 g each
1566b	Oyster Tissue	25 g
1567b	Wheat Flour	50 g
1568b	Rice Flour	50 g
1570a	Trace Elements in Spinach Leaves	60 g
1577c	Bovine Liver	20 g
1845a	Whole Egg Powder	5 pouches x 10 g each
1849a	Infant/Adult Nutritional Formula I (milk-based)	10 pouches x 10 g each
1869	Infant/Adult Nutritional Formula II (milk/whey/soy-based)	10 pouches x 10 g each
1946	Lake Superior Fish Tissue	5 x 7-9 grams
1947	Lake Michigan Fish Tissue	5 x 8 grams
2383a	Baby Food Composite	4 x 70 g
2384	Baking Chocolate	5 x 91 g
2385	Slurried Spinach	4 x 70 g
2386	Avocado Powder	5 x 10 g
2387	Peanut Butter	3 x 170 g
3035	Arsenic Species in Apple Juice	5 x 1.5 mL
3233	Fortified Breakfast Cereal	60 g each
3234	Soy Flour	50 g
3235	Soy Milk	10 x 10 mL
3252	Protein Drink Mix	5 pouches x 10 g each
3253	Yerba Mate Leaves	2 x 10 g
3254	Green Tea (*Camellia sinensis*) Leaves	5 x 3 g
3255	Green Tea (*Camellia sinensis*) Extract	5 x 1 g
3281	Cranberry (Fruit)	5 x 6 g
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
3287	Blueberry (Fruit)	5 pouches x 5 g each
3290	Dry Cat Food	5 pouches x 10 g each
3530	Iodized Table Salt (Iodide)	1 bottle x 200 g
8256	Wild-caught Coho Salmon	2 jars, 6 g to 8 g
8257	Aquacultured Coho Salmon	2 jars, 6 g to 8 g
8258	Wild-caught Shrimp	2 jars, 6 g to 8 g
8259	Aquacultured Shrimp	2 jars, 6 g to 8 g
8260	Infant Nutritional Formula (hydrolyzed milk-based)	400 g
8261	Adult Nutritional Formula (high-protein)	400 g

See Table 110.1 on the website for more information.

Food & Agriculture

Foods and Beverages - Other Components of Potential Interest

These SRMs are for validation of analytical procedures and calibration of apparatus used in the analysis of trace elements and other analytes in foods and related products.

SRM	Description	Unit of Issue
1548b	Typical Diet	2 x 5 g
1565	Mycotoxins in Corn	2 x 60 g
1566b	Oyster Tissue	25 g
1849a	Infant/Adult Nutritional Formula I (milk-based)	10 pouches x 10 g each
1869	Infant/Adult Nutritional Formula II (milk/whey/soy-based)	10 pouches x 10 g each
1946	Lake Superior Fish Tissue	5 x 7-9 grams
1947	Lake Michigan Fish Tissue	5 x 8 grams
2386	Avocado Powder	5 x 10 g
2387	Peanut Butter	3 x 170 g
3233	Fortified Breakfast Cereal	60 g each
3234	Soy Flour	50 g
3235	Soy Milk	10 x 10 mL
3253	Yerba Mate Leaves	2 x 10 g
3254	Green Tea (*Camellia sinensis*) Leaves	5 x 3 g
3255	Green Tea (*Camellia sinensis*) Extract	5 x 1 g

See Table 110.1 on the website for more information.

Wheat Hardness (kernel form)

This RM is intended primarily for calibrating instruments used to determine the hardness of bulk or single kernel wheat. RM 8441a was prepared and analyzed by the Federal Grain Inspection Service program, Grain Inspection Packers and Stockyards Administration of the United States Department of Agriculture.

SRM	Description	Unit of Issue
8441a	Wheat Hardness (kernel form)	set (50)

See Table 110.6 on the website for more information.

Food Contaminants and Allergens

SRM	Description	Unit of Issue
1566b	Oyster Tissue	25 g
1946	Lake Superior Fish Tissue	5 x 7-9 g
1947	Lake Michigan Fish Tissue	5 x 8 g
1953	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL
1954	Organic Contaminants in Fortified Human Milk	5 x 5 mL
2387	Peanut Butter	3 x 170 g
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g
8238	Glyphosphate in Oat Flour (High Level)	100 g
8239	Glyphosphate in Oat Flour (Low Level)	100 g
8404	Almond Flour for Allergen Detection	3 x 170 g
8405	Hazelnut Flour for Allergen Detection	5 x 8 g
8642a	FDA Saxitoxin Dihydrochloride Solution	5 x 1.2 mL

See Table 110.2 on the website for more information.

Agricultural Materials (powder form)

SRM	Description	Unit of Issue
1515	Apple Leaves	50 g
1547	Peach Leaves	50 g
1570a	Trace Elements in Spinach Leaves	60 g
1573a	Tomato Leaves	50 g
1575a	Trace Elements in Pine Needles (*Pinus taeda*)	50 g

See Table 110.4 on the website for more information.

Food & Agriculture

Fertilizers (powder form)

These SRMs are intended for use in the fertilizer industry as working standards.

SRM	Description	Unit of Issue
120c	Phosphate Rock (Florida)	90 g
193	Potassium Nitrate	90 g
194a	Ammonium Dihydrogen Phosphate	90 g
200b	Potassium Dihydrogen Phosphate (Fertilizer Standard)	90 g
694	Phosphate Rock, Western	90 g
695	Trace Elements in Multi-Nutrient Fertilizer	70 g
2429	Flue Gas Desulfurization Gypsum	200 g

See Table 110.5 on the website for more information.

Tobacco-Related Materials

SRM	Description	Unit of Issue
3222	Cigarette Tobacco Filler	20 x 10 g

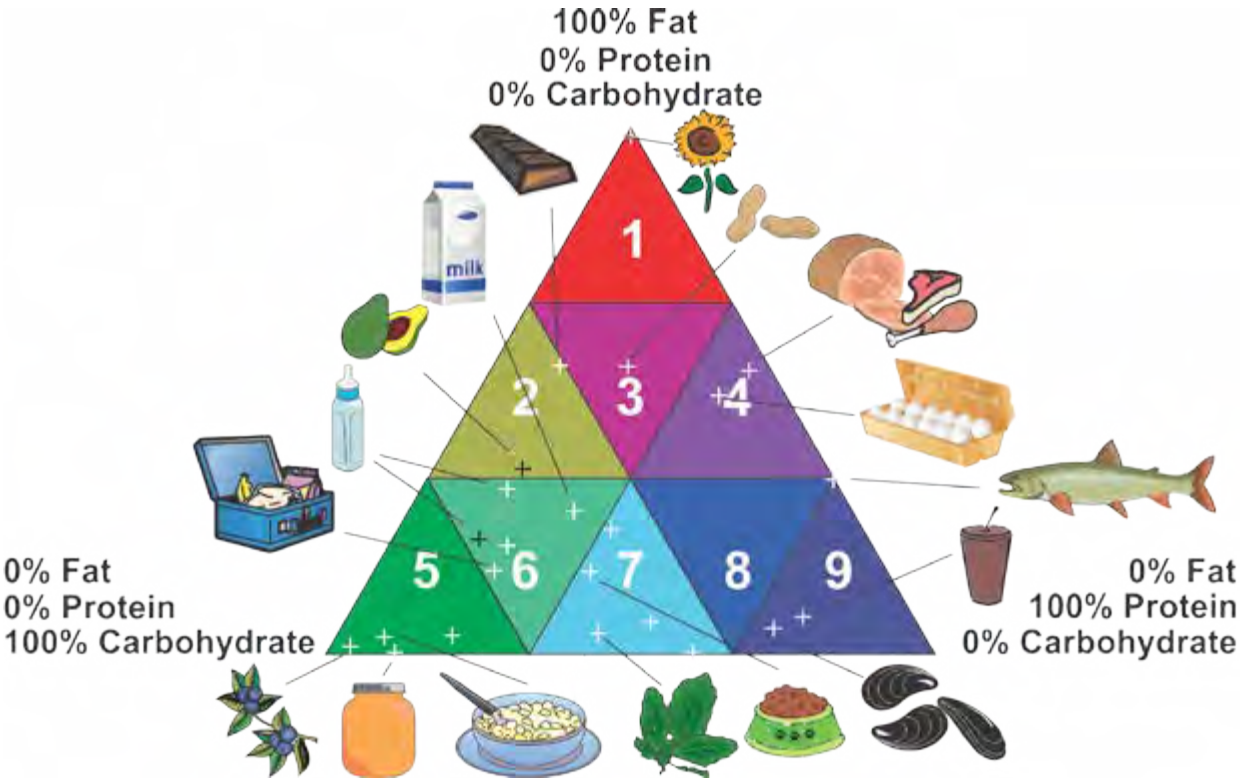
See Table 110.10 on the website for more information.

Dietary Supplement Materials (includes nutraceuticals and herbs)

SRM	Description	Unit of Issue
3232	Kelp Powder (*Thallus laminariae*)	3 x 5 g
3235	Soy Milk	10 x 10 mL
3246	*Ginkgo biloba* (Leaves)	5 x 3 g
3247	*Ginkgo biloba* (Extract)	5 x 1 g
3248	Ginkgo-Containing Tablets	5 x 1 g
3250	Saw Palmetto *(Serenoa repens)* Fruit	5 x 6 g
3251	Saw Palmetto *(Serenoa repens)* Extract	5 x 1 mL
3254	Green Tea (*Camellia sinensis*) Leaves	5 x 3 g
3255	Green Tea (*Camellia sinensis*) Extract	5 x 1 g
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g
3262	St. John's Wort (*Hypericum perforatum* L.) Aerial Parts	5 x 3.3 g
3268	Kudzu (*Pueraria montana var. lobata*) Extract	5 x 1 g
3275	Omega-3 and Omega-6 Fatty Acids in Fish Oil	3 ea 2 x 1.2 mL
3279	Chromium Dietary Supplement	5 x 6 g
3281	Cranberry (Fruit)	5 x 6 g
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
3283	Cranberry Extract	5 x 2.5 g
3284	Cranberry-Containing Solid Oral Dosage Form	5 x 2.5 g
3285	Mixed-Berry Containing Solid Oral Dosage Form	5 x 2.5 g
3289	Multivitamin Tablets	30 x 5 bottles
3291	Bilberry Extract	5 x 1 g
3294	Multielement Tablets	30 x 5 bottles
3299	Ground Turmeric (*Curcuma longa* L.) Rhizome	5 x 3 g
3300	Curcumin Extract of Turmeric (*Curcuma longa L.*) Rhizome	5 x 1 g
3384	Ground Asian Ginseng (*Panax ginseng C.A. Meyer*) Rhizome	5 x 3 g
3385	Asian Ginseng (*Panax ginseng*) Extract	5 x 1 g
3389	Ginsenosides Calibration Solutions	5 x 1 mL
3398	Ginger (*Zingiber officinale*) Rhizome	5 x 1.6 g
3530	Iodized Table Salt (*Iodide*)	1 x 200 g
8037	Krill Oil	3 x 4.5 mL
8183	Omega-3 and Omega-6 Fatty Acids in Botanical Oils	4 x 1.2 mL
8186	Soy Protein Isolate	5 x 10 g
8187	Soy Protein Concentrate	5 x 10 g
8188	Soy-Containing Solid Oral Dosage Form	5 x 2.6 g
8650	Ground Kudzu (*Pueraria montana var. lobata*) Rhizome	5 x 3 g
8644	Ginseng-Containing Solid Oral Dosage Form	5 x 2.6 g
8666	Ginger (*Zingiber officinale*) Extract	5 x 3 g

See Table 110.9 on the website for more information.

Distribution of SRMs in the AOAC Food Triangle



NIST classifies food-matrix SRMs based on fat, protein, and carbohydrate content using a triangle developed by AOAC INTERNATIONAL[1], based on the supposition that foods (and thus reference materials) within each sector will have similar properties and therefore will pose similar challenges in determination of the same nutrient. Preparation of food-matrix SRMs has been based on the distribution of foods from a typical US diet in the AOAC triangle, with a majority of common foods and SRMs categorized in sectors 5 and 6 (e.g., fruits, vegetables, cereals, and grains). Conversely, only a small fraction of foods and SRMs are categorized in sectors 1 through 4 (higher-fat foods like meats and nuts). Additional materials are also prepared based on suggestions from user communities.

1 SRM 1588c Organics in Fish Oil
SRM 3275 Fatty Acids in Fish Oils

2 SRM 2384 Baking Chocolate
SRM 2386 Avocado Powder

3 SRM 2387 Peanut Butter

4 SRM 1546a Meat Homogenate
SRM 1845a Whole Egg Powder

5 SRM 1568b Rice Flour
SRM 2383a Baby Food Composite
SRM 3233 Fortified Breakfast Cereal
SRM 3287 Blueberries
SRM 1869 Infant/Adult Nutritional Formula

6 SRM 1548b Typical Diet
SRM 1549a Whole Milk Powder
SRM 1849a Infant/Adult Nutritional Formula

7 SRM 1566b Oyster Tissue
SRM 2385 Slurried Spinach
SRM 3234 Soy Flour
SRM 3290 Dry Cat Food

9 SRM 1946 Lake Superior Fish Tissue
SRM 1947 Lake Michigan Fish Tissue
SRM 2974a Mussel Tissue
SRM 3252 Protein Drink Mix

[1] W.R. Wolf, K.W. Andrews (1995) *Fresenius J. Anal Chem* 352:73-76.

RM 8404 Almond Flour for Allergen Detection and RM 8405 Hazelnut Flour for Allergen Detection

Food allergies affect millions of Americans every year. Though medications can treat allergy symptoms, preventative measures such as accurate food labeling and stopping cross-contact with potential allergens during food preparation can help ensure people are not exposed to foods that might cause an allergic reaction.

To support these preventative measures, researchers from the National Institute of Standards and Technology (NIST) have developed tree nut reference materials — hazelnut and almond flours — that will help ensure accurate and consistent results for test kits that regulators and food manufacturers can use to detect tree nut allergens.

"The main purpose of these test kits is to ensure that a food product hasn't unintentionally come into contact with allergens while it was being made," said NIST chemist Melissa Phillips. In contrast with the more advanced regulatory tools for wheat and gluten, "there isn't a test to say if something is hazelnut free," she said. "Promoting awareness of cross-contact is the perspective we're coming from with these reference materials."

The U.S. Food and Drug Administration (FDA) regulates and provides guidance on assessing and managing allergens in food. Currently, the FDA recognizes eight food allergens: milk, eggs, fish, shellfish, soybeans, wheat, peanuts, and tree nuts. A law was signed last year that declared sesame as the ninth food allergen, but the addition will not become effective until the beginning of 2023.

Tree nut allergies affect an estimated 0.5% to 1% of the total U.S population. As the name implies, tree nuts come from trees that produce walnuts, hazelnuts, almonds, pistachios, pecans, cashews, Brazil nuts, and other common nuts.

Symptoms of tree nut or other food allergies can range from mild, such as breaking out in hives, to severe, including sudden drops in blood pressure, breathing difficulties and even death. The root causes of food allergies are often unknown, but the allergic reaction itself is caused when the body's immune system responds to proteins in that food. NIST's Food Protein Allergen Program crafted the first tree nut reference materials with numerous end users in mind, ranging from individual food scientists and test kit manufacturers to entire research organizations such as the Association of Official Analytical Collaboration (AOAC) International, which hosts a Gluten and Food Allergens Program for many different groups, some of which provided input and feedback on these reference materials. "The reference materials support agreement of results within the food allergen community for tree nut detection," said NIST chemist Ashley Beasley Green.

Current food packaging typically includes statements such as "contains milk" or "contains nut products" instead of listing how much of an allergen protein is present. To take the reporting of food allergens to the next level, the NIST program aims to support measurements of how much of a specific allergen protein is present, for example X amount of a specific almond protein. Knowing which specific proteins are present in a food can help physicians better understand and diagnose food allergies.

With the instruments and standards available now, determining the total amount of proteins by measuring each individual protein would be prohibitively time-consuming and expensive, so NIST researchers took an indirect approach that provided reasonable levels of accuracy. They worked with collaborators to measure the mass fraction of nitrogen atoms in the sample, which relates to how much of the hazelnut or almond proteins are in the sample. Researchers also confirmed that all of the proteins were from a single food source, and there was no cross-contact. Among other uses, the materials could help test kit manufacturers measure the total number of hazelnut and almond protein allergens in different food products and even compare their amounts.

Each reference material consists of a small pouch of five grams of the almond or hazelnut flour, with five pouches in a box. To produce them, researchers bought almond and hazelnut flour from different local stores and then tested it to ensure it did not have cross-contact with other tree nuts or contain other common allergens such as peanut and soy, said NIST chemist David Bunk.

Such cross-contact can frequently occur during the harvesting of tree nuts and at production plants through the use of shared equipment. For example, farmers could use the same agricultural equipment to harvest hazelnuts as they would pistachios, or a manufacturer could fail to properly clean equipment between making different types of flour.

The researchers worked with a company to properly package the reference material without creating additional risks of cross-contact. They then sent the materials to test kit developers who conducted their own tests on the reference materials, compared their results against a NIST-provided analysis, and provided feedback on their results and the tests they used. This feedback process helped NIST validate its own process and ensure the quality of the final product.

RM 8404 Almond Flour for Allergen Detection and RM 8405 Hazelnut Flour for Allergen Detection are available at NIST. Organizations wishing to purchase the reference materials can visit the NIST Standard Reference Materials page.

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Standard Reference Materials
for Chemical Composition

Geological Materials & Ores

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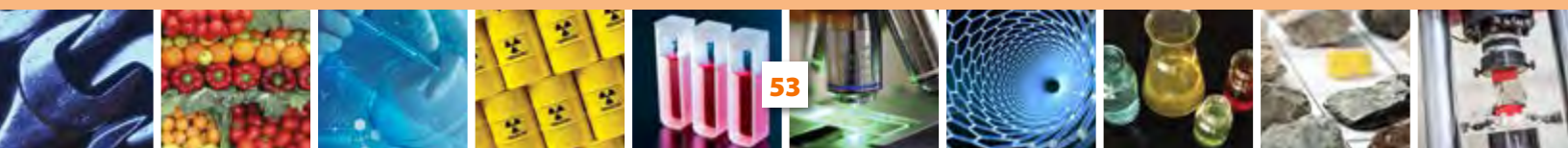

Geological Materials & Ores

Ores (powder form)

SRM	Description	Unit of Issue
25d	Manganese Ore	60 g
180	Fluorspar, High Grade	120 g
182	Lithium Ore (Petalite)	45 g
183	Lithium Ore (Lepidolite)	45 g
277	Tungsten Concentrate	100 g
330a	Copper Ore Mill Heads	90 g
331a	Copper Ore Mill Tails	40 g
423	Molybdenum Oxide Concentrate	50 g

See Table 111.2(1) on the website for more information.

Ores (powder form)

SRM	Description	Unit of Issue
670	Rutile Ore	90 g
690	Iron Ore Canada	100 g
691	Iron Oxide, Reduced	100 g
692	Iron Ore, Labrador	100 g
693	Iron Ore (Nimba)	100 g
886	Refractory Gold Ore	200 g
1835	Borate Ore	60 g
2430	Scheelite Ore	100 g

See Table 111.2(2) on the website for more information.

Ores (powder form) Phosphate Rocks and Bauxites

SRM	Description	Unit of Issue
69b	Bauxite (Arkansas)	60 g
120c	Phosphate Rock (Florida)	90 g
600	Bauxite, Australian-Darling Range	90 g
694	Phosphate Rock, Western	90 g
696	Bauxite, Surinam	60 g
697	Bauxite, Dominican	60 g
698	Bauxite, Jamaican	60 g

See Table 111.2(3) on the website for more information.

Clays (powder form)

SRM	Description	Unit of Issue
97b	Flint Clay	60 g
98b	Plastic Clay	60 g
679	Brick Clay	75 g

See Table 111.4 on the website for more information.

Rock and Minerals (powder form)

SRM	Description	Unit of Issue
1d	Limestone, Argillaceous	70 g
70b	Potassium Feldspar	40 g
81a	Glass Sand	75 g
88b	Dolomitic Limestone	75 g
99b	Soda Feldspar	40 g
165a	Glass Sand	75 g
278	Obsidian Rock	35 g
607	Potassium Feldspar	5 g
688	Basalt Rock	60 g
1413	High Alumina Sand	75 g
2429	Flue Gas Desulfurization Gypsum	200 g
2780a	Hard Rock Mine Waste	50 g

See Table 111.5 on the website for more information.

Refractories (powder form)

SRM	Description	Unit of Issue
76a	Burnt Refractory (Al_2O_3-40%)	75 g
77a	Burnt Refractory (Al_2O_3-60%)	75 g
78a	Burnt Refractory (Al_2O_3-70%)	75 g
198	Silica Brick	45 g
199	Silica Brick	45 g

See Table 111.6 on the website for more information.

Soils, Sediments, and Sludges (powder form)

SRMs 2586, 2587, 2700 2701, 2709a, 2710a, 2711a, 2781, 2782 also have non-certified leach data. See certificate for details and leach methods used.

SRM	Description	Unit of Issue
1646a	Estuarine Sediment	70 g
1944	New York/New Jersey Waterway Sediment	50 g
2586	Trace Elements in Soil Containing Lead From Paint (Nominal 500 mg/kg Lead)	55 g
2587	Trace Elements in Soil Containing Lead From Paint (Nominal 3000 mg/kg Lead)	55 g
2700	Hexavalent Chromium in Contaminated Soil (Low Level)	75 g
2701	Hexavalent Chromium in Contaminated Soil (High Level)	75 g
2702	Inorganics in Marine Sediment	50 g
2703	Sediment for Solid Sampling (Small Sample) Analytical Techniques	5 g
2706	New Jersey Soil, Organics and Trace Elements	50 g
2709a	San Joaquin Soil	50 g
2710a	Montana I Soil	50 g
2711a	Montana II Soil	50 g
2780a	Hard Rock Mine Waste	50 g
2781	Domestic Sludge	40 g
2782	Industrial Sludge	70 g
8704	Buffalo River Sediment	50 g

See Table 111.7 on the website for more information.

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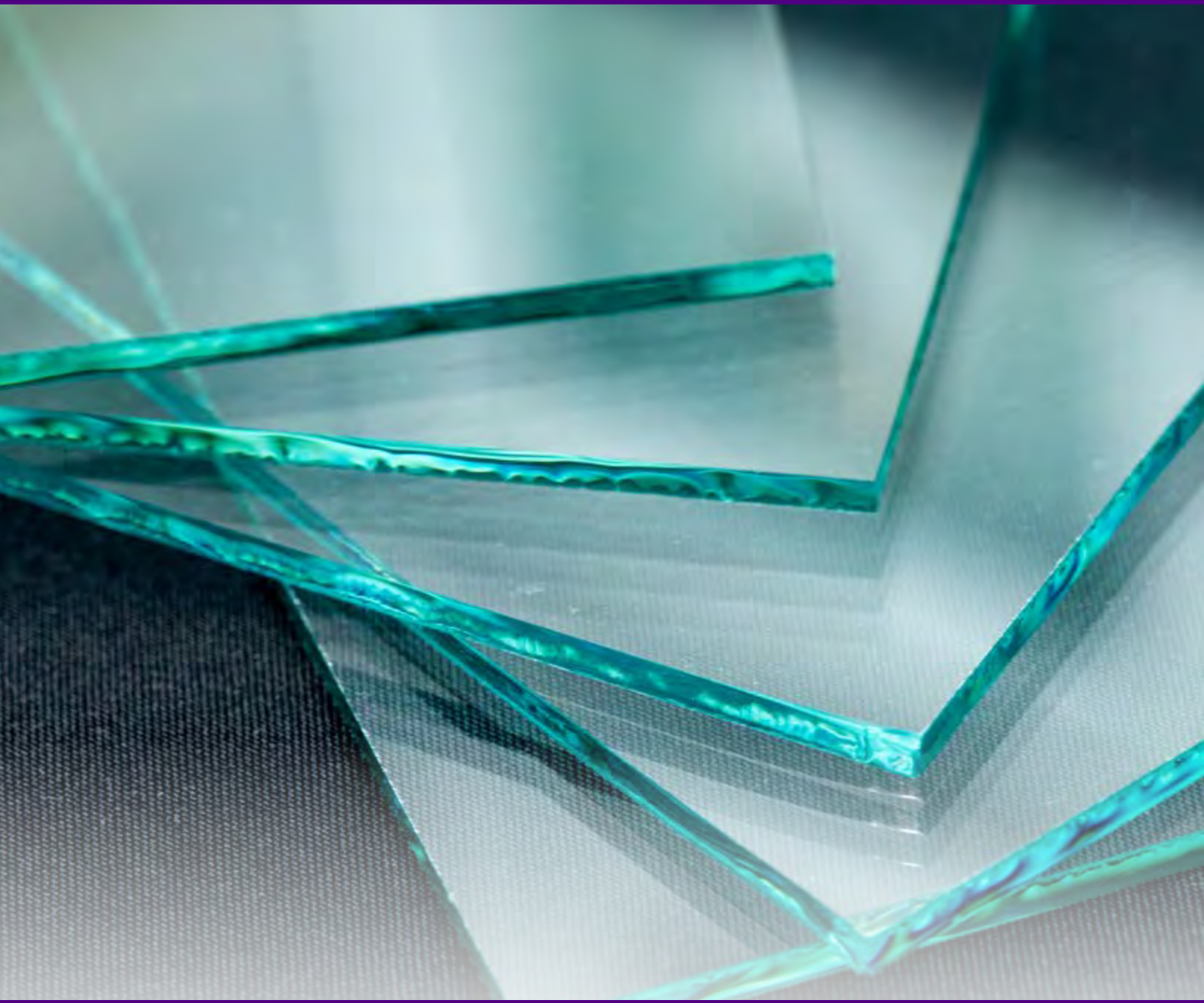
Standard Reference Materials for Chemical Composition

Ceramics & Glasses



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Ceramics & Glasses

Nitrides (powder form)

SRM	Description	Unit of Issue
8983	Silicon Nitride	4.5 g

See Table 112.1 on the website for more information.

Cemented Carbides (powder form)

SRMs 887-889 are prepared from sintered tungsten carbide base materials.

SRM	Description	Unit of Issue
887	Cemented Carbide (W-83,Co-10)	100 g
888	Cemented Carbide (W-64,Co-25,Ta-5)	100 g
889	Cemented Carbide (W-75,Co-9,Ta-5,Ti-4)	100 g

See Table 112.2 on the website for more information.

Glasses (powder and solid forms)

SRM	Description	Unit of Issue
80a	Soda-Lime Glass (beads)	45 g
81a	Glass Sand	75 g
89	Glass, Lead Barium	45 g
92	Soda-Lime Glass, Low Boron (powder)	45 g
93a	Borosilicate Glass	1 wafer
165a	Glass Sand	75 g
606	Trace Elements in Basalt Glass	glass mounted in epoxy
620	Soda-Lime, Flat	set (3)
1411	Soft Borosilicate Glass	set (10)
1412a	Multicomponent Glass (disk)	set (2)
1413	High Alumina Sand	75 g
1830	Soda-Lime Float Glass (Nominal Mass Fraction 0.1 % Al_2O_3)	3 platelets
1831	Soda-Lime Sheet Glass (Nominal Mass Fraction 1.2 % Al_2O_3)	3 platelets
2696	Silica Fume (powder)	70 g

See Table 112.3 on the website for more information.

Trace Elements (wafer form)

These SRMs are for calibrating instruments and evaluating analytical techniques used to determine trace elements in inorganic matrices. NOTE: The nominal glass composition of SRMs 610 through 617 is 72 % SiO_2, 12 % CaO, 14 % Na_2O, and 2% Al_2O_3.

SRM	Description	Unit of Issue
606	Trace Elements in Basalt Glass	glass mounted in epoxy
610	Trace Elements in Glass	4 wafers
611	Trace Elements in Glass	4 wafers
612	Trace Elements in Glass	4 wafers
613	Trace Elements in Glass	4 wafers
614	Trace Elements in Glass	4 wafers
616	Trace Elements in Glass	4 wafers
617	Trace Elements in Glass	4 wafers

See Table 112.4 on the website for more information.

Standard Reference Materials for Chemical Composition

Cement

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Cement

Cements and Related Materials (powder form)

These portland (1880b, 1881b, 1884b, 1885b, 1886a, 1887b, 1888b, and 1889b) and calcium aluminate (1882a and 1883a) cement SRMs are for x-ray spectroscopic and chemical analysis of cements and related materials.

SRM	Description	Unit of Issue
633a	Portland Cement	4 x 5 g
634a	Portland Cement	100 g
635a	Portland Cement (Blended with Slag)	5 x 5 g
1880b	Portland Cement	5 x 5 g
1881b	Portland Cement (Blended with Fly Ash)	5 x 5 g
1882a	Calcium Aluminate Cement	4 x 5 g
1883a	Calcium Aluminate Cement	4 x 5 g
1884b	Portland Cement	5 x 4.5 g
1885b	Portland Cement	5 x 5 g
1886a	Portland Cement (White Portland Cement with Low Iron)	4 x 5 g
1886b	White Portland Cement	5 x 5 g
1887b	Portland Cement	5 x 4 g
1888b	Portland Cement	4 x 5 g
1889b	Portland Cement (Blended with Limestone)	5 x 5 g
2429	Flue Gas Desulfurization Gypsum	200 g
2696	Silica Fume	70 g

See Table 113.1 on the website for more information.

Portland Cement Clinkers (solid form)

These SRMs provide certified values for the abundance of major phases in cement clinkers, i.e., the percentages of alite (C_3S), belite (C_2S), aluminate (C_3A), and ferrite ($C_2(A,F)$). NOTE: In cement chemist notation, C=CaO, S=SiO_2, A=Al_2O_3 and F=Fe_2O_3.

SRM	Description	Unit of Issue
2686a	Portland Cement Clinker	4 x 7 g
2687a	Portland Cement Clinker	5 x 8 g
2688	Portland Cement Clinker	3 x 10 g

See Table 113.2 on the website for more information.

Standard Reference Materials
for Chemical Composition

Engine Wear Materials

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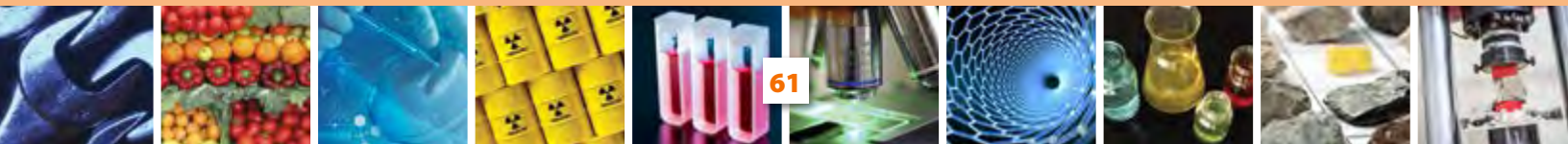


Engine Wear

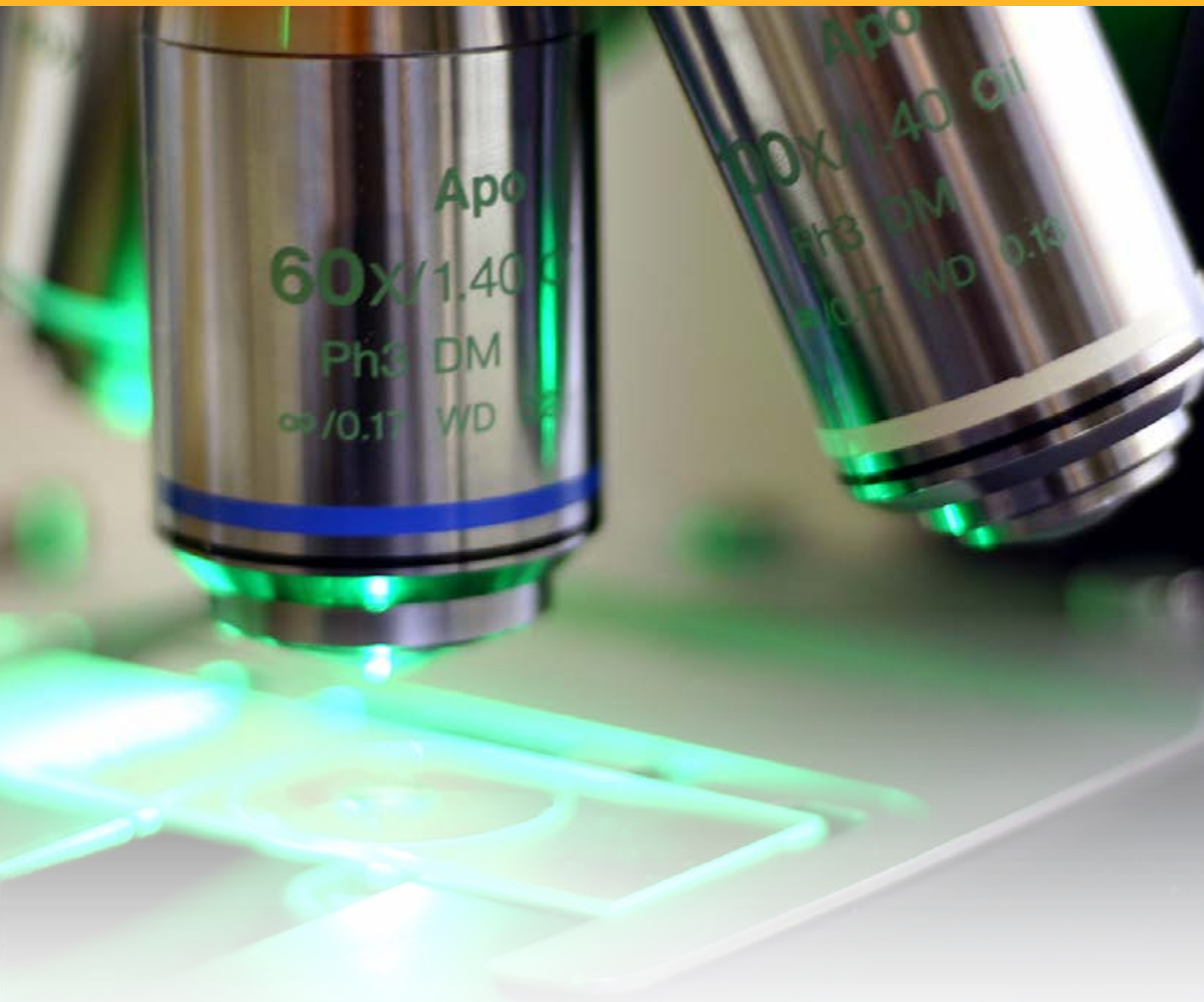
Lubricating Oils

SRM	Description	Unit of Issue
1085c	Wear Metals in Lubricating Oil	set (10)
1818a	Chlorine in Lubricating Base Oils	set (5)
1819a	Sulfur in Lubricating Base Oil	set (5)
1848	Lubricating Oil Additive Package	100 g

See Table 114.2 on the website for more information.

Standard Reference Materials for Chemical Composition

Forensics



Forensics

Ethanol Solutions

SRM	Description	Unit of Issue
1828c	Ethanol-Water Solutions (six levels)	set (6)
2891	Ethanol-Water Solution (Nominal Mass Fraction 0.02 %)	5 x 1.2 mL
2892	Ethanol-Water Solution (Nominal Mass Fraction 0.04 %)	5 x 1.2 mL
2893a	Ethanol-Water Solution (Nominal Mass Fraction 0.08 %)	5 x 1.2 mL
2894	Ethanol-Water Solution (Nominal Mass Fraction 0.1 %)	5 x 1.2 mL
2895	Ethanol-Water Solution (Nominal Mass Fraction 0.2 %)	5 x 1.2 mL
2896	Ethanol-Water Solution (Nominal Mass Fraction 0.3 %)	5 x 1.2 mL
2897a	Ethanol Water Solution (Nominal Mass Fraction 2 %)	5 x 10 mL
2898a	Ethanol Water Solution (Nominal Mass Fraction 6 %)	5 x 10 mL
2899a	Ethanol-Water Solution (Nominal Mass Fraction 25 %)	5 x 10 mL
2900	Ethanol-Water Solution (Nominal Mass Fraction 95.6 %)	5 x 10 mL

See Table 105.3 on the website for more information.

Drugs of Abuse, Smoking Metabolites, and Contaminates (urine)

SRM	Description	Unit of Issue
1507b	THC-9-COOH in Freeze-Dried Urine	set (3)
2926	Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 0.25 mL
2927	5N-Labeled Recombinant Human Insulin-like Growth Factor 1 (Frozen)	3 x 50 µL
3671	Nicotine Metabolites in Human Urine (Frozen)	3 x 10 mL
3672	Organic Contaminants in Smokers' Urine (Frozen)	5 x 10 mL
3673	Organic Contaminants in Non-Smokers' Urine (Frozen)	5 x 10 mL

See Table 105.7 on the website for more information.

Crime Scene Investigations

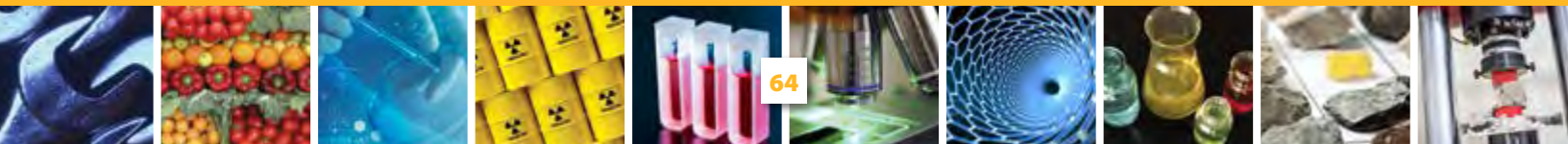
SRM	Description	Unit of Issue
2460a	Standard Bullet Replica	each
2461	Standard Cartridge Case	each

See Table 109.4 on the website for more information.

DNA Profiling, Nucleic Acid Materials, and Monoclonal Antibody

Standard Reference Material (SRM) 2372a is intended primarily for use in the value assignment of human genomic deoxyribonucleic acid (DNA) forensic quantitation materials. SRM 2372a consists of three well-characterized human genomic DNA materials in pH 8.0 aqueous buffer. The components are derived from human buffy coat samples and labeled A, B, and C. Component A consists of genomic DNA from a single male donor. Component B consists of genomic DNA from a single female donor. Component C consists of a gravimetric mixture of genomic DNA (1 part male donor to 3 parts female donor). SRM 2372a is certified for copy number and DNA concentration (ng/µL). A unit of the SRM consists of one sterile 0.5 mL vial of each component, each vial containing approximately 55 µL of DNA solution. Each of these vials is labeled and is sealed with a color -coded screw cap.

SRM 2374 is intended for use as a template for ribonucleic acid (RNA) control synthesis using in vitro transcription (IVT). These RNA controls are designed to be used as external, or "spike-in", controls to support confidence in gene expression assays by providing quantitative assessment of the technical performance of a gene expression measurement. A unit of the SRM contains 96 different 0.5 mL polypropylene tubes, with approximately 10 µg of dehydrated plasmid deoxyribonucleic acid (DNA) in each tube. Depending on the strand transcribed, the controls will mimic either "sense" or "anti-sense" eukaryotic messenger RNA (mRNA).



Forensics

SRM 2392 is intended to provide quality control when performing the polymerase chain reaction (PCR) and sequencing of human mitochondrial DNA (mtDNA) for forensic identifications, medical diagnosis, or mutation detection. It may also be used as a control when amplifying (PCR) and sequencing any DNA. SRM 2392 Mitochondrial DNA Sequencing contains DNA extracted from two cell lines plus cloned DNA from a region that is difficult to sequence. The certificate accompanying the SRM details the base pair sequences of the DNA, and the sequences of 58 unique primer sets which permit the amplification and sequencing of any specific area, or the entire human mitochondrial DNA (strand). SRM 2392 consists of three frozen components packaged in one box. For further information see: SP260-155.

RMs 8366, 8375, 8391, 8392, 8393, and 8398 are intended for assessing performance of human genome sequencing, including whole genome sequencing, whole exome sequencing, and more targeted sequencing such as gene panels. Specifically, the material can be used to obtain estimates of true positives, false positives, true negatives, and false negatives for variant calls.

SRM	Description	Unit of Issue
2365	BK Virus DNA Quantitative Standard	1 x 110 µL
2366a	Cytomegalovirus DNA (Towne$_{\Delta 147}$ BAC) for DNA Measurements	1 x 150 µL
2372a	Human DNA Quantitation Standard	3 x 55 µL
2373	Genomic DNA Standards for *HER2* Measurements	5 vials, 1 each
2374	DNA Sequence Library for External RNA Controls	96 tubes
2391d	PCR-Based DNA Profiling Standard	5 vials
2392	Mitochondrial DNA Sequencing (Human)	set (3)
2393	CAG Repeat Length Mutation in Huntington's Disease	set (6)
8366	*EGFR* and *MET* Gene Copy Number Standards for Cancer Measurements	6 x 100 µL
8375	Microbial Genomic DNA Standards for Sequencing Performance Assessment (MG-001, MG-002, MG-003, MG-004)	4 vials, 1 each
8376	Microbial Pathogen DNA Standards for Detection and Identification	20 tubes
8391	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	1 vial
8391 (QTY10)	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	10 vials
8392	Human DNA for Whole-Genome Variant Assessment (Family Trio of Eastern European Ashkenazi Jewish Ancestry) (HG-002, HG-003, HG-004)	3 vials, 1 each
8393	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	1 vial
8393 (QTY10)	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	10 vials
8398	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	1 vial
8398 (QTY10)	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	10 vials

See Table 105.8 on the website for more information.

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Standard Reference Materials for Physical Composition

Ion Activity

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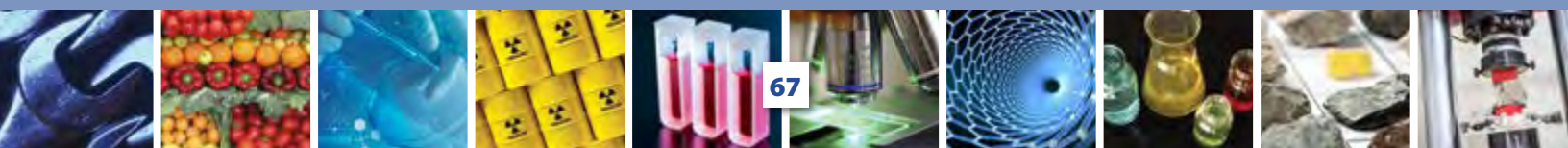

Ion Activity

pH Calibration (powder form)

These SRMs are used to prepare solutions of known hydrogen ion activity to calibrate commercial pH instruments. SRMs 186g and 191d are each certified for use as an admixture only. SRM 186g (186-I-g and 186-II-g) may be used to prepare solutions with a pH of 6. 8640 at 25°C, or physiological buffer solutions with a pH of 7.4157 at 25°C.

SRM	Description	Unit of Issue
185i	Potassium Hydrogen Phthalate	60 g
186g	Potassium Dihydrogen Phosphate (186-I-g) Disodium Hydrogen Phosphate (186-II-g)	1 x 30 g; 1 x 45 g
187f	Sodium Tetraborate Decahydrate (Borax)	30 g
188	Potassium Hydrogen Tartrate	60 g
189c	Potassium Tetroxalate Dihydrate	65 g
191d	Sodium Bicarbonate (191d-I) Sodium Carbonate (191d-II)	1 x 25 g; 1 x 30 g
2193a	Calcium Carbonate [used as saturated $Ca(OH)_2$ solution]	30 g

See Table 201.1 on the website for more information.

pD Calibration (powder form)

These SRMs are for the preparation of solutions of known deuterium ion activity to calibrate pH instruments to indicate pD data. SRMs 2186-I and 2186-II, and 2191a and 2192a are certified for use as admixtures only.

SRM	Description	Unit of Issue
2185	Potassium Hydrogen Phthalate pD Standard	60 g
2186I	Potassium Dihydrogen Phosphate	30 g
2186II	Disodium Hydrogen Phosphate	30 g
2191a	Sodium Bicarbonate	30 g
2192a	Sodium Carbonate	30 g

See Table 201.3 on the website for more information.

Ion-Selective Electrode Calibration (powder form)

These SRMs 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 mol/L.

SRM	Description	Unit of Issue
2201	Sodium Chloride (Ion-Selective)	125 g
2203	Potassium Fluoride (Standard for Ion-Selective Electrodes)	125 g

See Table 201.4 on the website for more information.

Standard Reference Materials for Physical Composition

Polymeric Properties

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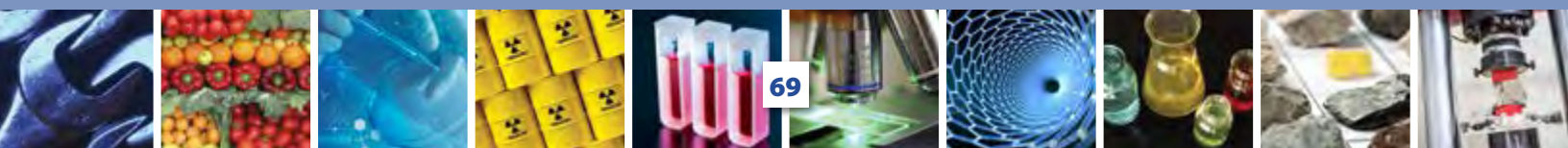

Polymeric Properties

Polymers (liquid, pellet, and powder forms)

These SRMs are for the calibration of instrumentation used in polymer technology science for the determination of molecular weight, and molecular weight distribution and as characterized samples for other physical properties of polymers.

Polymers

SRM	Description	Unit of Issue
705a	Polystyrene (Narrow Molecular Weight Distribution)	5 g
706a	Polystyrene (Broad Molecular Mass Distribution)	18 g
1473c	Low Density Polyethylene Resin	60 g
1474b	Polyethylene Resin	60 g
1475a	Polyethylene, Linear	50 g
1476a	Branched Polyethylene Resin	12 g
1478	Polystyrene (Narrow Molecular Weight Distribution)	2 g
1479	Polystyrene (Narrow Molecular Weight Distribution)	2 g
1482a	Linear Polyethylene Narrow Molecular Mass Distribution (Nominal Mass-Average Molar Mass of 13 600 g/mol)	0.3 g
1483a	Linear Polyethylene Narrow Molecular Mass Distribution (Nominal Mass-Average Molar Mass of 32 100 g/mol)	0.3 g
1484a	Linear Polyethylene	0.3 g
1488	Poly (Methyl Methacrylate) (29 K Narrow Molecular Weight Distribution)	2 g
2885	Polyethylene (Mass-Average Molar Mass [Mw] 6 280 g/mol)	0.3 g
2886	Polyethylene (Mass-Average Molar Mass [Mw] 87 000 g/mol)	0.3 g
2887	Polyethylene (Mass-Average Molar Mass [Mw] 196 400 g/mol)	0.3 g

See Table 202.1 on the website for more information.

Melt Flow Rate

SRM	Description	Unit of Issue
1496	Unpigmented Polyethylene Gas Pipe Resin	0.9 kg

See Table 202.1 on the website for more information.

Viscosity

SRM	Description	Unit of Issue
2492	Bingham Paste Mixture for Rheological Measurements	kit for two batches
2493	Bingham Mortar Mixture for Rheological Measurements	kit for two batches
2497	Bingham Concrete Mixture for Rheological Measurements	kit for one batch

See Table 202.1 on the website for more information.

Elements in Polymers

SRM	Description	Unit of Issue
2855	Additive Elements in Polyethylene	3 Levels, 80 g each
2859	Restricted Elements in Polyvinyl Chloride	25 g
2861	Restricted Elements in Polyvinyl Chloride	25 g

See Table 202.2 on the website for more information.

Standard Reference Materials for Physical Composition

Thermodynamic Properties

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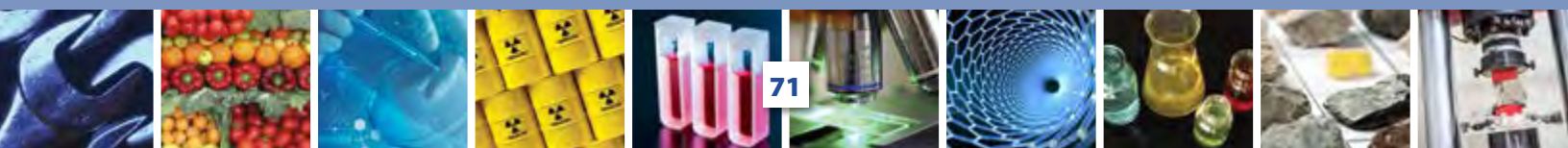


Thermodynamic

Combustion Calorimetry (powder form)

These SRMs are for use as standards for calibration of combustion bomb calorimeters used in checking the performance of apparatus, and analytical procedures.

SRM	Description	Unit of Issue
39j	Benzoic Acid Calorimetric Standard	30 g
1657	Synthetic Refuse-Derived Fuel Combustion Calorimetric Standard	100 g
2152	Urea Combustion Calorimetric Standard	25 g

See Table 203.1 on the website for more information.

Differential Scanning Calorimetry and Differential Thermal Analysis

These SRMs are intended for calibration and validation of differential scanning calorimeters, differential thermal analyzers, and similar instruments.

SRM	Description	Unit of Issue
2232	Indium DSC Calibration Standard - Temperature and Enthalpy of Fusion	1 g
2234	Gallium for Thermal Analysis	2 g
2235	Bismuth for Thermal Analysis	1.5 g

See Table 203.5 on the website for more information.

Enthalpy and Heat Capacity

SRM	Description	Unit of Issue
705a	Polystyrene (Narrow Molecular Weight Distribution)	5 g
720	Sapphire Heat Capacity	15 g
781D2	Molybdenum - Heat Capacity (rod form)	6.4 mm D

See Table 203.5 on the website for more information.

Thermal Analysis Purity Set

SRM 1514 is for evaluating methods of determining purity by differential scanning calorimetry. It consists of pure phenacetin and phenacetin doped with p-aminobenzoic acid.

SRM	Description	Unit of Issue
1514	Thermal Analysis Purity Set	set (4)

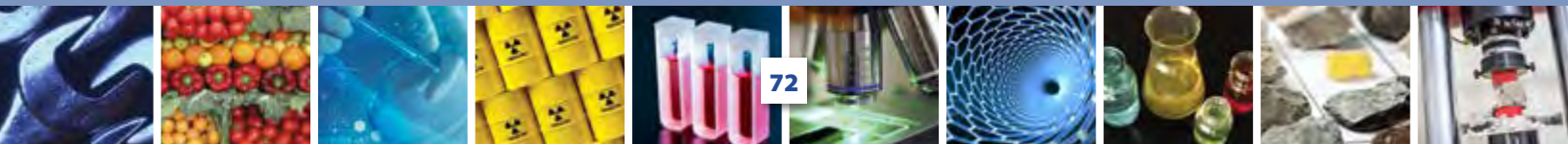
See Table 203.5 on the website for more information.

Defining Fixed Point, International Temperature Scale of 1990, ITS-90 (solid forms)

These SRMs are for use in preparing defining fixed points of the International Temperature Scale of 1990, ITS-90.

SRM	Description	Unit of Issue
740a	Zinc Freezing-Point Standard 419.527 °C	200 g
741a	Tin Freezing-Point Standard	200 g

See Table 203.8 on the website for more information.



Thermodynamic

Reference Points (solid forms)

These moderate purity SRMs are for use in preparing reference point devices and for calibrating thermometers, thermocouples, and other temperature measuring devices.

SRM	Description	Unit of Issue
742	Aluminum Oxide Pyrometric Standard	10 g
8172	Copper Freezing-Point Reference (1084.6 °C)	450 g
8173	Lead Freezing-Point Reference (327.453 °C)	600 g

See Table 203.10 on the website for more information.

Freezing Point, Melting Point, and Triple Point Cells (solid forms)

These SRM fixed point devices are for use in the realization of internationally accepted secondary reference points and/or triple points. They are not intended for calibration of differential scanning calorimeters.

SRM	Description	Unit of Issue
1972	1,3-Dioxolan-2-one Triple Point Standard	60 g
8174	Gallium Melting-Point Reference (29.7646 °C) (fixed-point cell)	25 g

See Table 203.11 on the website for more information.

Thermocouple Materials and Thermometers

SRM	Description	Unit of Issue
1749	Gold versus Platinum Thermocouple Certified Thermometer	each
1967a	High-Purity Platinum Thermoelement (platinum wire)	0.51 mm D x 1 m L

See Table 203.13 on the website for more information.

Thermal Conductivity of Iron (rod form), Fibrous Glass, and Polystyrene

SRM	Description	Unit of Issue
1450e	Thermal Conductivity - Fibrous Glass Board	each
1453	Thermal Conductivity - Expanded Polystyrene Board	each
8420	Electrolytic Iron	0.64 cm D x 5 cm L

See Table 203.15 on the website for more information.

Thermal Expansion of Metal, Glass (rod form)

SRM	Description	Unit of Issue
731L1	Borosilicate Glass - Thermal Expansion	5 cm
731L2	Borosilicate Glass - Thermal Expansion	10 cm
731L3	Borosilicate Glass - Thermal Expansion	15 cm

See Table 203.16 on the website for more information.

Thermal Resistance Properties of Fibrous Glass and Fumed Silica Board

SRM	Description	Unit of Issue
1452	Thermal Resistance - Fibrous Glass Blanket for High-Precision Measurements	each
1459	Thermal Resistance - Fumed Silica Board	each

See Table 203.17 on the website for more information.

Thermoelectric Materials

SRM	Description	Unit of Issue
3451	Low-Temperature Seebeck Coefficient Standard	bar
3452	High-Temperature Seebeck Coefficient Standard (295 K to 900 K)	bar

See Table 203.18 on the website for more information.

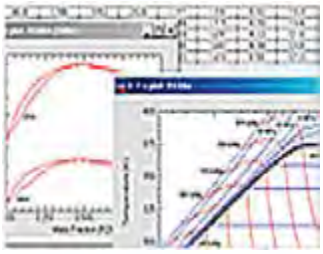
NIST Measurement Services Websites of Interest

Standard Reference Materials

Standard Reference Materials
https://www.nist.gov/srm

Historical Archived Certificates/Reports of Investigation
https://shop.nist.gov/ccrz__CCPage?pageKey=SRMArchive&cclcl=en_US

Standard Reference Data



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Calibrations

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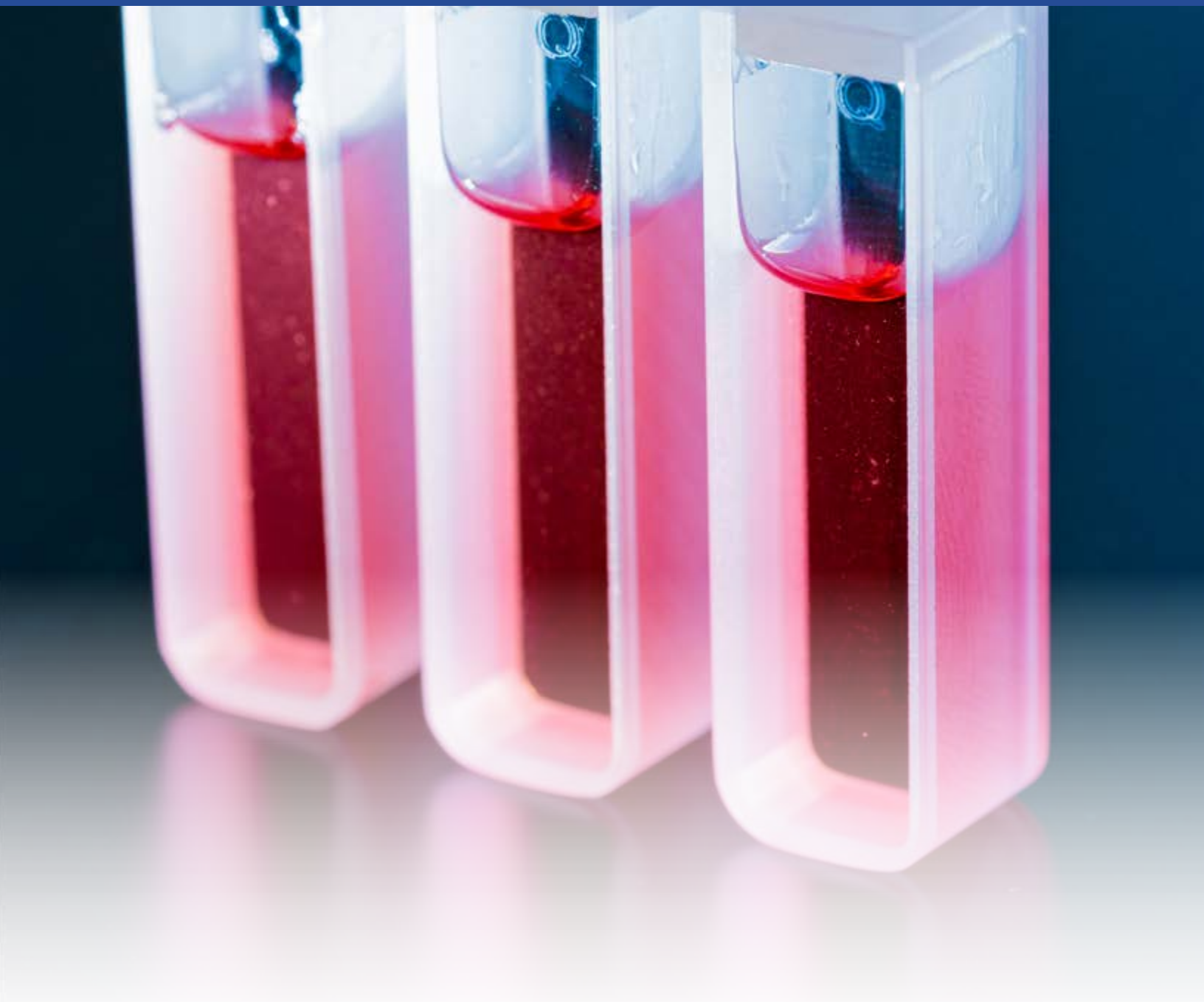
Standard Reference Materials for Physical Composition

Optical Properties



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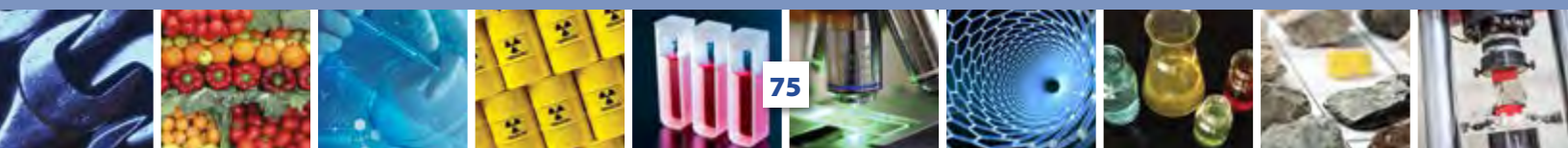


Optical Properties

Molecular Absorption (film, filter, solid, and solution forms)

The optical SRMs for spectrophotometry are certified transfer standards that fall into three general categories: transmittance, wavelength, and stray radiant energy; each of which addresses a specific instrumental parameter of an absorption spectrometer that must be in control for accurate optical transmittance measurements. To obtain optimum verification results, each SRM must be used within the specified range of conditions for which it is intended.

SRM	Description	Unit of Issue
931h	Liquid Absorbance Filters, UV-VIS	set (12)
1921b	IR Transmission Wavelength/Wavenumber Standard (Polystyrene Film)	1 card
1928	Infrared Specular High Reflectance Standard (Nominal Diameter 51 mm)	disk
1929	Infrared High Reflectance Specular Standard (Nominal Diameter 25 mm)	disk
2031c	Metal-on-Fused-Silica Neutral Density Filters (250 nm to 635 nm)	set (3)
2034	Holmium Oxide Solution Wavelength Standard from 240 nm to 650 nm	cuvette
2035b	Ultraviolet-Visible-Near-Infrared Wavelength/Wavenumber Transmission Standard	each
2036	Near Infrared Wavelength/Wavenumber Reflection Standard	each

See Table 204.1 on the website for more information.

Infrared Reflectance (solid form)

SRM	Description	Unit of Issue
2036	Near Infrared Wavelength/ Wavenumber Reflection Standard	each

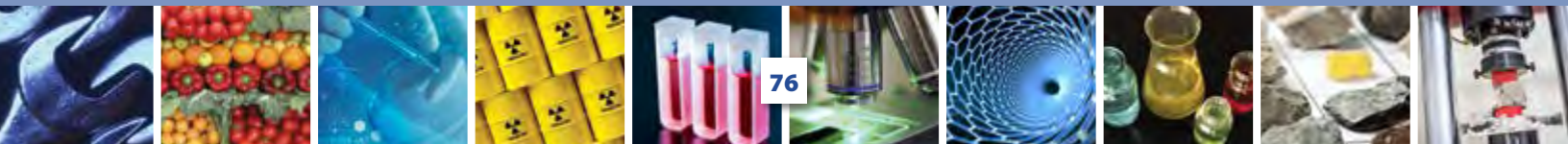
See Table 204.2 on the website for more information.

Optical Rotation (powder form)

SRM 17g is intended for calibrating or checking polarimetric apparatus. In aqueous solution, the optical rotation of SRM 17g is value assigned at four wavelengths.

SRM	Description	Unit of Issue
17g	Sucrose Optical Rotation	60 g

See Table 204.2 on the website for more information.



Optical Properties

Fluorescence and Raman Spectroscopy

SRM	Description	Unit of Issue
1932	Fluorescein Solution	3 x 2 mL
1934	Fluorescent Dyes for Quantitative Flow Cytometry (Visible Spectral Range)	set (4)
2241	Relative Intensity Correction Standard for Raman Spectroscopy: 785 nm Excitation	each
2242a	Relative Intensity Correction Standard for Raman Spectroscopy: 532 nm Excitation	each
2244	Relative Intensity Correction Standard for Raman Spectroscopy: 1064 nm Excitation	each
2246	Relative Intensity Correction Standard for Raman Spectroscopy: 830 nm Excitation	each
2940a	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Orange Emission	each
2941a	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Green Emission	each
2942	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Ultraviolet Emission	each
2943	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Blue Emission	each
2944	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Red Emission	each

See Table 204.2 on the website for more information.

Photography (chart form)

SRM 1010a is used to test the resolving power of cameras or of whole microcopying systems. It consists of 5 charts printed photographically on paper, that have 26 high-contrast, 5-line patterns ranging in spatial frequency of 1 mm^{-1} to 18 mm^{-1}.

SRM	Description	Unit of Issue
1010a	Microcopy Resolution Test Charts	set (5)

See Table 204.2 on the website for more information.

Optical Properties

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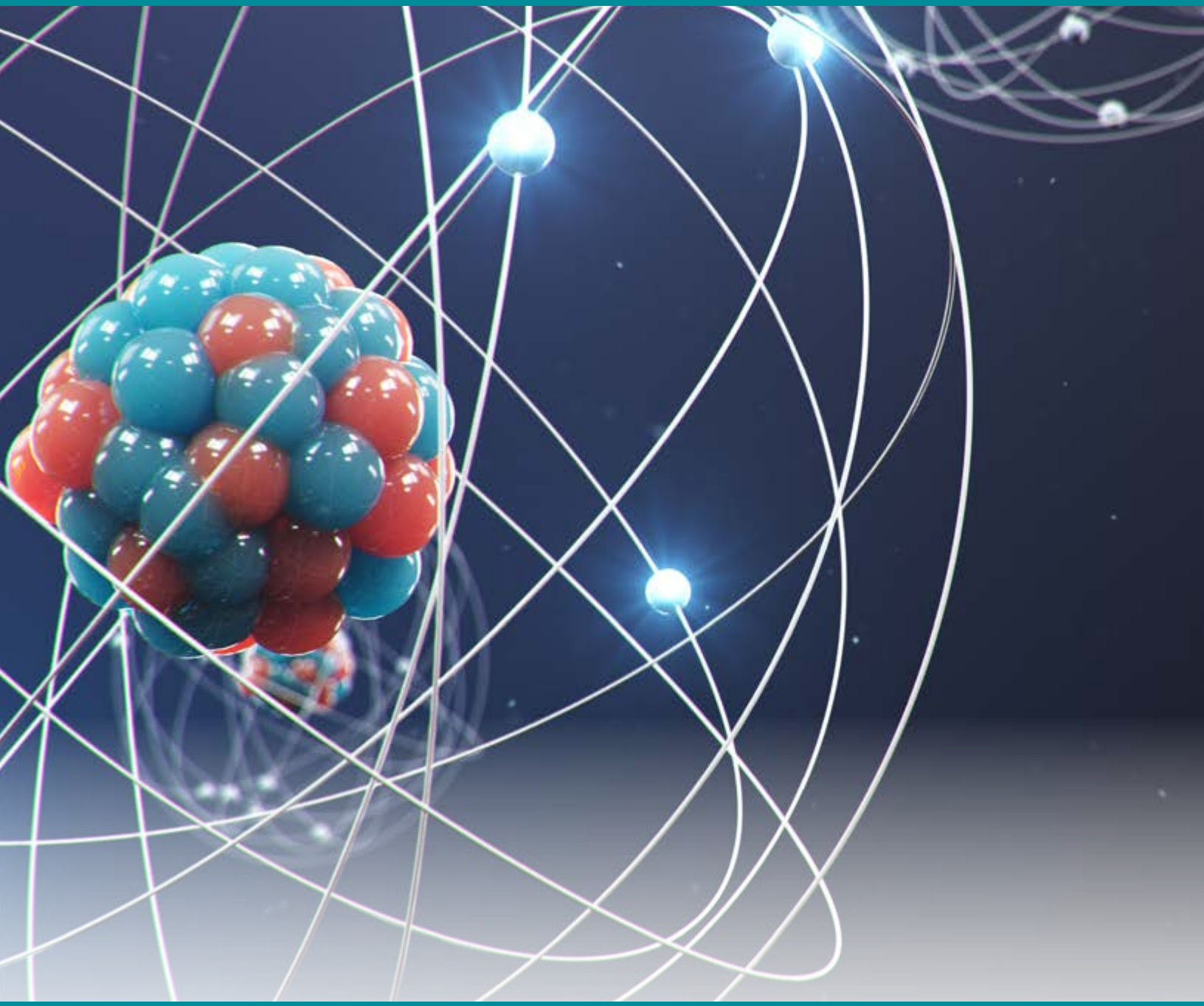
Standard Reference Materials for Physical Composition

Radioactivity



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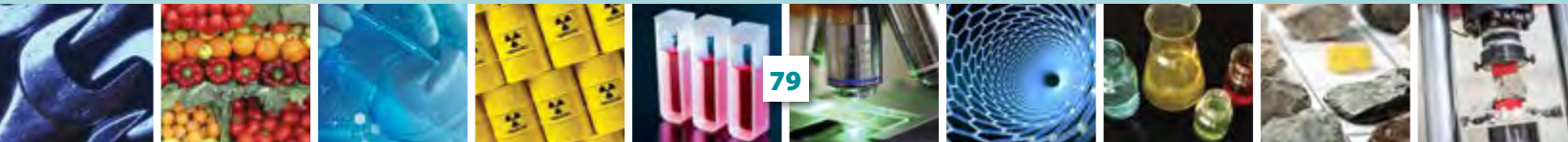


Radiation Dosimetry (wire form)

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

Radionuclide Calibration Services

Radioactive SRM Purchasing Instructions & License Certification Form

Radioactive SRMs-General Info

SRM	Description	Unit of Issue
953	Neutron Density Monitor Wire	1 m

See Table 205.1 on the website for more information.

Special Nuclear Materials

The U.S. Department of Energy New Brunswick Laboratory issues special nuclear reference materials as NBL Certified Reference Materials (CRMs). These CRMs include the plutonium and uranium assay, and isotopic materials previously issued by the National Institute of Standards and Technology. All orders or inquiries should be addressed to: U.S. Department of Energy, New Brunswick Laboratory, 9800 S. Cass Avenue, Bldg. 350, Argonne, IL 60439-4899. Attn: Reference Materials Sales; Phone (630) 252-2767; Fax (630) 252-6256; E-mail usdoe.nbl@ch.doe.gov

Radiopharmaceuticals (solution and gaseous forms)

These SRMs are intended for the calibration of radioactivity-measuring instruments. They are calibrated in terms of activity per gram of solution (except SRM 4415, which is calibrated in terms of activity). Each SRM is contained in a 5 mL flame-sealed glass ampoule and, except for SRM 4415, consists of the radionuclide dissolved in an aqueous solution (usually acidic). These SRMs are produced in collaboration with the NRMAP, Inc. and, because of the short half lives, are available only at specific times.

When an import permit for radioactive material is required of a customer outside the U.S., NIST must have a copy to complete an order and facilitate shipment.

SRM	Description	Unit of Issue	Approximate Activity	Half Life (days)	Month Produced*
4401L	Iodine-131 Radioactivity Standard	5 mL	5 MBq/g	8	February
4404L	Thallium-201 Radioactivity Standard	5 mL	10 MBq/g	3	June
4407L	Iodine-125 Radioactivity Standard	5 mL	5 MBq/g	59.4	December
4410H	Technetium-99m Radioactivity Standard	5 mL	1.0 GBq/g	0.3	September
4412L	Molybdenum-99 Radioactivity Standard	5 mL	10 MBq/g	2.74	April
4415L	Xenon-133 Radioactivity Standard	5 mL	150 MBq/g	5.243	September
4416L	Gallium-67 Radioactivity Standard	5 mL	5 MBq/g	3.3	May
4417L	Indium-111 Radioactivity Standard	5 mL	10 MBq/g	2.8	August
4427L	Yttrium-90 Radioactivity Standard	5 mL	5 MBq/g	2.67	October

See Table 205.5 on the website for more information.

*Check the website for details as to the order date deadline for these SRMs.
For information on the NRMAP/NIST Program, see https://www-s.nist.gov/srmors/certificates/documents/NRMAP-PharmBroch2012.pdf

Radioactive Solutions

These SRMs are intended for the calibration of radioactivity measuring instruments and for the monitoring of chemical and geochemical processes. They are calibrated in terms of activity per gram of solution. Each SRM is contained in a flame-sealed glass ampoule or bottle and, except as noted, consists of the radionuclide dissolved in an aqueous solution (usually acidic).

When an import permit for radioactive material is required of a customer outside the U.S., NIST must have a copy to complete an order and facilitate shipment.

SRM	Description	Unit of Issue
4222d	Carbon-14-n-hexadecane Radioactivity Standard	5 mL
4226d	Nickel-63 Radioactivity Standard	5 mL
4233f	Cesium-137 Radioactivity Standard	5 mL
4239a	Strontium-90 Radioactivity Standard	5 mL
4251d	Barium-133 Radioactivity Standard	5 mL
4274	Holmium-166m Gamma-ray Emission Rate Standard	5 mL
4288b	Technetium-99 Radioactivity Standard	5 mL
4320b	Curium-244 Radioactivity Standard	5 mL
4321d	Natural Uranium Radioactivity Standard	5 mL
4322d	Americium-241 Radioactivity Standard	5 mL
4323c	Plutonium-238 Radioactivity Standard	5 mL
4324b	Uranium-232 Radioactivity Standard	5 mL
4326a	Polonium-209 Radioactivity Standard	5 mL
4328c	Thorium-229 Radioactivity Standard	5 mL
4329a	Curium-243 Radioactivity Standard	5 mL
4330c	Plutonium-239 Radioactivity Standard	3 mL
4332e	Americium-243 Radioactivity Standard	5 mL
4334j	Plutonium-242 Radioactivity Standard	5 mL
4337	Lead-210 Radioactivity Standard	5 mL
4338b	Plutonium-240 Radioactivity Standard	5 mL
4339b	Radium-228 Radioactivity Standard	5 mL
4340b	Plutonium-241 Radioactivity Standard	5 mL
4341a	Neptunium-237 Radioactivity Standard	5 mL
4342a	Thorium-230 Radioactivity Standard	5 mL
4361c	Hydrogen-3 Radioactivity Standard	500 mL
4370d	Europium-152 Radioactivity Standard	5 mL
4915f	Cobalt-60 Radioactivity Standard	5 mL
4919I	Strontium-90 Radioactivity Standard	5 mL
4926e	Hydrogen-3 Radioactivity Standard	20 mL
4927g	Hydrogen-3 Radioactivity Standard	5 mL
4929f	Iron-55 Radioactivity Standard	5 mL
4943	Chlorine-36 Radioactivity Standard	3 mL
4949d	Iodine-129 Radioactivity Standard	5 mL
4965a	Radium-226 Radioactivity Standard	5 mL
4966a	Radium-226 Radioactivity Standard	5 mL
4967a	Radium-226 Radioactivity Standard	5 mL
4969	Radium-226 Radioactivity Standard	5 mL

See Table 205.4 on the website for more information.

Radioactivity

Carbon-14 Dating (solid form)

This SRM is an international standard for contemporary carbon-14 against which world-wide measurements can be compared. Each SRM consists of approximately 225 g of a 450 kg lot of oxalic acid prepared by fermentation of French beet molasses from the 1977 spring, summer, and autumn harvests.

SRM	Description	Unit of Issue
4990C	Oxalic Acid	8 x 28 g

See Table 205.7 on the website for more information.

Radioactive Natural Matrix Materials (powder form)

For further information on the Descriptions of Radioactive Environmental Natural Matrix Standards click link: Descriptions of Environmental Natural Matrix Standards

When an import permit for radioactive material is required of a customer outside the U.S., NIST must have a copy to complete an order and facilitate shipment.

Radionuclide Calibration Services

Radioactive SRM Purchasing Instructions & License Certification Form

Radioactive SRMs-General Info

SRM	Description	Unit of Issue
4350B	River Sediment Environmental Radioactivity Standard	85 g
4351	Human Lung Environmental Radioactivity Standard	45 g
4352	Human Liver Environmental Radioactivity Standard	45 g
4353a	Rocky Flats Soil Number 2	75 g
4354	Freshwater Lake Sediment Environmental Radioactivity Standard	25 g
4355	Peruvian Soil Powder	75 g
4356	Ashed Bone Environmental Radioactivity Standard	15 g
4357	Ocean Sediment Environmental Radioactivity Standard	85 g
4358	Ocean Shellfish Radionuclide Standard	150 g
4359	Seaweed Radionuclide Standard	300 g

See Table 205.11 on the website for more information.

Ordering Radioactive SRM(s)?

Start by submitting a request to our SRM Sales Office via email (srminfo@nist.gov). After it has been received, you will be contacted for any additional information needed. Based on the regulations that apply to you as a customer either *within the United States* (United States includes Puerto Rico and all territories, and possessions of the United States) or *outside the United States*, NIST will determine if your request can be cleared for processing. Requirements for the different customer locations are outlined below.

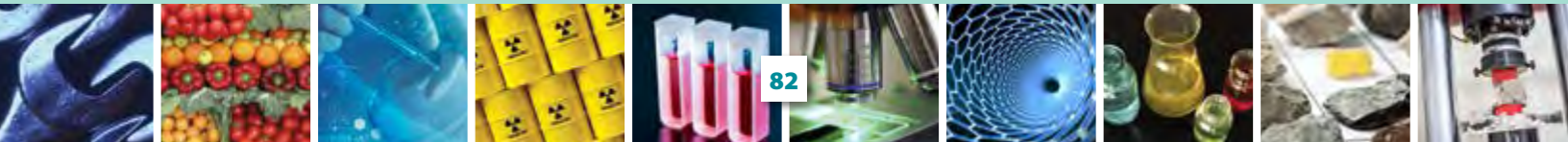
Customers in Organizations within the United States:

If the material(s) requested is/are subject to license requirements by the Nuclear Regulatory Commission (NRC), then prior to shipment NIST is required by law to verify the domestic customer's authorization to receive and possess radioactive material. Once NIST makes a determination, you will be notified with the disposition of your request. For approved requests, your order confirmation or quote will be forwarded to you.

Customers in Organizations outside the United States:

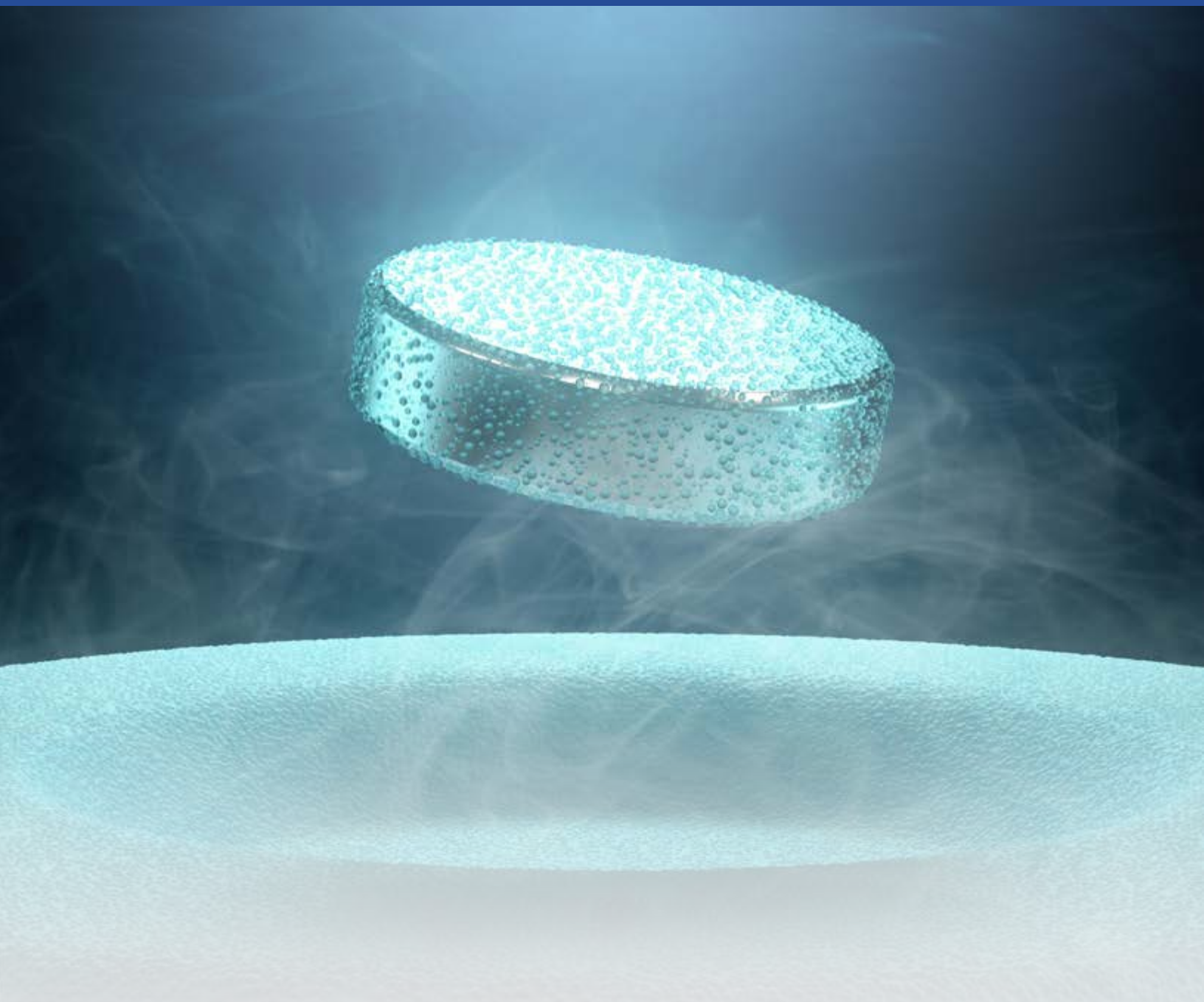
- **Import permit for radioactive material:** Your country may require an import permit for radioactive material. Prior confirmation of your import permit status is necessary for the disposition of your request.
    - If your country *requires an import permit*, NIST must have a copy in order to complete your order and facilitate shipment with the carrier.
- **Export controls:** NIST is required to determine if your country is subject to export controls as determined by the Nuclear Regulatory Commission (NRC) and the U.S. Department of Commerce, Bureau of Industry and Security. NIST will review those controls and determine the disposition of your request.
- **Once NIST has received your import permit** (if applicable) and approved your request for export, your order confirmation or quote will be forwarded.

If you have any technical questions, please contact the NIST Radiation Physics Division at radsrms@nist.gov.



Standard Reference Materials for Physical Composition

Electrical Properties



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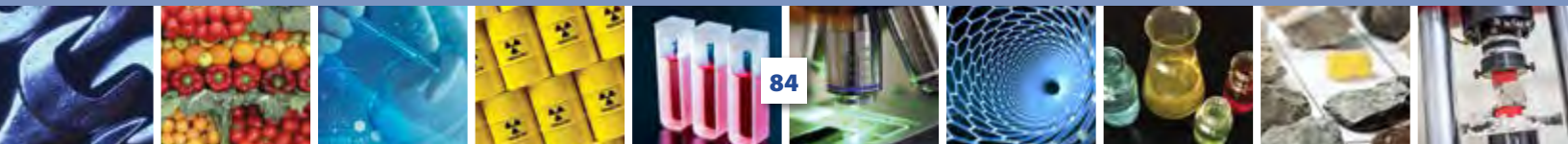
Electrical Resistivity and Conductivity of Iron (rod form)

SRM	Description	Unit of Issue
8420	Electrolytic Iron	0.64 D x 5.0

See Table 206.1 on the website for more information.



Standard Reference Materials for Physical Composition

Metrology

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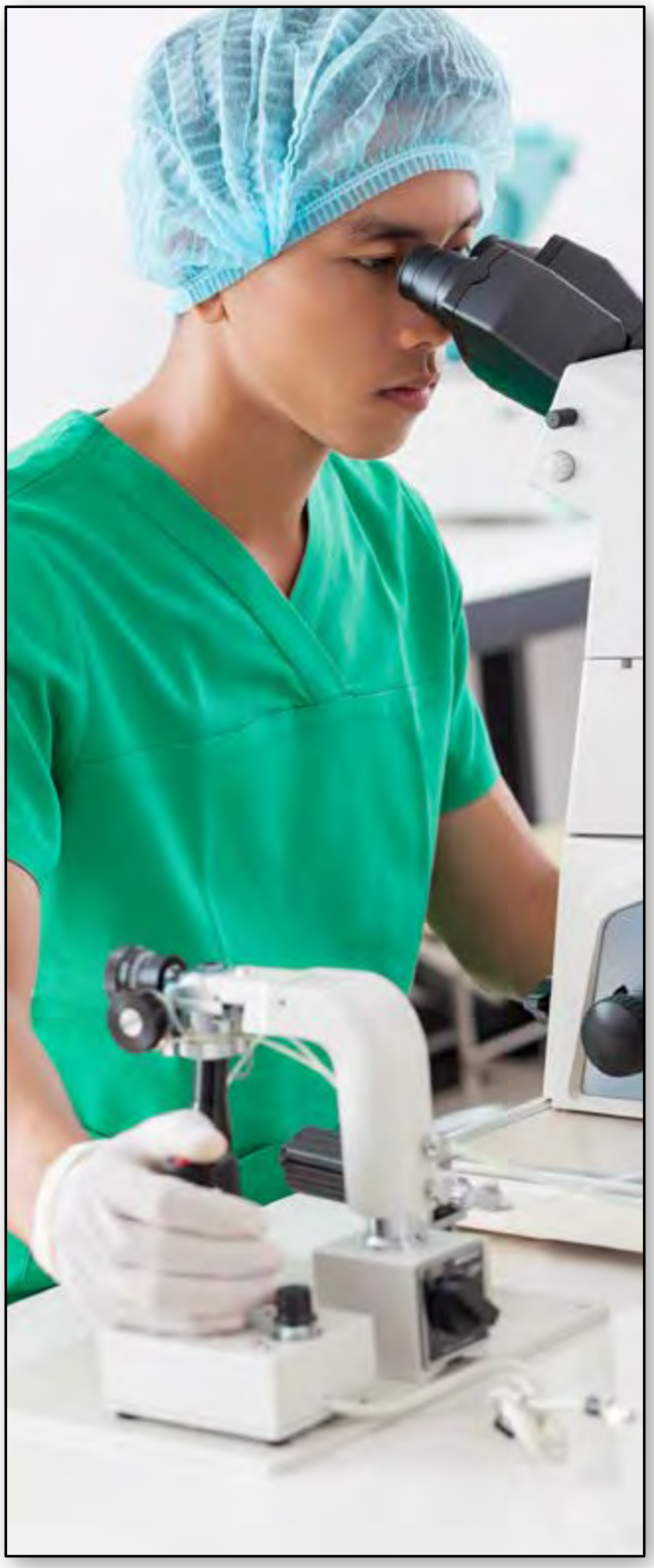
Depth Profiling (wafer form)

SRMs 2133, 2134, and 2137 are for calibrating the secondary ion response to minor and trace element levels in a silicon matrix. SRM 2133 is certified for phosphorus; SRM 2134 is certified for arsenic; SRM 2137 is certified for boron. SRM 2135c is for calibrating equipment used to measure sputtered depth and erosion rates in surface analysis. SRM 2135c is certified for total chromium and total nickel thickness, for individual layer uniformity, for nickel/chromium bilayer uniformity, and for individual layer thickness.

SRM	Description	Unit of Issue
2133	Phosphorus Implant in Silicon Depth Profile Standard	each
2134	Arsenic Implant in Silicon Depth Profile Standard	each
2135c	Ni/Cr Thin Film Depth Profile Standard	each
2137	Boron Implant in Silicon Standard for Calibration of Concentration in a Depth Profile	each

See Table 207.3 on the website for more information.

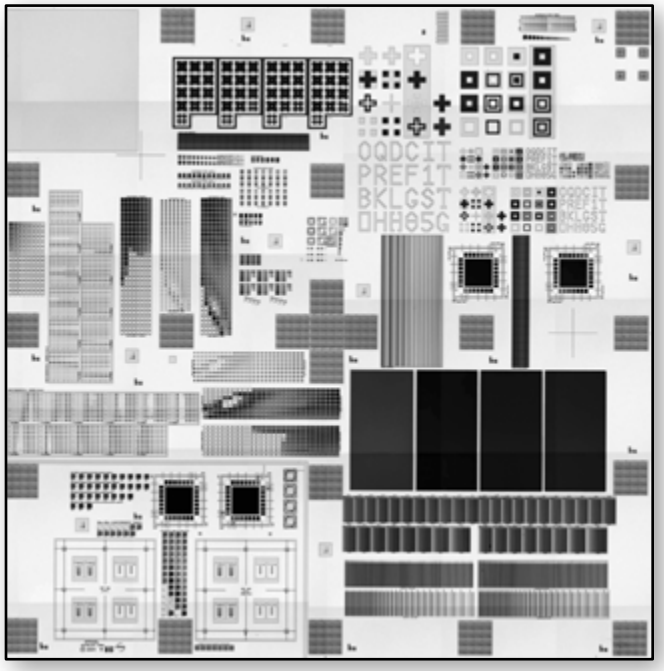


Microscale Dimensional Measurement Standards

RM 8820 is primarily intended to be used for X and Y scale (or magnification) calibrations from less than 10 times magnifications to more than 100 000 times magnifications in scanning electron microscopes (SEMs). It was designed to provide good contrast at low and high electron landing energies (accelerating voltages). Beyond testing scale calibration, it can be used for non-linearity measurements, especially at lower than 10 000 times magnifications. It can also be used for optical and scanning probe, and other types of microscopes. Most SEMs require a set of calibration structures of different sizes to cover the full range of possible magnifications. This Reference Material is designed to meet that need.

SRM	Description	Unit of Issue
8820	Scanning Electron Microscope Scale Calibration Artifact	each

See Table 207.9 on the website for more information.



RM 8820. Optical microscope view of the 20 mm × 20 mm chip.

New SRMs/RMs

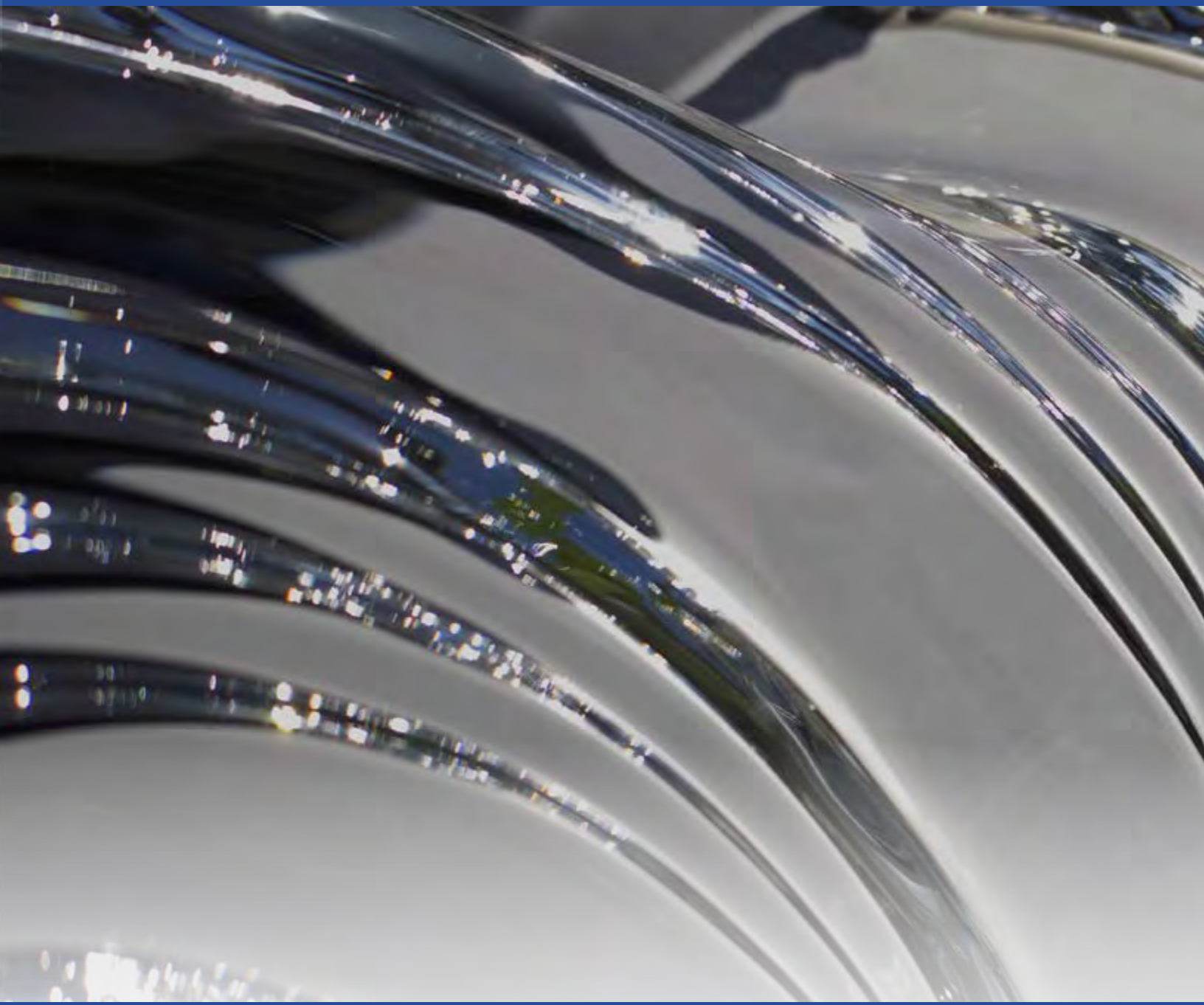
Check out our SRM website (www.nist.gov/srm) for news regarding SRMs/RMs. This includes information about newly released SRMs, RMs, Renewals, and Revisions. It also has links to available resources for questions or ordering SRMs.

Would you like to add your name to our mailing list to receive updates on New SRMs/RMs ?

Sign up on our homepage at
https://www.nist.gov/srm under New SRMs/RMs

Standard Reference Materials for Physical Composition

Liquids & Glasses



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Liquids & Glasses

Chemical Resistance [Durability] of Glass (solid form)

This SRM is for checking test methods and calibrating equipment used to determine the resistance of glass containers to chemical attack.

SRM	Description	Unit of Issue
622	Soda-Lime-Silica Glass	2.2 kg

See Table 208.1 on the website for more information.

Viscosity of Glass (bar form)

SRM 717a is for checking the performance of high temperature viscosity equipment (rotating cylinders) and low temperature viscosity equipment (fiber elongation, beam bending, parallel plates, etc.).

SRM	Description	Unit of Issue
717a	Hi Boron Glass Viscosity	block

See Table 208.3 on the website for more information.

Glass Liquidus Temperature (solid form)

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 C 829.

SRM	Description	Unit of Issue
1416	Aluminosilicate Glass for Liquidus Temperature	250 g

See Table 208.4 on the website for more information.

Relative Stress Optical Coefficient (bar form)

SRM	Description	Unit of Issue
709	Extra Dense Lead Glass	block

See Table 208.6 on the website for more information.

Electrical Properties of Dielectrics

SRM 624 is intended to validate test methods and for calibrating equipment used to determine the dc volume resistivity of glass per ASTM C 657.

SRM	Description	Unit of Issue
624	Lead-Silica Glass for dc Volume Resistivity	200 g

See Table 208.2 on the website for more information.

Viscosity Fixpoints (solid forms)

These SRMs are for the calibration of equipment for the determination of the softening, annealing, and strain points of glass.

SRM	Description	Unit of Issue
709	Extra Dense Lead Glass	block
717a	Hi Boron Glass Viscosity	block

See Table 208.5 on the website for more information.

Density

SRMs 211d and 2214 are for reference in the determination of the density of liquids. The certified densities were determined by means of hydrostatic weighing and are provided at 15 °C, 20 °C, and 25 °C.

SRM	Description	Unit of Issue
211d	Toluene Liquid Density Extended Range	4 x 5 mL
2214	Isooctane Liquid Density	4 x 5 mL

See Table 208.8 on the website for more information.

Standard Reference Materials for Physical Composition

X-Ray Diffraction

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X-Ray Diffraction

Diffraction and Scattering

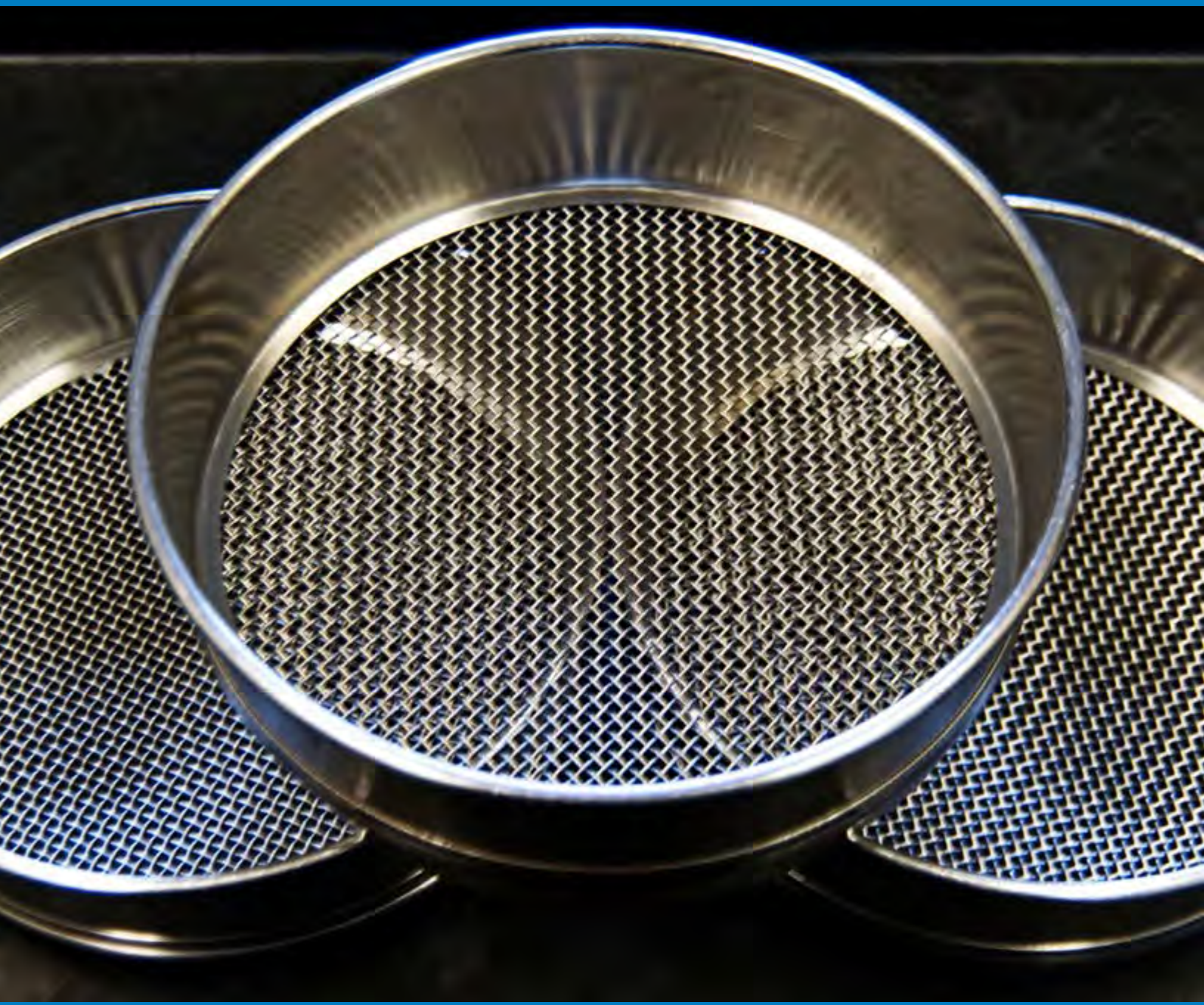
SRMs 656, 676a, 674b, 1878b, and 1879b consist of high phase purity materials for use in the quantitative analysis of samples by the internal standard method. SRM 656 consists of 2 silicon nitride powders, one high in the α polymorph, the other high in the β polymorph content. SRMs 640f, 660c, 675, and 1976c consist of materials with select crystallographic and microstructure properties used in the evaluation of diffraction equipment for the following variables; 1) d-spacing or line position, 2) line or instrument intensity, and 3) instrumental or sample contributions to the shape of reflection profiles. SRM 1976c, a sintered alumina plate, is also certified with respect to lattice parameters as well as 13 relative intensity values from 22° to 155° 2q (Cu Kα). SRM 1990 is certified for lattice parameter.

SRM	Description	Unit of Issue
640f	Line Position and Line Shape Standard for Powder Diffraction (Silicon Powder)	7.5 g
656	Silicon Nitride for Quantitative Analysis by Powder Diffraction	2 x 10 g
660c	Line Position and Line Shape Standard for Powder Diffraction (Lanthanum Hexaboride Powder)	6 g
674b	X-Ray Powder Diffraction Intensity Set (Quantitative Powder Diffraction Standard)	10 g
675	Line Position, Mica (XRD)	7.5 g
676a	Alumina Powder for Quantitative Analysis by X-Ray Diffraction	20 g
1878b	Respirable Alpha Quartz (Quantitative X-Ray Powder Diffraction Standard)	5 g
1879b	Respirable Cristobalite (Quantitative X-Ray Powder Diffraction Standard)	5 g
1976c	Instrument Response Standard for X-Ray Powder Diffraction	disc
1979	Powder Diffraction Line Profile Standard for Crystallite Size Analysis (Nano-Crystalline ZnO Powder)	2 x 3 g
1990	Single Crystal Diffractometer Alignment Standard - Ruby Sphere	3 spheres
2000	Calibration Standard for High-Resolution X-Ray Diffraction	block
3600	Absolute Intensity Calibration Standard for Small-Angle X-Ray Scattering	coupon

See Table 209.1 on the website for more information.

Standard Reference Materials for Engineering Composition

Sizing



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Particle Size (powder and solid forms)

These SRMs are intended for evaluating and calibrating specific types of particle size measuring instruments, including light scattering, electrical zone flow-through counters, optical, and scanning electron microscopes, sedimentation systems, and wire cloth sieving devices.

SRMs 1003c, 1004b, 1017b, 1018b, and 1019b each consist of soda-lime glass beads covering a particular size distribution (PSD) range. RM 8010 is a three bottle set of different sands (A, C, and D), intended for use in sieving only, and covers the sieve size range from 30 mesh to 325 mesh.

SRM 659 consists of equiaxed silicon nitride particles measured using sedimentation. SRM 1978 consists of granular, irregular shaped zirconium oxide particles measured using sedimentation. SRM 1982 consists of spheroidal particles measured using scanning electron microscopy, laser scattering, and sieving.

SRM 1961 is monodisperse latex particles in a water suspension produced by the National Aeronautics and Space Administration (NASA).

RMs 8012 and 8013 are gold nanoparticles in water.

SRM	Description	Unit of Issue
1003c	Glass Beads - Particle Size Distribution (20 µm to 50 µm diameter range)	28 g
1017b	Glass Beads - Particle Size Distribution (100 µm to 400 µm diameter range)	70 g
1019b	Glass Beads - Particle Size Distribution (750 µm to 2450 µm diameter range)	200 g
1021	Glass Beads - Particle Size Distribution (2 µm to 12 µm diameter range)	4 g
1690	Polystyrene Spheres (1 µm Diameter Particle Size)	5 mL
1691	Polystyrene Spheres (0.3 µm Diameter Particle Size)	5 mL
1961	Polystyrene Spheres (30 µm Diameter Particle Size)	5 mL
1963a	Polystyrene Spheres (100 nm Diameter Particle Size)	5 mL
1964	Polystyrene Spheres (60 nm Diameter Particle Size)	5 mL
1978	Particles Size Distribution Standard for Gravity Sedimentation	5 g
1984	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Acicular)	14 g
1985	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Spheroidal)	14 g
8010	Sand for Sand Sieve Analysis	3 x 130 g
8012	Gold Nanoparticles, Nominal 30 nm Diameter	2 x 5 mL
8013	Gold Nanoparticles, Nominal 60 nm Diameter	2 x 5 mL
8634	Ethylene Tetrafluoroethylene for Particle Size Distribution and Morphology	20 mL
8988	Titanium Dioxide Powder - Particle Size Distribution	6 g

See Table 301.1 on the website for more information.

Sizing

Cement and Coal Fly Ash Fineness

SRM 46h is for determining sieve residue according to ASTM C430. Each set consists of 10 sealed vials, each containing approximately 5 g of cement.

SRM 114r is for calibrating the Blaine fineness meter according to the latest issue of ASTM C204, to determine sieve residue according to ASTM C430, and to verify procedure for particle size distribution by a laser diffraction method (no-standard method available). Each set consists of 20 sealed vials, each containing approximately 5 g of cement.

SRM	Description	Unit of Issue
46h	Portland Cement Fineness Standard	10 x 5 g
114r	Portland Cement Fineness Standard	20 x 5 g
2689	Coal Fly Ash	3 x 10 g
2690	Coal Fly Ash	3 x 10 g
2691	Coal Fly Ash	3 x 10 g

See Table 301.2 on the website for more information.

Particle Count Materials (powder and suspension forms)

These SRM and RM materials are intended for use in calibrating the response of particle sizing instrumentation, including optical counters, in accordance with National Fluid Power Association (NFPA) and ISO standard methods (NFPA/T2.9.6 R2-1998, ISO/FDIS 11171, ISO/FDIS 12103) for determining particle contamination in oils. SRM 2806b is certified for particle concentration, and projected area diameter. It consists of a polydisperse, irregularly-shaped mineral dust suspended in 5606 hydraulic fluid. RMs 8631b and 8632 are mineral test dusts of medium, and ultrafine particle size, and can be used to prepare suspensions in other types of oils. **NOTE:** The same lot of medium test dust was used to produce SRM 2806b and RM 8631b, and is a derivative of Arizona Road Dust.

SRM	Description	Unit of Issue
2806d	Medium Test Dust (MTD) in Hydraulic Fluid	3 x 400 mL
8631b	Medium Test Dust (MTD)	20 g
8632a	Ultra Fine Test Dust (UFTD)	20 g

See Table 301.5 on the website for more information.

Electrophoretic Mobility, E (suspension form)

SRM 1980 is intended for use in the calibration and evaluation of equipment used to measure electrophoretic mobility. It consists of a goethite suspension saturated with phosphate in a sodium perchlorate electrolyte solution.

SRM	Description	Unit of Issue
1980	Positive Electrophoretic ($+\mu_E$) Mobility Standard (500 mg/L)	40 mL
1992	Zeta Potential - Colloidal Silica (Nominal Mass Fraction 0.15 %)	4 x 5 mL
1993	Zeta Potential – Colloidal Silica (Nominal Mass Fraction 2.2 %)	2 x 25 mL

See Table 301.3 on the website for more information.

Surface Area of Powders and Mercury Porosimetry Standards

These SRMs are intended for calibrating and verifying the performance of instruments used to determine the specific surface area of powders by the Brunauer, Emmett, and Teller (BET) method or instruments that use mercury intrusion to measure the pore size and porosity of porous materials. The surface areas of SRMs 1898, 1900, 2206, and 2207 are based on both multi-point and single point analysis of the BET equation.

SRM	Description	Unit of Issue
1898	Titanium Dioxide Nanomaterial	15 g
1900	Specific Surface Area Standard	4 g
1917	Mercury Porosimetry Standard	10 g
2206	Controlled Pore Glass - BET Specific Surface Area (Nominal Pore Diameter 300 nm)	5 g
2207	Controlled Pore Glass - BET Specific Surface Area (Nominal Pore Diameter 18 nm)	5 g
2696	Silica Fume (powder form)	70 g

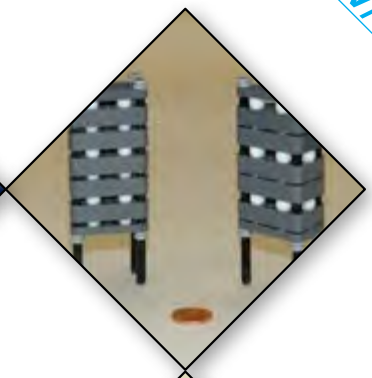
See Table 301.4 on the website for more information.

Please Register Your SRM Online!

Registering will ensure that you will be notified of any technical updates or developments.

https://www.nist.gov/srm_reg





Standard Reference Materials for Engineering Composition

Surface Finish

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Surface Finish

Microindentation Hardness (block form)

These SRMs are for use in calibrating, and checking the performance of microhardness testers, and may be used in conjunction with ASTM E 384. SRMs 1893 through 1907 are 1.25 cm x 1.25 cm (SRM 2798 is 1.35 cm x 1.35 cm), and were made by electroforming the test metal on AISI 1010 steel substrate. SRMs 2830 and 2831 are intended to meet the needs of the structural, electronic, and biomedical ceramics communities.

SRM	Description	Unit of Issue
1893	Copper Microhardness Test Block (Knoop)	each
1894a	Vickers Microhardness of Copper	each
1895	Nickel Microhardness Test Block (Knoop)	each
1896b	Vickers Microhardness of Nickel	each
1905	Nickel Microhardness Test Block (Knoop)	each
1906	Nickel Microhardness Test Block (Knoop)	each
1907	Nickel Microhardness Test Block (Knoop)	each
1908	Vickers Microhardness of Nickel	each
1909	Vickers Microhardness of Nickel	each
2798a	Vickers Microhardness of Nickel	each
2828	Knoop Microhardness of Steel	each
2829	Vickers Microhardness of Steel	each
2830	Knoop Hardness of Ceramics	each
2831	Vickers Hardness of Ceramics and Hardmetals	each

See Table 302.1 on the website for more information.

Abrasive Wear (block form)

This SRM is for use in the dry sand/rubber wheel abrasion test per ASTM G 65, Procedure A.

SRM	Description	Unit of Issue
1857	Tool Steel for Abrasive Wear Standard	2 blocks

See Table 302.2 on the website for more information.

Surface Roughness (block form)

These SRMs 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	Description	Unit of Issue
2073a	Sinusoidal Roughness Specimen	each

See Table 302.4 on the website for more information.

Rockwell Hardness (block form)

These Standard Reference Materials (SRMs) are transfer standards intended primarily for use in the calibration and verification of the performance of Rockwell hardness equipment using the applicable Rockwell hardness C scale (HRC), Rockwell hardness 15N scale (HR15N), or Rockwell hardness 30N scale (HR30N). Each SRM unit is a steel test block, nominally 64 mm in diameter and 15 mm thick, having a polished test surface described by a micro-engraved circle 52 mm in diameter. Each SRM unit is individually certified and bears a unique serial number on the edge of the block.

SRM	Description	Unit of Issue
2810	Rockwell C Hardness - Low Range	1 block
2811	Rockwell C Hardness - Mid Range	1 block
2812	Rockwell C Scale Hardness - High Range	1 block
2816	Rockwell Hardness 15N Scale - Low Range (Nominal 72 HR15N)	1 block
2817	Rockwell Hardness 15N Scale - Mid Range (Nominal 83 HR15N)	1 block
2818	Rockwell Hardness 15N Scale - High Range (Nominal 91 HR15N)	1 block
2819	Rockwell Hardness 30N Scale - Low Range (Nominal 45 HR30N)	1 block
2820	Rockwell Hardness 30N Scale - Mid Range (Nominal 64 HR30N)	1 block
2821	Rockwell Hardness 30N Scale - High Range (Nominal 79 HR30N)	1 block

See Table 302.5 on the website for more information.

Standard Reference Materials for Engineering Composition

Fire Research

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Fire Research

Flooring Radiant Panel (sheet form)

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 E 648.

SRM	Description	Unit of Issue
1012	Flooring Radiant Panel	set (3)

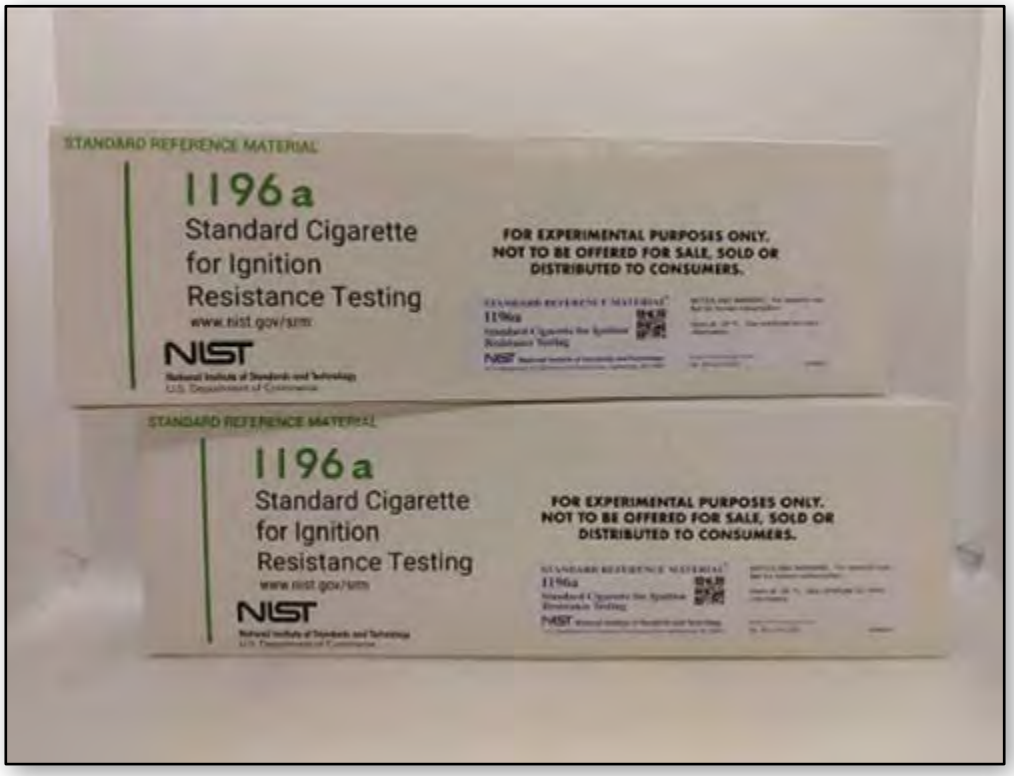
See Table 305.4 on the website for more information.

Standard Cigarettes for Ignition Strength and Ignition Resistance Testing

SRM 1082 is intended for use by test laboratories to assess, and control their testing of cigarette ignition in accordance with ASTM Standard Methods E 2187-16. SRM 1196a is intended for use by test laboratories to test mattresses, upholstered furniture, and its components, and thermal insulation for resistance to cigarette ignition in accordance with 16 CFR 1632, 16 CFR 1634 (proposed), and 16 CFR 1209.

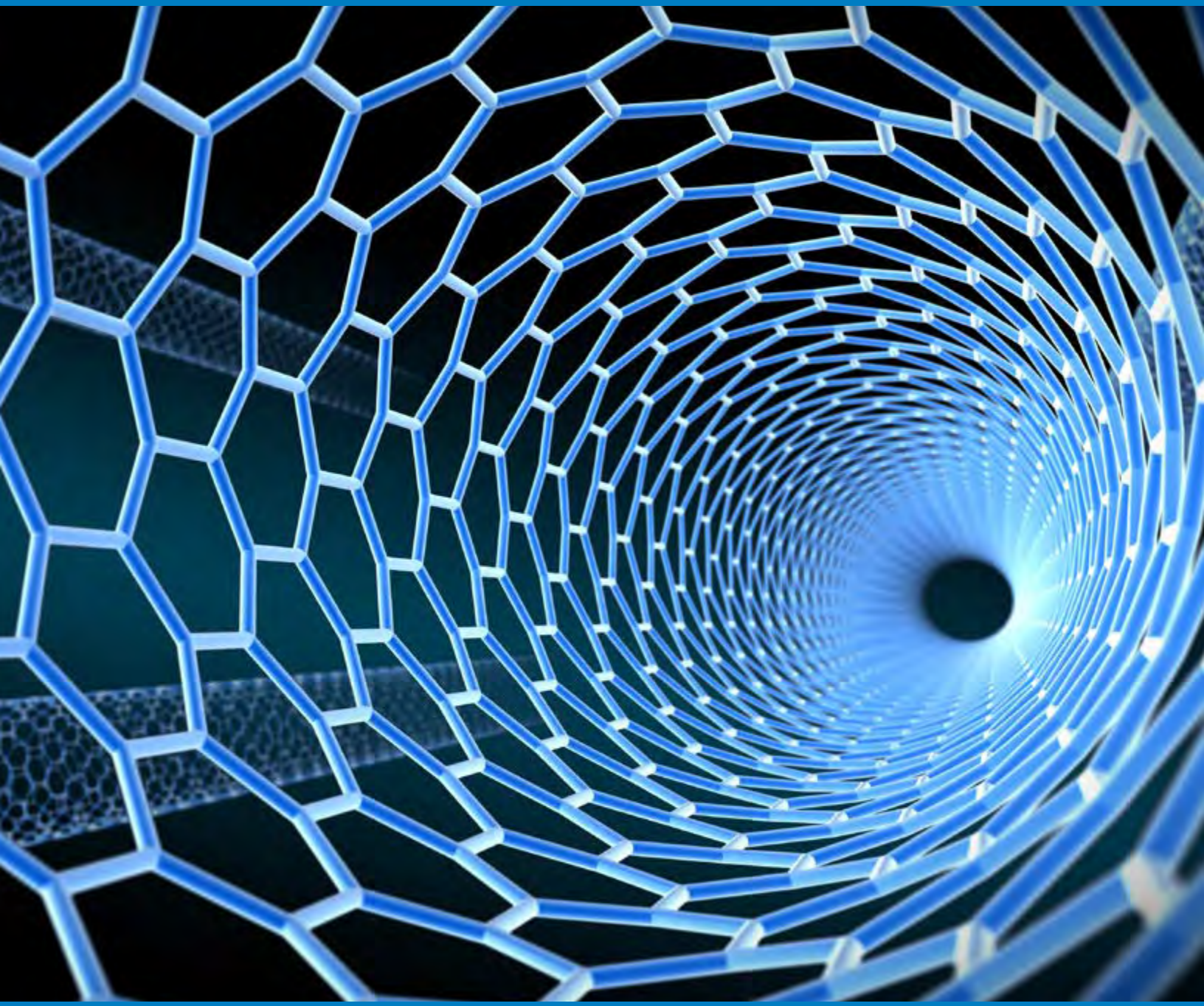
SRM	Description	Unit of Issue
1082	Cigarette Ignition Strength Standard (200 cigarettes)	1 carton
1196a	Standard Cigarette for Ignition Resistance Testing (400 cigarettes)	2 cartons

See Table 305.5 on the website for more information.



Standard Reference Materials for Engineering Composition

Nanomaterials



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Nanomaterials

Nanomaterials (less than or equal to 100 nm)

SRM	Description	Unit of Issue
1898	Titanium Dioxide Nanomaterial	15 g
1963a	Polystyrene Spheres (Nominal 100 nm Diameter)	5 mL
1964	Polystyrene Spheres (Nominal 60 nm Diameter)	5 mL
8012	Gold Nanoparticles (Nominal 30 nm Diameter)	2 x 5 mL
8013	Gold Nanoparticles (Nominal 60 nm Diameter)	2 x 5 mL
8017	Polyvinylpyrrolidone Coated Silver Nanoparticles (Nominal Diameter 75 nm)	5
8027	Silicon Nanoparticles (Nominal Diameter 2 nm)	5 x 1 mL

See Table 308.1 on the website for more information.

Standard Reference Materials for Engineering Composition

Miscellaneous Performance

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Miscellaneous Performance

Impact Standards: Charpy V-Notch Specimens

These SRMs are test specimens intended primarily for the verification of Charpy testing machines. The dimensions of these SRMs comply with the current ASTM Standard E23 and the current ISO 148-1 Standard.

SRMs 2092, 2096, and 2098 are NIST-Verification Charpy V-notch specimens that have a post-test evaluation service and proficiency test data available with them. SRMs 2092 and 2096 are to be tested at -40 °C; SRM 2098 is to be tested at room temperature (21 °C). These SRMs should be tested (broken) at the same time, then returned to NIST Boulder for evaluation. An acceptable machine will produce an average value within 1.4 J or 5 % of the certified energy value, whichever is greater.

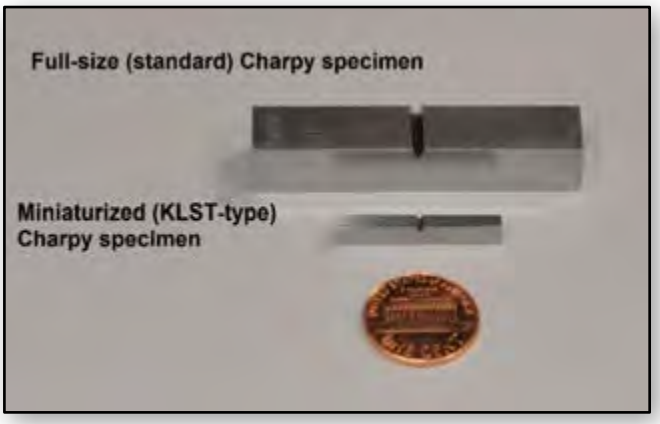
SRMs 2093 and 2097 are Self-Verification Charpy V-notch specimens that do not have any post-test services available with them. These SRMs provide a lower cost option for the Self-Service user. SRMs 2093 and 2097 are to be tested at -40 °C. These SRMs are not returned to NIST Boulder for evaluation.

SRMs 2112 and 2113 are NIST-Verification Charpy V-notch specimens that are certified for absorbed energy at -40 °C and room temperature, and for maximum force at room temperature. These SRMs provide a means to verify the performance of both the energy and force scales of an instrumented Charpy impact machine at room temperature (21 °C). They can also be used to verify just the energy scale of a machine at -40° C, interchangeably with SRMs 2092 and 2096. An acceptable machine will produce an average value within 1.4 J or 5 % of the certified energy value, whichever is greater. Currently, specific requirements are not available to verify the performance of the force scale for a Charpy test machine.

SRMs 2216, 2218, and 2219 are intended for the verification of maximum force and absorbed energy values measured at room temperature using a small-scale Charpy impact machine, in accordance with the current standards ASTM E2248 or ISO 14556. Each SRM unit consists of a set of three KLST-type specimens needed to perform a single verification.

SRM	Description	Unit of Issue
2092	Low-Energy Charpy V-Notch Specimens (NIST-Verification, 8-mm Striker)	set
2093	Low-Energy Charpy V-Notch Specimens (Self-Verification, 8-mm Striker)	set
2096	High-Energy Charpy V-Notch Specimens (NIST-Verification, 8-mm Striker)	set
2097	High-Energy Charpy V-Notch Specimens (Self-Verification, 8-mm Striker)	set
2098	Super-High-Energy Charpy V-Notch Specimens (NIST-Verification, 8-mm Striker)	set
2099	Super-High-Energy Charpy V-Notch Specimens (Self-Verification, 8 mm Striker)	set
2112	Dynamic Impact Force Verification Specimens (Self-Verification, 8-mm Striker, 24 kN nominal)	set
2113	Dynamic Impact Force Verification Specimens (Self-Verification, 8-mm Striker, 33 kN nominal)	set
2197	Low-Energy Charpy V-Notch Specimens (Self-Verification, 2-mm Striker)	set
2198	High-Energy Charpy V-Notch Specimens (Self-Verification, 2-mm Striker)	set
2199	Super-High-Energy Charpy V-Notch Specimens (Self-Verification, 2 mm Striker)	set
2216	Miniaturized Low-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
2218	Miniaturized High-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
2219	Miniaturized Super-High-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
2237	Miniaturized Low-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set
2238	Miniaturized High-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set
2239	Miniaturized Super-High-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set

See Table 309.1 on the website for more information.



Miscellaneous Performance

Tape Adhesion Testing (sheet form)

This SRM is intended as a uniform source of linerboard for use with ASTM Standards D 2860 Standard Test Method for Adhesion of Pressure-Sensitive Tape to Fiberboard at 90° Angle and Constant Stress, D 3654 Standard Test Method for Holding Power of Pressure-Sensitive Tapes, and D 3889 Standard Method for Adherence to Linerboard of Pressure-Sensitive Tapes at Low Temperature.

SRM	Description	Unit of Issue
1810a	Linerboard	50 each

See Table 309.4 on the website for more information.

Bleached Kraft Pulps (sheet form)

RM 8495 Northern Softwood Bleached Kraft Pulp and RM 8496 Eucalyptus Hardwood Bleached Kraft Pulp are intended primarily for use in fundamental studies on the physical properties of fibers and paper sheets. The materials selected for these two RMs are bleached dried lap pulp, each from a single lot of a standard commercial production run. The materials were selected because of their differing fiber size, differing papermaking properties, and similarity to commercially available materials.

RMs 8495 and 8496 were developed and prepared with input and support from the Pulp Material Research Committee (PMRC), a subcommittee of the Fundamental Research Committee. These materials were donated by industry and are being distributed by the SRM Program. At this time, no extensive property measurements have been made on these materials beyond ensuring they were within the control limits of the normal production run. A measurement error study is in progress with participation by international paper technical laboratories. As results become available, they will be published and added to the Report of Investigation that accompanies each of these materials.

SRM	Description	Unit of Issue
8495	Northern Softwood	10 sheets
8496	Eucalyptus Hardwood	10 sheets

See Table 309.5 on the website for more information.

Secondary Ferrite Standards

Reference Materials RM 8480 and RM 8481, Secondary Ferrite Standards, are intended for the calibration of instruments used to measure weld metal ferrite content in accordance with American National Standards Institute/American Welding Society (ANSI/AWS) Standard A4.2, and International Organization of Standardization (ISO) Standard 8249. RM 8480 consists of a low range (8 specimens distributed in the range of 0 FN to 30 FN), and RM 8481 is the corresponding high range (8 specimens distributed in the range of 30 FN to 120 FN).

Previously issued SRMs 485 to 488 are a suite of SRMs for Austenite in Ferrite, which were produced a little over 20 years ago. They are now considered technically obsolete and are not longer suitable for their intended purpose. NIST has more recently developed other reference mixtures of austenite and ferrite, RM 8480 Secondary Ferrite Number Standard-Low Range, and RM 8481 Secondary Ferrite Number Standard-High Range, which are listed below. These are in units of FN, as they were designed for magnetic response measurements of ferrite in an austenitic matrix.

SRM	Description	Unit of Issue
8480	Secondary Ferrite Number Standard - Low Range	10x12x20
8481	Secondary Ferrite Number Standard - High Range	set (8)

See Table 309.6 on the website for more information.

Miscellaneous Performance

Fracture Toughness of Ceramics

SRMs 2100a and 2100b Fracture Toughness of Ceramic are intended for verification of fracture toughness testing procedures, and may be used in conjunction with ASTM Standard Test Method ASTM C1421-99 "Standard Test Methods for Fracture Toughness of Advanced Ceramics."

A unit of SRMs 2100a or 2100b consists of five hot-pressed silicon nitride flexure specimens. Each specimen is 3 mm x 4 mm x (45 to 47) mm. The SRM may be used with any fracture toughness test method, but is optimized for beam bending test configurations.

SRM	Description	Unit of Issue
2100a	Fracture Toughness of Ceramic	5 bars
2100b	Fracture Toughness of Ceramic	5 bars

See Table 309.7 on the website for more information.

Magnetic Moment

These Standard Reference Materials are intended for use in the calibration of magnetometers (such as vibrating sample magnetometers) that are used in the measurement of magnetic properties of materials.

SRM	Description	Unit of Issue
762	Magnetic Moment Standard - Nickel Disk	6 mm D
764a	Magnetic Susceptibility Standard - Platinum Cylinder	3 mm D x 3.42 mm L
772a	Magnetic Moment Standard - Nickel Sphere	each
2853	Magnetic Moment Standard - Yttrium Iron Garnet Sphere	each

See Table 309.8 on the website for more information.

Standard Bullet Replica and Cartridge Case

SRM	Description	Unit of Issue
2460a	Standard Bullet Replica	each
2461	Standard Cartridge Case	each

See Table 309.11 on the website for more information.

Force Calibration

SRM	Description	Unit of Issue
3461	Standard Reference Cantilevers for Atomic Force Microscopy Spring Constant Calibration	each

See Table 309.12 on the website for more information.

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