



# SRM

## NIST Standard Reference Materials®



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2025 Catalog

NIST SP 260-176

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NIST SP 260-176

# Standard Reference Materials<sup>®</sup> Catalog

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**N**IST 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.

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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/>.



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# Standard Reference Materials for Chemical Composition



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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
<b>8k</b>	Bessemer Steel (Simulated) 0.1 % Carbon	150 g
<b>12h</b>	Basic Open-Hearth Steel, 0.4% Carbon	150 g
<b>13g</b>	0.6% Carbon Steel	150 g
<b>14g</b>	Carbon Steel (AISI 1078)	150 g
<b>16f</b>	Basic Open-Hearth Steel, 1% Carbon	150 g
<b>19h</b>	Basic Electric Steel, 0.2% Carbon	150 g
<b>20g</b>	AISI 1045 Steel	150 g
<b>152a</b>	Basic Open-Hearth Steel 0.5% Carbon (Tin Bearing)	150 g
<b>178</b>	0.4C Basic Oxygen Furnace Steel	150 g
<b>368</b>	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
<b>361</b>	AISI 4340 Steel (chip form)	150 g
<b>363</b>	Chromium-Vanadium Steel (Modified)	150 g
<b>2160</b>	Low-Alloy Steel (pin form)	200 g
<b>2161</b>	Low Alloy Steel (chip form)	150 g
<b>2162</b>	Low Alloy Steel (chip form)	150 g
<b>2163</b>	Low Alloy Steel (chip form)	150 g
<b>2164</b>	Low Alloy Steel (chip form)	150 g
<b>2165</b>	Low Alloy Steel (chip form)	150 g
<b>2166</b>	Low Alloy Steel (chip form)	150 g
<b>2167</b>	Low Alloy Steel (chip form)	150 g
<b>2168</b>	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
<b>30f</b>	Cr-V Steel (SAE 6150)	150 g
<b>33e</b>	Nickel Steel	150 g
<b>72g</b>	Low Alloy Steel (AISI 4130)	150 g
<b>100b</b>	Manganese Steel	150 g
<b>125b</b>	LA Steel, High Silicon	100 g
<b>129c</b>	LA Steel, High Sulfur (SAE 112)	150 g
<b>131h</b>	Refined Cast Iron	100 g
<b>139b</b>	Chromium-Nickel-Molybdenum Steel	150 g
<b>155</b>	Chromium-Tungsten Steel	150 g
<b>163</b>	Chromium Steel (granular form)	100 g
<b>179</b>	LA Steel, High Silicon	150 g
<b>291</b>	Cr-Mo Steel (ASTM A-213)	150 g
<b>293</b>	Cr-Ni-Mo (AISI 8620)	150 g
<b>2171</b>	LA Steel, (HSLA 100)	150 g

See [Table 101.2](#) on the website for more information.



# Chemical Composition

## Ferrous Metals

### Low Alloy Steels (disk and rod forms)

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

See [Table 101.8](#) on the website for more information.



### High Alloy Steels (chip form)

SRM	Description	Unit of Issue
<b>126c</b>	High-Nickel Steel (Nominal Mass Fraction 36 % Ni)	150 g
<b>344</b>	15 Chromium-7 Nickel Steel (Mo Precipitation Hardening)	150 g
<b>345b</b>	Fe-Cr-Ni Alloy UNS J92180	150 g
<b>346a</b>	Valve Steel	150 g
<b>862</b>	High-Temperature Alloy L 605	100 g
<b>868</b>	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
<b>866</b>	Incoloy 800	100 g
<b>867</b>	Ni-Fe-Cr Alloy UNS N08825	100 g
<b>1230</b>	High-Temperature Alloy A286	disk
<b>1246</b>	Incoloy 800	disk
<b>1247</b>	Ni-Fe-Cr Alloy UNS N08825	disk
<b>1250</b>	High-Temperature Alloy (Fe-Ni-Co)	disk
<b>C2400</b>	Fe-Cr-Ni Alloy UNS J92180	disk

See [Table 101.9](#) on the website for more information.



### Stainless Steels (chip form)

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

See [Table 101.6](#) on the website for more information.

### Stainless Steels (disk form)

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

See [Table 101.10](#) on the website for more information.

### Tool Steels (chip form)

SRM	Description	Unit of Issue
<b>50c</b>	Tungsten-Chromium-Vanadium Steel	150 g
<b>132b</b>	Tool Steel (AISI M2)	150 g
<b>134a</b>	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
<b>57b</b>	Silicon Metal	40 g
<b>58a</b>	Ferrosilicon (73% Si Regular Grade)	75 g
<b>59a</b>	Ferrosilicon Grade E1	50 g
<b>64c</b>	Ferrochromium High Carbon	100 g
<b>68c</b>	Standard Ferromanganese	100 g
<b>90</b>	Ferrophosphorus	75 g
<b>195</b>	Ferrosilicon (75% Si-High-Purity Grade)	75 g
<b>196</b>	Ferrochromium Low Carbon	100 g
<b>689</b>	Ferrochromium Silicon	100 g

See [Table 101.12](#) on the website for more information.

### Specialty Steels (disk form)

SRM	Description	Unit of Issue
<b>1157</b>	Tool Steel (AISI M2)	disk
<b>1158</b>	High-Nickel Steel (Nominal Mass Fraction 36 % Ni)	disk
<b>1772</b>	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
<b>1089†</b>	Steels, Set (consists of SRMs 1095, 1096, 1097, 1098 and 1099)	5 rods
<b>1090</b>	Oxygen in Ingot Iron	rod
<b>1091a</b>	Oxygen in Stainless Steel (AISI 431)	rod
<b>1093</b>	Oxygen in Valve Steel	rod
<b>1094</b>	Oxygen in Maraging Steel	rod
<b>1755</b>	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
<b>C1137a</b>	White Cast Iron	disk
<b>1138a</b>	Cast Steel Standard	block
<b>C1145a</b>	White Cast Iron	disk
<b>1173</b>	Ni-Cr-Mo-V Steel	disk
<b>C1173</b>	Cast Steel 3	disk
<b>C1290</b>	High-Alloy White Cast Iron (HC-250+V)	disk
<b>C1291</b>	High-Alloy White Cast Iron (Ni-Hard, Type I)	disk
<b>C1292</b>	High-Alloy White Cast Iron I (Ni-Hard, Type IV)	disk
<b>C2424</b>	Ductile Iron C	disk

See [Table 101.14](#) on the website for more information.

### Cast Irons (chip form)

SRM	Description	Unit of Issue
<b>4l</b>	Cast Iron	150 g
<b>5m</b>	Cast Iron	150 g
<b>6g</b>	Cast Iron	150 g
<b>107c</b>	Cast Iron (Ni-Cr-Mo)	150 g
<b>115a</b>	Copper-Nickel-Chromium Cast Iron	150 g
<b>122i</b>	Cast Iron	150 g
<b>334</b>	Gray Cast Iron	150 g
<b>341</b>	Ductile Cast Iron	150 g
<b>342a</b>	Nodular Cast Iron	150 g
<b>892</b>	High-Alloy White Cast Iron (Ni-Hard, Type IV)	150 g

See [Table 101.13](#) on the website for more information.

## New SRMs/RMs

Check out our SRM website ([www.nist.gov/srm](http://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



## Chemical Composition 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
<b>87a</b>	Silicon-Aluminum Alloy	75 g
<b>853a</b>	Aluminum Alloy 3004 (chip form)	25 g
<b>854a</b>	Aluminum Alloy 5182 (chip form)	25 g
<b>855a</b>	Aluminum Casting Alloy 356	30 g
<b>856a</b>	Aluminum Casting Alloy 380	30 g
<b>858</b>	Aluminum Alloy 6011	35 g
<b>1240c</b>	Aluminum Alloy 3004	disk
<b>1241c</b>	Aluminum Alloy 5182	disk
<b>1255b</b>	Aluminum Alloy 356	disk
<b>1256b</b>	Aluminum Alloy 380	disk
<b>1258-I</b>	Aluminum Alloy 6011 (Modified)	disk
<b>1259</b>	Aluminum Alloy 7075	disk
<b>2426</b>	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
<b>862</b>	High-Temperature Alloy L 605	100 g
<b>1242</b>	High Temperature Alloy L 605	disk
<b>1775</b>	Refractory Alloy MP-35-N	disk
<b>2175</b>	Refractory Alloy MP-35-N	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
<b>158a</b>	Silicon Bronze	150 g
<b>458</b>	Beryllium-Copper (17510)	50 g
<b>459</b>	Beryllium-Copper (17200)	50 g
<b>460</b>	Beryllium-Copper Alloy	50 g
<b>871</b>	Phosphor Bronze (CDA 521)	100 g
<b>872</b>	Phosphor Bronze (CDA 544)	100 g
<b>874</b>	Cupro-Nickel, 10% (CDA 706) "HIGH-PURITY"	100 g
<b>875</b>	Cupro-Nickel, 10% (CDA 706) "DOPED"	100 g
<b>880</b>	Nickel Silver (CDA 770) (granular form)	100 g
<b>1034</b>	Unalloyed Copper	rod
<b>1035</b>	Leaded-Tin Bronze Alloy	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
<b>399</b>	Unalloyed Copper - Cu VI	50 g
<b>454</b>	Unalloyed Copper XI (chips)	35 g
<b>457</b>	Unalloyed Copper IV (solid)	rod
<b>494</b>	Unalloyed Copper I (solid)	rod
<b>495</b>	Unalloyed Copper II (solid)	rod
<b>498</b>	Unalloyed Copper V (solid)	rod
<b>500</b>	Unalloyed Copper - Cu VII	rod
<b>C1251a</b>	Phosphorus Deoxidized Copper -Cu VIII	block
<b>C1252a</b>	Phosphorus Deoxidized Copper -Cu IX	block
<b>C1253a</b>	Phosphorus Deoxidized Copper - Cu X	block

See [Table 102.5](#) on the website for more information.

## 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
<b>1107</b>	Naval Brass UNS 46400	disk
<b>1115</b>	Commercial Bronze Standard for Optical Emission and X-ray Spectroscopic Analysis	disk
<b>1124</b>	Free Cutting Brass (UNS C36000)	1 disk
<b>C1251a</b>	Phosphorus Deoxidized Copper -Cu VIII	block
<b>C1252a</b>	Phosphorus Deoxidized&nbsp;Copper -Cu IX	block
<b>C1253a</b>	Phosphorus Deoxidized Copper - Cu X	block
<b>1276a</b>	Cupro-Nickel (CDA 715)	disk

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
<b>53e</b>	Lead-Base Bearing Metal (84Pb-10Sb-6Sn)	150 g
<b>127b</b>	Solder (40Sn-60Pb)	150 g
<b>1129</b>	Solder (63Sn-37Pb)	200 g
<b>1131</b>	Solder (40Sn - 60Pb)	disk
<b>1132</b>	Lead-Base Bearing Metal (84 Pb-10 Sb-6 Sn)	disk
<b>C2415a</b>	Battery Lead (UNS 52770)	disk
<b>C2416</b>	Bullet Lead	disk
<b>C2417</b>	Lead-Base Alloy	disk

See [Table 102.10](#) on the website for more information.

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

SRM	Description	Unit of Issue
<b>349a</b>	Ni-Cr-Co Alloy UNS N07001	150 g
<b>861</b>	Nickel-based Superalloy PWA 1484 (chip form)	50 g
<b>864</b>	Nickel Alloy UNS N06600 (chip form)	100 g
<b>865</b>	Inconel 625	150 g
<b>882</b>	Nickel-Copper Alloy (65Ni-31Cu-3Al) (granule form)	100 g
<b>897</b>	Tracealloy A	35 g
<b>899</b>	Tracealloy C	35 g
<b>1159</b>	Electronic and Magnetic Alloy Standard	disk
<b>1160</b>	Elec/Mag Ni-Mo-Fe	disk
<b>1243</b>	Ni-Cr-Co Alloy UNS N07001	disk
<b>1244</b>	Nickel Alloy UNS N06600	disk
<b>C1248</b>	Nickel-Copper Alloy	disk
<b>1249</b>	Ni-Cr-Fe-Nb-Mo Alloy UNS N07718	disk
<b>1775</b>	Refractory Alloy MP-35-N	disk
<b>2175</b>	Refractory Alloy MP-35-N	150 g

See [Table 102.12](#) on the website for more information.

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

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

See [Table 102.15](#) on the website for more information.

### Titanium Base Alloys (chip and disk forms)

SRM	Description	Unit of Issue
<b>173c</b>	Titanium Alloy UNS R56400 (chip form)	50 g
<b>647</b>	Titanium Alloy, Al-Mo-Sn-Zr	50 g
<b>648</b>	Titanium-Base Alloy 5Al-2Sn-2Zr-4Cr-4Mo	50 g
<b>649</b>	Titanium-Base Alloy (15V-3Al-3Cr-3Sn)	50 g
<b>654b</b>	Titanium Alloy, Al-V	disk
<b>1128</b>	Titanium -Base Alloy (15V-3Al-3Cr-3Sn)	disk
<b>2061</b>	TiAl(NbW) Alloy for Microanalysis	cube
<b>2431</b>	Titanium Base Alloy	50 g
<b>2432</b>	Titanium-Base Alloy 10V - 2Fe - 3Al	50 g
<b>2433</b>	Titanium-Base Alloy 8Al-1Mo-1V	50 g
<b>2452</b>	Hydrogen In Titanium Alloy (Nominal Mass Fraction 60 mg/kg H) (chip form)	10 g
<b>2453a</b>	Hydrogen In Titanium Alloy (Nominal Mass Fraction 125 mg/kg H)	10 g
<b>2454a</b>	Hydrogen in Titanium Alloy (Nominal Mass Fraction 215 mg/kg H) (pin 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
<b>625</b>	Zinc-Base Die-Casting Alloy A	block
<b>626</b>	Zinc-Base Die-Casting Alloy B	block
<b>627</b>	Zinc-Base Die-Casting Alloy C	block
<b>628</b>	Zinc-Base Die-Casting Alloy D	block
<b>629</b>	Zinc-Base Die-Casting Alloy E	block
<b>630</b>	Zinc-Base Die-Casting Alloy F	block
<b>631</b>	Spectrographic Zinc Spelter (Modified)	block
<b>1738</b>	Zinc-Aluminum Alloy	disk
<b>1740</b>	Zinc-Aluminum Alloy	disk
<b>1741</b>	Zinc-Aluminum Alloy	disk
<b>2139</b>	Zinc-Aluminum Alloy	100 g
<b>2426</b>	55 % Aluminum-Zinc Alloy	40 g

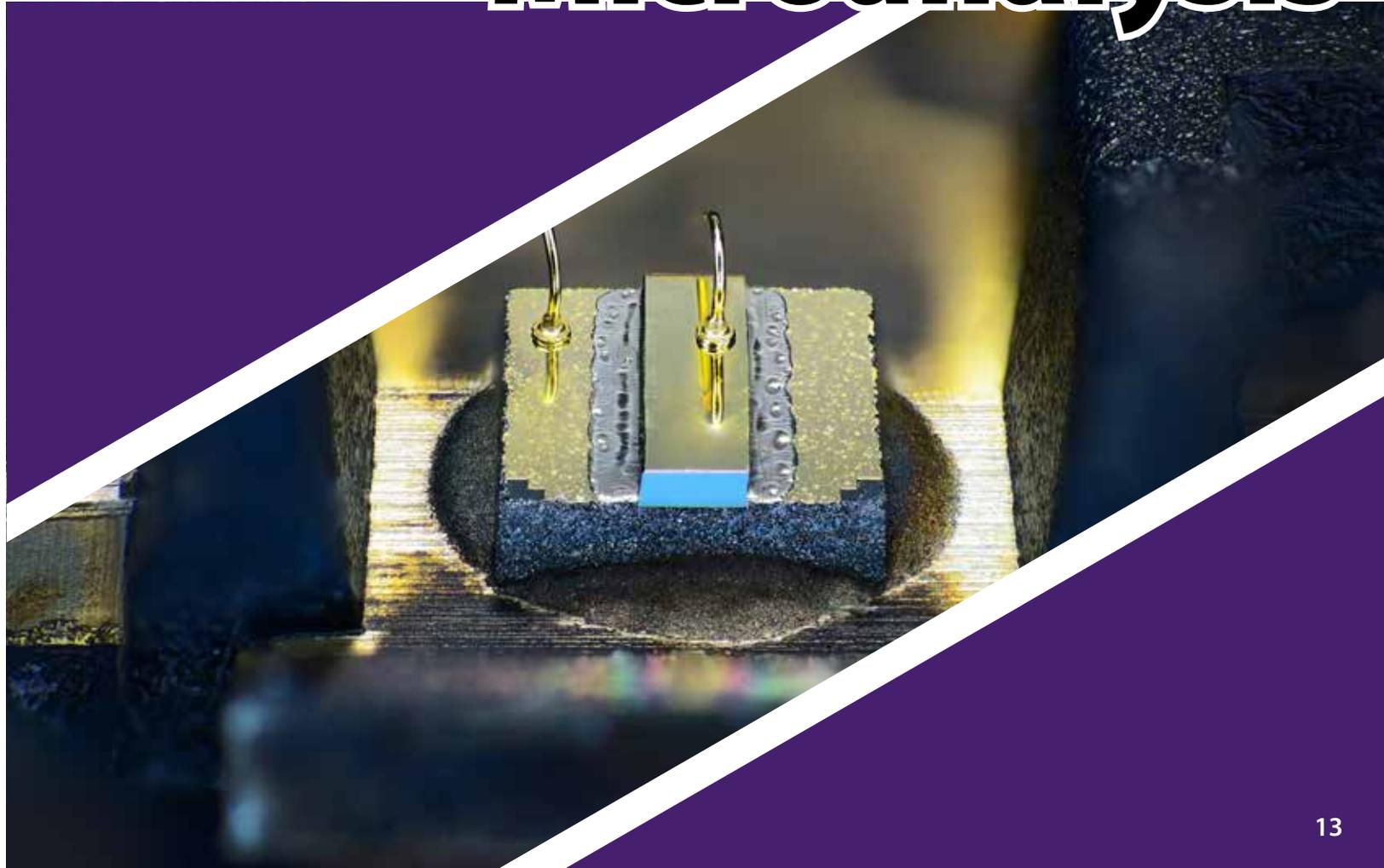
See [Table 102.17](#) on the website for more information.

### Zirconium Base Alloys (chip form)

SRM	Description	Unit of Issue
<b>360c</b>	Zirconium (Sn-Fe-Cr) Alloy	100 g
<b>1229</b>	Zirconium (Sn-Fe-Cr) Alloy UNS R60804	block

See [Table 102.18](#) on the website for more information.

# Standard Reference Materials for Chemical Composition



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

SRM	Description	Unit of Issue
<a href="#">480</a>	Tungsten 20 % - Molybdenum Alloy Electron Microprobe Standard	disk
<a href="#">481</a>	Gold-Silver Wires for Microprobe Analysis	set (6)
<a href="#">482</a>	Gold-Copper Wires for Microprobe Analysis	set (6)
<a href="#">2061</a>	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
<a href="#">2066</a>	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

SRM 2841 is intended for use as a reference standard for analytical methods that measure the composition of thin films, such as electron microprobe analysis (EMPA), photoluminescence (PL), auger electron spectroscopy (AES), and X-ray photoelectron spectroscopy (XPS). The SRM consists of an epitaxial layer of  $Al_xGa_{1-x}As$ , 3 $\mu$ m 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
<a href="#">2841</a>	Semiconductor Thin Film: $Al_xGa_{1-x}As$ Epitaxial Layers (Al mole fraction $x$ near 0.20)	disk

See [Table 103.4](#) on the website for more information.

## Standard Reference Materials for Chemical Composition





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## High-Purity Metals (solid forms)

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

SRM	Description	Unit of Issue
<b>682</b>	High-Purity Zinc	half-round bar
<b>683</b>	Zinc, Metal	half-round bar
<b>728</b>	Intermediate-Purity Zinc	pellet form, 450 g
<b>885</b>	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  $100\% \pm 0.02\%$  (Purity 99.98+ %).

### Working Standard:

A commercially available substance of purity  $100\% \pm 0.05\%$  (Purity 99.95+ %).

### Secondary Standard:

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

SRM	Description	Unit of Issue
<b>17g</b>	Sucrose Optical Rotation	60 g
<b>84l</b>	Potassium Hydrogen Phthalate	60 g
<b>136f</b>	Potassium Dichromate (Oxidimetric Standard)	60 g
<b>350c</b>	Benzoic Acid (Acidimetric Standard)	30 g
<b>351a</b>	Sodium Carbonate (Acidimetric Standard)	50 g
<b>723e</b>	Tris (hydroxymethyl) aminomethane (HOCH <sub>2</sub> ) <sub>3</sub> CNH <sub>2</sub> Acidimetric Standard	50 g
<b>917d</b>	D-Glucose (Dextrose)	50 g
<b>973</b>	Boric Acid (Acidimetric Standard)	100 g
<b>999c</b>	Potassium Chloride Primary Standard	30 g
<b>8040a</b>	Sodium Oxalate (Reductometric Standard)	60 g

See [Table 104.3](#) on the website for more information.

## Microchemistry (powder form)

SRM	Description	Unit of Issue
<b>141e</b>	Acetanilide	2 g
<b>143d</b>	Cystine (L-Cystine)	2 g
<b>2141</b>	Urea	2 g
<b>2143</b>	<i>p</i> -Fluorobenzoic Acid	2 g
<b>2144</b>	<i>m</i> -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
<b>3101a</b>	Aluminum (Al) Standard Solution	5 x 10 mL
<b>3102a</b>	Antimony (Sb) Standard Solution	50 mL
<b>3103a</b>	Arsenic (As) Standard Solution	5 x 10 mL
<b>3104a</b>	Barium (Ba) Standard Solution	5 x 10 mL
<b>3105a</b>	Beryllium (Be) Standard Solution	5 x 10 mL
<b>3106</b>	Bismuth (Bi) Standard Solution	5 x 10 mL
<b>3107</b>	Boron (B) Standard Solution	50 mL
<b>3108</b>	Cadmium (Cd) Standard Solution	5 x 10 mL
<b>3109a</b>	Calcium (Ca) Standard Solution	5 x 10 mL
<b>3110</b>	Cerium (Ce) Standard Solution	5 x 10 mL
<b>3111a</b>	Cesium (Cs) Standard Solution	5 x 10 mL
<b>3112a</b>	Chromium (Cr) Standard Solution	5 x 10 mL
<b>3113</b>	Cobalt (Co) Standard Solution	5 x 10 mL
<b>3114</b>	Copper (Cu) Standard Solution	5 x 10 mL
<b>3115a</b>	Dysprosium (Dy) Standard Solution	5 x 10 mL
<b>3116a</b>	Erbium (Er) Standard Solution	5 x 10 mL
<b>3117a</b>	Europium (Eu) Standard Solution	5 x 10 mL
<b>3118a</b>	Gadolinium (Gd) Standard Solution	5 x 10 mL

# Chemical Composition High-Purity Materials

SRM	Description	Unit of Issue
<b>3119a</b>	Gallium (Ga) Standard Solution	5 x 10 mL
<b>3120a</b>	Germanium (Ge) Standard Solution	50 mL
<b>3121</b>	Gold (Au) Standard Solution	5 x 10 mL
<b>3122</b>	Hafnium (Hf) Standard Solution	50 mL
<b>3123a</b>	Holmium (Ho) Standard Solution	5 x 10 mL
<b>3124a</b>	Indium (In) Standard Solution	5 x 10 mL
<b>3126a</b>	Iron (Fe) Standard Solution	5 x 10 mL
<b>3127a</b>	Lanthanum (La) Standard Solution	5 x 10 mL
<b>3128</b>	Lead (Pb) Standard Solution	5 x 10 mL
<b>3129a</b>	Lithium (Li) Standard Solution	5 x 10 mL
<b>3130a</b>	Lutetium (Lu) Standard Solution	5 x 10 mL
<b>3131a</b>	Magnesium (Mg) Standard Solution	5 x 10 mL
<b>3132</b>	Manganese (Mn) Standard Solution	5 x 9 mL
<b>3133</b>	Mercury (Hg) Standard Solution	5 x 10 mL
<b>3134</b>	Molybdenum (Mo) Standard Solution	5 x 10 mL
<b>3135a</b>	Neodymium (Nd) Standard Solution	5 x 10 mL
<b>3136</b>	Nickel (Ni) Standard Solution	5 x 10 mL
<b>3137</b>	Niobium (Nb) Standard Solution	50 mL
<b>3138</b>	Palladium (Pd) Standard Solution	5 x 10 mL
<b>3139a</b>	Phosphorus (P) Standard Solution	5 x 10 mL
<b>3140</b>	Platinum (Pt) Standard Solution	5 x 10 mL
<b>3141a</b>	Potassium (K) Standard Solution	5 x 10 mL
<b>3142a</b>	Praseodymium (Pr) Standard Solution	5 x 10 mL
<b>3143</b>	Rhenium (Re) Standard Solution	5 x 10 mL
<b>3144</b>	Rhodium (Rh) Standard Solution	5 x 10 mL
<b>3145a</b>	Rubidium (Rb) Standard Solution	5 x 10 mL

SRM	Description	Unit of Issue
<b>3147a</b>	Samarium (Sm) Standard Solution	5 x 10 mL
<b>3148a</b>	Scandium (Sc) Standard Solution	5 x 10 mL
<b>3149</b>	Selenium (Se) Standard Solution	5 x 10 mL
<b>3150</b>	Silicon (Si) Standard Solution	50 mL
<b>3151</b>	Silver (Ag) Standard Solution	5 x 10 mL
<b>3152a</b>	Sodium (Na) Standard Solution	50 mL
<b>3153a</b>	Strontium (Sr) Standard Solution	5 x 10 mL
<b>3154</b>	Sulfur (S) Standard Solution	5 x 10 mL
<b>3155</b>	Tantalum (Ta) Standard Solution	50 mL
<b>3156</b>	Tellurium (Te) Standard Solution	5 x 10 mL
<b>3157a</b>	Terbium (Tb) Standard Solution	5 x 10 mL
<b>3158</b>	Thallium (Tl) Standard Solution	5 x 10 mL
<b>3160a</b>	Thulium (Tm) Standard Solution	5 x 10 mL
<b>3161a</b>	Tin (Sn) Standard Solution	50 mL
<b>3162a</b>	Titanium (Ti) Standard Solution	50 mL
<b>3163</b>	Tungsten (W) Standard Solution	50 mL
<b>3164</b>	Uranium (U) Standard Solution (Radioactive)	5 x 10 mL
<b>3165</b>	Vanadium (V) Standard Solution	5 x 10 mL
<b>3166a</b>	Ytterbium (Yb) Standard Solution	5 x 10 mL
<b>3167a</b>	Yttrium (Y) Standard Solution	5 x 10 mL
<b>3168a</b>	Zinc (Zn) Standard Solution	5 x 10 mL
<b>3169</b>	Zirconium (Zr) Standard Solution	50 mL
<b>3177</b>	Mercuric Chloride (HgCl <sub>2</sub> ) Standard Solution	5 x 10 mL

See [Table 104.5](#) on the website for more information.



## 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
<b>3030</b>	Monomethylarsonic Acid Standard Solution	2 x 5 mL
<b>3031</b>	Dimethylarsinic Acid Standard Solution	2 x 5 mL
<b>3033</b>	Arsenobetaine Standard Solution	2 x 5 mL
<b>3034</b>	Arsenocholine Standard Solution	2 x 5 mL
<b>3036</b>	Arsenic Acid (AsV) Standard Solution	2 x 10 mL
<b>3037</b>	Arsenous Acid (AsIII) Standard Solution	2 x 10 mL
<b>3103a</b>	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
<b>3180</b>	Iodide Anion Standard Solution	5 x 5 mL
<b>3181</b>	Sulfate Anion (SO <sub>4</sub> <sup>2-</sup> ) Standard Solution	5 x 10 mL
<b>3182</b>	Chloride Anion (Cl <sup>-</sup> ) Standard Solution	5 x 10 mL
<b>3183</b>	Fluoride Anion (F <sup>-</sup> ) Standard Solution	50 mL
<b>3184</b>	Bromide Anion (Br <sup>-</sup> ) Standard Solution	5 x 10 mL
<b>3185</b>	Nitrate Anion (NO <sub>3</sub> <sup>-</sup> ) Standard Solution	5 x 10 mL
<b>3186</b>	Phosphate Anion (PO <sub>4</sub> <sup>3-</sup> ) 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
<b>951a</b>	Boric Acid Isotopic Standard	10 g
<b>973</b>	Boric Acid (Acidimetric Standard)	100 g
<b>975a</b>	Isotopic Standard for Chlorine	0.25 g
<b>977</b>	Isotopic Standard for Bromine	0.25 g
<b>978a</b>	Assay-Isotopic Standard for Silver	0.25 g
<b>979</b>	Chromium Isotopic Standard	0.25 g
<b>980</b>	Isotopic Standard for Magnesium	0.25 g
<b>982</b>	Equal-Atom Lead Isotopic Standard	1 g wire
<b>983</b>	Radiogenic Lead Isotopic Standard	1 g wire
<b>984</b>	Rubidium Chloride	0.25 g
<b>986</b>	Isotopic Standard for Nickel	0.5 g
<b>987</b>	Strontium Carbonate Isotopic Standard	1 g
<b>994</b>	Isotopic Standard for Gallium	0.25 g
<b>997</b>	Thallium Isotopic Standard	0.25 g
<b>3230</b>	Iodine-129 Isotopic Standard (Low Level)	5x5 mL
<b>3231</b>	Iodine-129 Isotopic Standard (High Level)	5x5 mL
<b>3328</b>	Lead (Pb) Isotopic Standard Solution	2 x 10 mL
<b>8599</b>	Henderson Molybdenite	10 g

See [Table 104.9](#) on the website for more information.

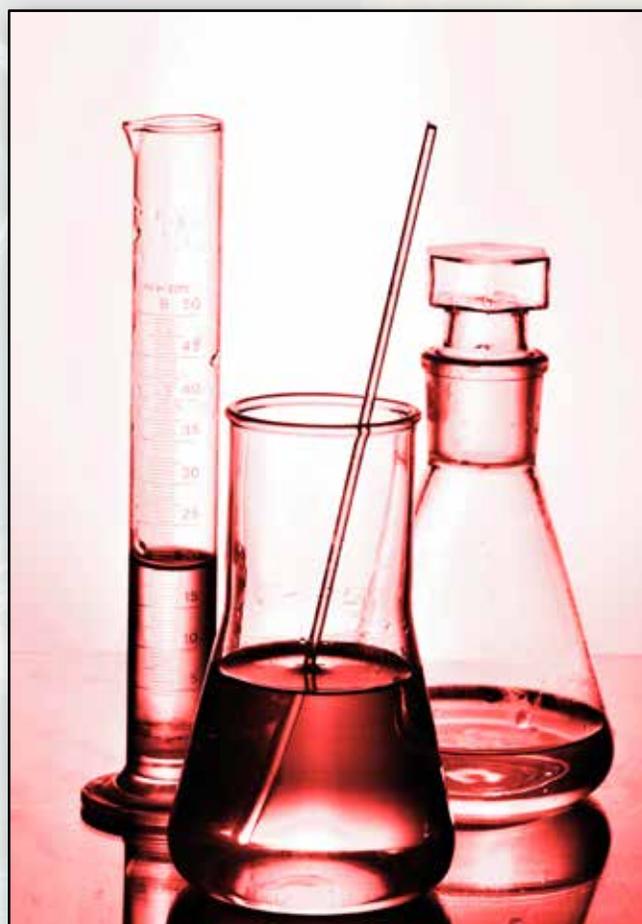
### Light Stable Isotopic Materials (gas, liquid, and solid forms)

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<sub>2</sub> (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
<b>8301</b>	Boron Isotopes in Marine Carbonate (Simulated Coral and Foraminifera Solutions)	6 x 4 mL
<b>8529</b>	IAEA-S-3 (Sulfur Isotopes in Silver Sulfide)	1 x 0.5 g
<b>8535a</b>	VSMOW2 Vienna Standard Mean Ocean Water (Hydrogen and Oxygen Isotopes in Water)	20 mL
<b>8536</b>	GISP-Water	20 mL
<b>8537</b>	SLAP-Water Light Stable Isotopic Standard	20 mL
<b>8539</b>	NBS22 Oil (Carbon and Hydrogen Isotopes in Oil)	1 mL
<b>8540</b>	IAEA-CH-7 (Carbon and Hydrogen Isotopes in Polyethylene Foil)	3.5 g
<b>8541</b>	USGS24 Graphite (Carbon Isotopes in Graphite)	0.8 g
<b>8542</b>	IAEA-CH-6 Sucrose (Carbon Isotopes in Sucrose)	1 g
<b>8544</b>	NBS 19 Limestone (Carbon and Oxygen Isotopes in Carbonate)	0.4 g
<b>8545</b>	LSVEC (Carbon, Oxygen, and Lithium Isotopes in Lithium Carbonate)	0.4 g
<b>8546</b>	NBS28 (Silicon and Oxygen Isotopes in Silica Sand)	0.4 g
<b>8547</b>	IAEA-N-1 (Nitrogen Isotopes in Ammonium Sulfate)	0.4 g
<b>8548</b>	IAEA-N-2 (Nitrogen Isotopes in Ammonium Sulfate)	0.4 g
<b>8550</b>	USGS25 (Nitrogen Isotopes in Ammonium Sulfate)	0.5 g
<b>8551</b>	USGS26 (Nitrogen Isotopes in Ammonium Sulfate)	0.5 g
<b>8552</b>	NSVEC (Nitrogen Isotopes in Gaseous Nitrogen)	300 μmol
<b>8553</b>	IAEA-S-4 (Sulfur Isotopes in Elemental Sulfur)	0.5 g
<b>8554</b>	IAEA-S-1 (Sulfur Isotopes in Silver Sulfide)	0.5 g
<b>8555</b>	IAEA-S-2 (Sulfur Isotopes in Silver Sulfide)	0.5 g

SRM	Description	Unit of Issue
<b>8557</b>	NBS127 (Sulfur and Oxygen Isotopes in Barium Sulfate)	0.5 g
<b>8558</b>	USGS32 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
<b>8562</b>	CO <sub>2</sub> - <sup>13</sup> C-enriched, Paleomarine Origin (Carbon Dioxide)	set (2)
<b>8563</b>	CO <sub>2</sub> - <sup>13</sup> C-depleted, Petrochemical Origin (Carbon Dioxide)	set (2)
<b>8564</b>	CO <sub>2</sub> -Biogenic, Modern Biomass Origin (Carbon Dioxide)	set (2)
<b>8568</b>	USGS34 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
<b>8569</b>	USGS35 (Nitrogen and Oxygen Isotopes in Nitrate)	0.9 g
<b>8574</b>	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 2025 SRM EXHIBIT SCHEDULE

## March 3 - 5, 2025

*Pittcon Conference and Exposition*  
**Boston Convention & Exhibition Center**  
**Booth #832/833**  
Boston, MA

## June 1 - 4, 2025

*BERM 16 International Symposium on Biological  
and Environmental Reference Materials*  
**Halifax Convention Center**  
Nova Scotia, Canada

## July 29 - 31, 2025

*ADLM (Association for Diagnostics &  
Laboratory Medicine) 2025*  
*\*formerly AACC*  
**Mc Cormick Place Convention Center**  
**Booth #4242**  
Chicago, IL

## August 23 - 28, 2025

*AOAC International 139th Annual  
Meeting & Exposition*  
**Marriott Baltimore Waterfront**  
**Booth #218**  
San Diego, CA



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# Standard Reference Materials for Chemical Composition



# Clinical, Health & Industrial Hygiene



**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	25 g
913b	Uric Acid	10 g
914b	Creatinine	10 g
915c	Calcium Carbonate	20 g
916b	Bilirubin	100 mg
917d	D-Glucose (Dextrose)	50 g
918c	Potassium Chloride General and Ion Activity Standard	30 g
919b	Sodium Chloride	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 Standard)	10 x 2.2 mL
928	Lead Nitrate	30 g
929a	Magnesium Gluconate	5 g
937	Iron Metal	50 g
955d	Toxic Metals and Metabolites in Frozen Human Blood	6 x 1.6 mL
956d	Electrolytes in Frozen Human Serum	6 x 2 mL
965b	Glucose in Frozen Human Serum	8 x 2 mL
967a	Creatinine in Frozen Human Serum	4 x 1 mL
968f	Fat-Soluble Vitamins in Frozen Human Serum	2 x 1 mL
971a	Hormones in Frozen Human Serum	4 x 2 mL
972a	Vitamin D Metabolites in Frozen Human Serum	4 x 1 mL
998	Angiotensin I (Human)	0.5 mg
1400	Bone Ash	50 g
1401	Trace Metals in Frozen Human Blood	4 x 1.6 mL
1486	Bone Meal	50 g
1507b	11-Nor-Delta-9-Tetrahydrocannabinol-9-Carboxylic Acid in Freeze-Dried Urine	set (3)
1595	Tripalmitin	2 g
1598a	Inorganic Constituents in Animal Serum	2 x 5 mL
1949	Frozen Human Prenatal Serum	8 vials (2 each level)
1950	Metabolites in Frozen Human Plasma	5 x 1 mL
1951c	Lipids in Frozen Human Serum	4 x 1 mL

SRM	Description	Unit of Issue
1955	Homocysteine and Folate in Frozen Human Serum	set (3)
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
2365	BK Virus DNA Quantitative Standard	1 x 110 µL
2366a	Cytomegalovirus DNA (Towne <sub>Δ147</sub> BAC) for DNA Measurements	1 x 150 µL
2378	Fatty Acids in Frozen Human Serum	3 x 1 mL
2389a	Amino Acids in 0.1 mol/L Hydrochloric Acid	5 x 1.2 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
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
2968	3-Epi-25-Hydroxyvitamin 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
2972b	25-Hydroxyvitamin D Calibration Solutions	15 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
3666	Albumin and Creatinine in Frozen Human Urine	4 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)	5 x 1.5 mL
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
3949	Folate Vitamers in Frozen Human Serum	3 x 1 mL
3950	Vitamin B in Frozen Human Serum	2 x 1 mL
3951	Fatty Acid Species in Frozen Human Serum	3 x 1 mL

SRM	Description	Unit of Issue
<b>8321</b>	Peptide Mixture for Proteomics	3 x 50 uL
<b>8323</b>	Yeast Protein Extract	3 x 0.2 mL
<b>8461</b>	Human Liver for Proteomics	0.5 g
<b>8642a</b>	FDA Saxitoxin Dihydrochloride Solution	5 x 1.2 mL
<b>8671</b>	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
<b>2668</b>	Toxic Elements in Frozen Human Urine	set (10)
<b>2669</b>	Arsenic Species in Frozen Human Urine	set (10)
<b>3668</b>	Mercury, Perchlorate, and Iodide in Frozen Human Urine	set (10)
<b>3669</b>	Arsenic Species in Frozen Human Urine (Elevated Levels)	set (5)

See [Table 105.4](#) 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
<b>2910b</b>	Hydroxyapatite	2 g
<b>8012</b>	Gold Nanoparticles, Nominal 30 nm Diameter	2 x 5 mL
<b>8013</b>	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
<b>2783</b>	Air Particulate on Filter Media	2 + 2 Blank (47 mm dia)
<b>2950a</b>	Respirable Alpha Quartz on Filter Media (Nominal Mass of Alpha Quartz: 5 μg - 500 μg)	35 filters plus 35 blanks
<b>2960</b>	Respirable Cristobalite on Filter Media (Nominal Mass of Cristobalite: 5 μg - 250 μg)	30 filters plus 30 blanks
<b>8785</b>	Air Particulate Matter on Filter Media	3 filters
<b>8786</b>	Filter Blank for RM 8785	1 filter

See [Table 105.10](#) on the website for more information.

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

SRM	Description	Unit of Issue
<b>968f</b>	Fat-Soluble Vitamins in Frozen Human Serum	2 x 1 mL
<b>972a</b>	Vitamin D Metabolites in Frozen Human Serum	4 x 1 mL
<b>1949</b>	Frozen Human Prenatal Serum	8 vials (2 each)
<b>1950</b>	Metabolites in Frozen Human Plasma	5 x 1 mL
<b>2968</b>	3-Epi-25-Hydroxyvitamin D3 Calibration Solution	5 x 1.2 mL
<b>2969</b>	Vitamin D Metabolites in Frozen Human Serum (Total 25-Hydroxyvitamin D Low Level)	2 x 1 mL
<b>2970</b>	Vitamin D Metabolites in Frozen Human Serum (25-Hydroxyvitamin D2 High Level)	2 x 1 mL
<b>2971</b>	24R, 25-Dihydroxyvitamin D3 Calibration Solution	5 x 1 mL
<b>2972b</b>	25-Hydroxyvitamin D Calibration Solutions	15 x 1.2 mL
<b>2973</b>	Vitamin D Metabolites in Frozen Human Serum (High Level)	2 x 1 mL

See [Table 105.5](#) 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
<b>1828c</b>	Ethanol-Water Solutions (Six Levels)	6 x 1.2 mL
<b>2891</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.02 %)	5 x 1.2 mL
<b>2892</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.04 %)	5 x 1.2 mL
<b>2893a</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.08 %)	5 x 1.2 mL
<b>2894</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.1 %)	5 x 1.2 mL
<b>2895</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.2 %)	5 x 1.2 mL
<b>2896</b>	Ethanol-Water Solution (Nominal Mass Fraction 0.3 %)	5 x 1.2 mL
<b>2897a</b>	Ethanol-Water Solution (Nominal Mass Fraction 2 %)	5 x 10 mL
<b>2898a</b>	Ethanol-Water Solution (Nominal Mass Fraction 6 %)	5 x 10 mL
<b>2899a</b>	Ethanol-Water Solution (Nominal Mass Fraction 25 %)	5 x 10 mL
<b>2900</b>	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 Contaminants (urine)

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

See [Table 105.7](#) on the website for more information.

### 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 certified mass fraction.

RM 8230 is intended primarily for challenging, evaluating, and comparing analytical workflows involving nucleic acid-based detection. RM 8230 yeast cells have a noncoding sequence of nucleic acids stably inserted into their genome for targeted detection. Typical instrumentation for using this RM include polymerase chain reaction (PCR), quantitative PCR (qPCR), digital PCR (dPCR), and DNA sequencing technologies. In addition, this RM is characterized for total cells and may be used to support the assessment and comparison of microbial cell counting methods.

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

See [Table 105.6](#) 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
<b>909c</b>	Frozen Human Serum	3 x 2 mL
<b>927f</b>	Bovine Serum Albumin (7 %, solution) (Total Protein Solution)	10 x 2.2 mL
<b>955d</b>	Toxic Metals and Metabolites in Frozen Human Blood	6 x 1.6 mL
<b>956d</b>	Electrolytes in Frozen Human Serum	6 x 2 mL
<b>965b</b>	Glucose in Frozen Human Serum	set (8)
<b>967a</b>	Creatinine in Frozen Human Serum	set (4)
<b>968f</b>	Fat-Soluble Vitamins, Carotenoids, and Cholesterol in Human Serum	set (3)
<b>971a</b>	Hormones in Frozen Human Serum	2 x 2 mL
<b>972a</b>	Vitamin D Metabolites in Frozen Human Serum	4 x 1 mL
<b>1401</b>	Trace Metals in Frozen Human Blood	4 x 1.6 mL
<b>1507b</b>	11-Nor-Delta-9-Tetrahydrocannabinol-9- Carboxylic Acid in Freeze-Dried Urine	set (3)
<b>1949</b>	Frozen Human Prenatal Serum	8 x 1.8 mL
<b>1950</b>	Metabolites in Human Plasma	5 x 1 mL
<b>1951c</b>	Lipids in Frozen Human Serum	4 x 1 mL
<b>1955</b>	Homocysteine and Folate in Frozen Human Serum	set (3)
<b>1957</b>	Organic Contaminants in Non-Fortified Human Serum	5
<b>1958</b>	Organic Contaminants in Fortified Human Serum	5
<b>2378</b>	Fatty Acids in Frozen Human Serum	3 x 1 mL
<b>2668</b>	Toxic Elements in Frozen Human Urine	10 x 1.5 mL
<b>2669</b>	Arsenic Species in Frozen Human Urine	10 x 1.5 mL
<b>2925</b>	Recombinant Human Serum Albumin Solution (Primary Reference Calibrator for Urine Albumin) (Frozen)	2 x 0.5 mL
<b>2969</b>	Vitamin D Metabolites in Frozen Human Serum (Total 25-Hydroxyvitamin D Low Level)	2 x 1 mL
<b>2970</b>	Vitamin D Metabolites in Frozen Human Serum (25-Hydroxyvitamin D2 High Level)	2 x 1 mL
<b>2973</b>	Vitamin D Metabolites in Frozen Human Serum (High Level)	2 x 1 mL
<b>3666</b>	Albumin and Creatinine in Frozen Human Urine	4 x 1 mL
<b>3667</b>	Creatinine in Frozen Human Urine	1 x 10 mL
<b>3668</b>	Mercury, Perchlorate, and Iodide in Frozen Human Urine	10 x 1.5 mL
<b>3669</b>	Arsenic Species in Frozen Human Urine (Elevated Levels)	10 x 1.5 mL

SRM	Description	Unit of Issue
<b>3671</b>	Nicotine Metabolites in Human Urine (Frozen)	5 x 1.5 mL
<b>3672</b>	Organic Contaminants in Smoker's Urine (Frozen)	10 x 1.5 mL
<b>3673</b>	Organic Contaminants in Non-Smoker's' Urine (Frozen)	10 x 1.5 mL
<b>3949</b>	Folate Vitamers in Frozen Human Serum	3 x 1 mL
<b>3950</b>	Vitamin B6 in Frozen Human Serum	2 x 1 mL
<b>3951</b>	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
<b>1648a</b>	Urban Particulate Matter	2 g
<b>1649b</b>	Urban Dust	2 g
<b>1650b</b>	Diesel Particulate Matter	200 mg
<b>1878b</b>	Respirable Alpha Quartz (Quantitative X-Ray Powder Diffraction Standard)	5 g
<b>1879b</b>	Respirable Cristobalite (Quantitative X-Ray Powder Diffraction Standard)	5 g
<b>1975</b>	Diesel Particulate Extract	4 x 1.2 mL
<b>2583</b>	Trace Elements in Indoor Dust (Nominal Mass Fraction of 90 mg/kg Lead)	8 g
<b>2584</b>	Trace Elements in Indoor Dust (Nominal Mass Fraction of 1% Lead)	8 g
<b>2585</b>	Organic Contaminants in House Dust	10 g
<b>2786</b>	Fine Atmospheric Particulate Matter (Mean Particle Diameter < 4 µm)	100 mg to 140 mg
<b>2787</b>	Fine Atmospheric Particulate Matter (Mean Particle Diameter < 10 µm)	
<b>2975</b>	Diesel Particulate Matter	100 mg to 140 mg
<b>8044</b>	Common Commercial Asbestos: Chrysotile	

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 50 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).

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
<b>2365</b>	BK Virus DNA Quantitative Standard	1 vial
<b>2366a</b>	Cytomegalovirus DNA (Towne $\Delta$ <sub>147</sub> BAC) for DNA Measurements	1 vial
<b>2367</b>	JC Virus DNA Quantitative Standard	1 x 110 μL
<b>2372a</b>	Human DNA Quantitation Standard	set (3)
<b>2373</b>	Genomic DNA Standards for <i>HER2</i> Measurements	set (5)
<b>2374</b>	DNA Sequence Library for External RNA Controls	96 tubes
<b>2391d</b>	PCR-Based DNA Profiling Standard	5 vials
<b>2393</b>	CAG Repeat Length Mutation in Huntington’s Disease	set (6)
<b>2917</b>	Plasmid DNA for Fecal Indicator Detection and Identification	set (6)
<b>8230</b>	<i>Saccharomyces cerevisiae</i> NE095 Cells for Cell Counting and DNA-based Detection (freeze-dried)	16 vials (12 yeast, 4 matrix)
<b>8366</b>	<i>EGFR</i> and <i>MET</i> Gene Copy Number Standards for Cancer Measurements	set (6)
<b>8375</b>	Microbial Genomic DNA Standards for Sequencing Performance Assessment (MG-001, MG-002, MG-003, MG-004)	set (4)
<b>8376</b>	Microbial Pathogen DNA Standards for Detection and Identification	20 tubes
<b>8391</b>	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	1 vial
<b>8391 (QTY 10)</b>	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	10 vials of RM 8391
<b>8392</b>	Human DNA for Whole-Genome Variant Assessment (Trio of Eastern European Ashkenazi Jewish Ancestry) (HG-002, HG-003, HG-004)	3 vials
<b>8393</b>	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	1 vial
<b>8393 (QTY 10)</b>	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	10 vials of RM 8391
<b>8398</b>	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	1 vial
<b>8398 (QTY 10)</b>	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.

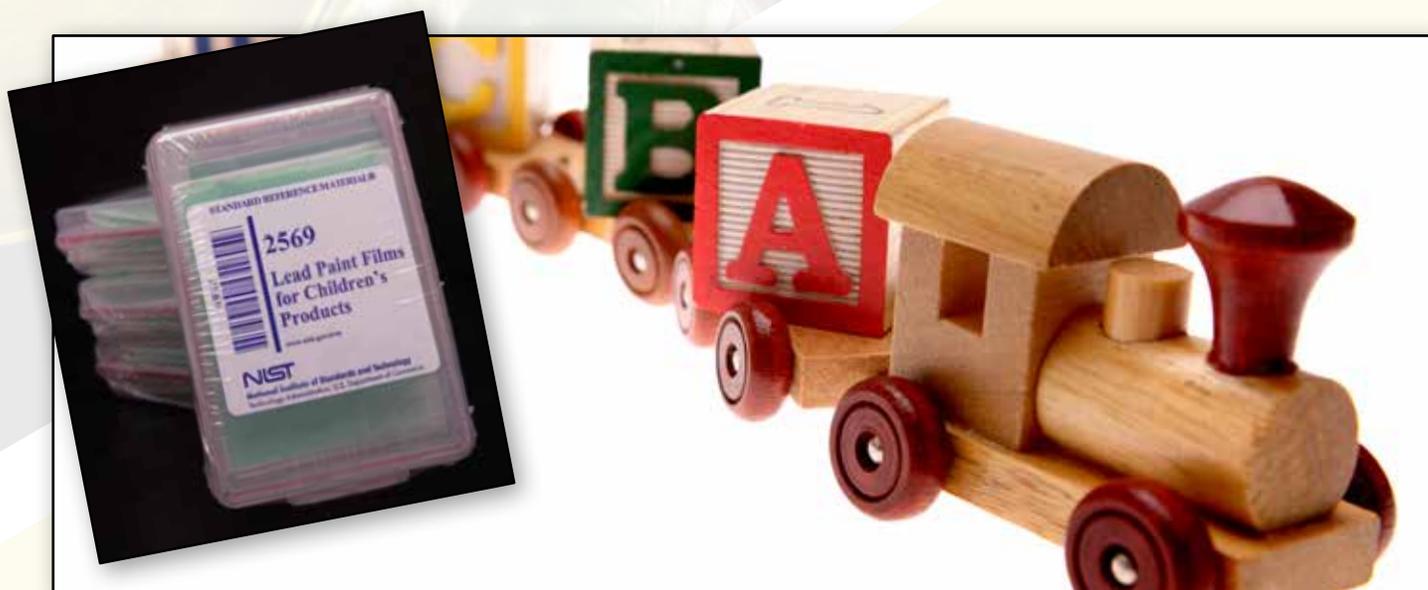
## Lead in Paint, Dust, and Soil (powder and sheet forms)

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
<b>1648a</b>	Urban Particulate Matter	2 g
<b>2569</b>	Lead Paint Films for Children's Products	8 sheets
<b>2570</b>	Lead Paint Film for Portable X-Ray Fluorescence Analyzers - Blank (Color: White)	1 film
<b>2571</b>	Lead Paint Film for Building Surfaces (Nominal Pb 3.5 mg/cm <sup>2</sup> )(Color: Yellow)	1 + blank
<b>2572</b>	Lead Paint Film for Building Surfaces (Nominal Pb 1.6 mg/cm <sup>2</sup> )(Color: Orange)	1 + blank
<b>2573</b>	Lead Paint Film for Building Surfaces (Nominal Pb 1.0 mg/cm <sup>2</sup> )(Color: Red)	1 + blank

SRM	Description	Unit of Issue
<b>2574</b>	Lead Paint Film for Building Surfaces (Nominal Pb 0.7 mg/cm <sup>2</sup> )(Color: Gold)	1 + blank
<b>2575</b>	Lead Paint Film for Building Surfaces (Nominal Pb 0.3 mg/cm <sup>2</sup> )(Color: Green)	1 + blank
<b>2576</b>	Lead Paint Film for Building Surfaces (Nominal Pb 5.6 mg/cm <sup>2</sup> )(Color: Blue)	1 + blank
<b>2579a</b>	Lead Paint Films For Building Surfaces (SRM 2570 through SRM 2575)	set (6)
<b>2580</b>	Powdered Paint (Nominal Mass Fraction 4 % Lead)	30 g
<b>2581</b>	Powdered Paint (Nominal Mass Fraction 0.5 % Lead)	35 g
<b>2582</b>	Powdered Paint (Nominal Mass Fraction 200 mg/kg Lead)	20 g
<b>2583</b>	Trace Elements in Indoor Dust (Nominal Mass Fraction of 90 mg/kg Lead)	8 g
<b>2584</b>	Trace Elements in Indoor Dust (Nominal Mass Fraction of 1% Lead)	8 g
<b>2586</b>	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction 500 mg/kg Lead)	55 g
<b>2587</b>	Trace Elements in Soil (Nominal Mass Fraction of 3000 mg/kg Lead)	55 g
<b>2589</b>	Powdered Paint (Nominal Mass Fraction 10% Lead)	35 g
<b>2783</b>	Air Particulate on Filter Media (47 mm dia)	2 + 2 Blank

See [Table 105.13](#) on the website for more information.



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# Standard Reference Materials for Chemical Composition



**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
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
2983	Inorganics in Geoduck Clam Tissue ( <i>Panopea generosa</i> )	12 g
8210	Hemp	3 x 1.5 g

SRM	Description	Unit of Issue
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

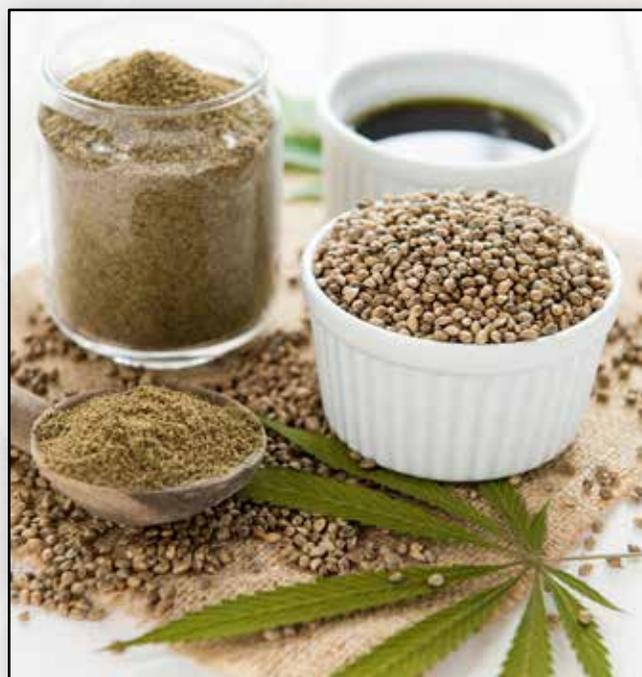
See [Table 106.1](#) on the website for more information.

**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
<b>1632e</b>	Trace Elements in Coal (Bituminous)	50 g
<b>2718a</b>	Green Petroleum Coke	50 g
<b>2719</b>	Calcined Petroleum Coke	50 g
<b>2775</b>	Sulfur in Foundry Coke	50 g
<b>2776</b>	Sulfur in Furnace Coke	50 g
<b>8499</b>	Trace Elements in Coal (Bituminous)	50 g
<b>8704</b>	Buffalo River Sediment	50 g
<b>8785</b>	Air Particulate Matter on Filter Media	3 filters
<b>8786</b>	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  $\mu\text{m}$ , 200 mesh) powders.

SRM	Description	Unit of Issue
<b>2556</b>	Used Auto Catalyst (Pellets)	70 g
<b>2557</b>	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
<b>8850</b>	Zeolite Y	35-40 g
<b>8851</b>	Zeolite A	35-40 g
<b>8852</b>	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



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## 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<sup>3</sup> 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.

<b>2635a*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 25 µmol/mol)	6 L cylinder
<b>2636a*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 250 µmol/mol)	6 L cylinder
<b>2637a*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 2500 µmol/mol)	6 L cylinder
<b>2638a*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 5000 µmol/mol)	6 L cylinder
<b>2639a</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 1 % mol/mol)	6 L cylinder
<b>2640a</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 2 % mol/mol)	6 L cylinder
<b>2641a</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 4 % mol/mol)	6 L cylinder
<b>2642a*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 8 % mol/mol)	6 L cylinder
<b>2740a</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 % mol/mol)	6 L cylinder
<b>2741a</b>	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.

## Carbon Monoxide in Air or Nitrogen

SRM	Description	Unit of Issue
<b>1677c*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 µmol/mol)	6 L cylinder
<b>1678c*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
<b>1679c*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
<b>1680b*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
<b>1681b*</b>	Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 µmol/mol)	6 L cylinder

# Chemical Composition

## Primary Gas Mixtures

### Carbon Dioxide in Nitrogen

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

### Hydrogen Sulfide in Nitrogen

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

## Organic Components in Air or Nitrogen

SRM	Description	Unit of Issue
<b>1658a</b>	Methane in Air (Nominal Amount-of-Substance Fraction 1 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1659a</b>	Methane in Air (Nominal Amount-of-Substance Fraction 10 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1665b</b>	Propane in Air (Nominal Amount-of-Substance Fraction 3 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1666b</b>	Propane in Air (Nominal Amount-of-Substance Fraction 10 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1667b</b>	Propane in Air (Nominal Amount-of-Substance Fraction 50 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1668b*</b>	Propane in Air (Nominal Amount-of-Substance Fraction 100 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1669b</b>	Propane in Air (Nominal Amount-of-Substance Fraction 500 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2644a</b>	Propane in Nitrogen (Nominal Amount-of-Substance Fraction 250 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2647a</b>	Propane in Nitrogen (Nominal Amount-of-Substance Fraction 2500 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2750</b>	Methane in Air (Nominal Amount-of-Substance Fraction 50 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2751</b>	Methane in Air (Nominal Amount-of-Substance Fraction 100 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2764</b>	Propane in Air (Nominal Amount-of-Substance Fraction 0.25 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2765</b>	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
<b>1683b*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1684b*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1685b*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 250 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1686b*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1687b*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 $\mu\text{mol/mol}$ )	6 L cylinder
<b>1718</b>	Nitrous Oxide in Air (Nominal Amount-of-Substance Fraction 1 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2627a*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 5 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2628a*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2629a*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 20 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2630*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 1500 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2631a*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 3000 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2735</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 800 $\mu\text{mol/mol}$ )	6 L cylinder
<b>2737*</b>	Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 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.

# Chemical Composition

## Primary Gas Mixtures

### Oxygen in Nitrogen

SRM	Description	Unit of Issue
<b>2657a*</b>	Oxygen in Nitrogen (Nominal Amount-of-Substance Fraction 2 % mol/mol)	6 L cylinder
<b>2658a*</b>	Oxygen in Nitrogen (Nominal Amount-of-Substance Fraction 10 % mol/mol)	6 L cylinder
<b>2659a*</b>	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
<b>1661a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 500 µmol/mol)	6 L cylinder
<b>1662a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1000 µmol/mol)	6 L cylinder
<b>1663a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 1500 µmol/mol)	6 L cylinder
<b>1664a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 2500 µmol/mol)	6 L cylinder
<b>1689</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 5 µmol/mol)	6 L cylinder
<b>1693a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 50 µmol/mol)	6 L cylinder
<b>1694a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 100 µmol/mol)	6 L cylinder
<b>1696a*</b>	Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 3500 µmol/mol)	6 L cylinder

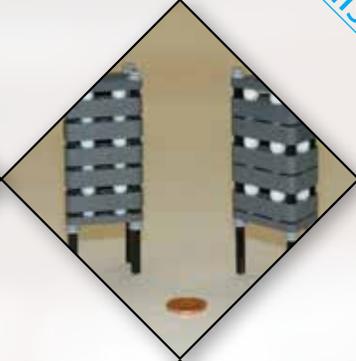
\* The SRMs that are marked with \* are also available as NTRMs from commercial suppliers.

See [Table 107.8](#) on the website for more information.



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# Standard Reference Materials for Chemical Composition



# Chemical Composition

## 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
<b>1634c</b>	Trace Elements in Fuel Oil	100 mL
<b>8505</b>	Vanadium in Crude Oil	250 mL

See [Table 108.2](#) on the website for more information.

### Crude Oil

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

See [Table 108.3](#) on the website for more information.

### Bituminous Coal

SRM	Description	Unit of Issue
<b>1632e</b>	Trace Elements in Coal (Bituminous)	100 mL
<b>2683c</b>	Bituminous Coal (Nominal Mass Fraction 2 % Sulfur)	50 g
<b>2684c</b>	Bituminous Coal (Nominal Mass Fraction 3 % Sulfur)	50 g
<b>2685c</b>	Bituminous Coal (Nominal Mass Fraction 5 % Sulfur)	50 g
<b>2692c</b>	Bituminous Coal (Nominal Mass Fraction 1 % Sulfur)	50 g
<b>2693</b>	Bituminous Coal (Nominal Mass Fraction 0.5 % Sulfur)	50 g
<b>8499</b>	Trace Elements in Coal (Bituminous)	5 x 20 mL

See [Table 108.3](#) on the website for more information and additional resources.

### Gasoline

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

See [Table 108.3](#) on the website for more information.

### Subbituminous Coal

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

See [Table 108.3](#) on the website for more information.

## Residual Fuel Oil

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

See [Table 108.3](#) on the website for more information.



## Petroleum Coke

SRM	Description	Unit of Issue
<b>2718a</b>	Green Petroleum Coke	50 g
<b>2719</b>	Calcined Petroleum Coke	50 g

See [Table 108.3](#) on the website for more information.

## Metallurgical Coke

SRM	Description	Unit of Issue
<b>2775</b>	Sulfur in Foundry Coke	50 g
<b>2776</b>	Sulfur in Furnace Coke	50 g

See [Table 108.3](#) on the website for more information.

## Middle Distillates

SRM	Description	Unit of Issue
<b>1617b</b>	Sulfur in Kerosine (High Level)	100 mL
<b>2723b</b>	Sulfur in Diesel Fuel Oil (Nominal Mass Fraction 10 mg/kg)	100 mL
<b>2770</b>	Sulfur in Diesel Fuel Oil (Nominal Mass Fraction 40 mg/kg)	10 x 10 mL

See [Table 108.3](#) on the website for more information.

## Chemical Composition Fossil & Alternative Fuels

### 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. The water concentration value for RM 8509 is not certified, but represent the “best estimate” of the moisture content determined by NIST, and is intended for use in developing and validating methods for the determination of moisture in a similar matrix.

SRM	Description	Unit of Issue
<b>2721</b>	Crude Oil (Light-Sour)	5 x 10 mL
<b>2722</b>	Crude Oil (Heavy-Sweet)	5 x 10 mL
<b>2890</b>	Water Saturated 1-Octanol	5 x 2 mL
<b>8509</b>	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
<b>1632e</b>	Trace Elements in Coal (Bituminous)	50 g
<b>1633c</b>	Trace Elements in Coal Fly Ash	75 g
<b>1635a</b>	Trace Elements in Coal (Subbituminous)	50 g
<b>2429</b>	Flue Gas Desulfurization Gypsum	200 g
<b>2689</b>	Coal Fly Ash	3 x 10 g
<b>2690</b>	Coal Fly Ash	3 x 10 g
<b>2691</b>	Coal Fly Ash	3 x 10 g
<b>2718a</b>	Green Petroleum Coke	50 g
<b>2719</b>	Calcined Petroleum Coke	50 g
<b>8499</b>	Trace Elements in Coal (Bituminous)	50 g

See [Table 108.6](#) on the website for more information.

### Biomass Constituents

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

See [Table 108.9](#) on the website for more information.



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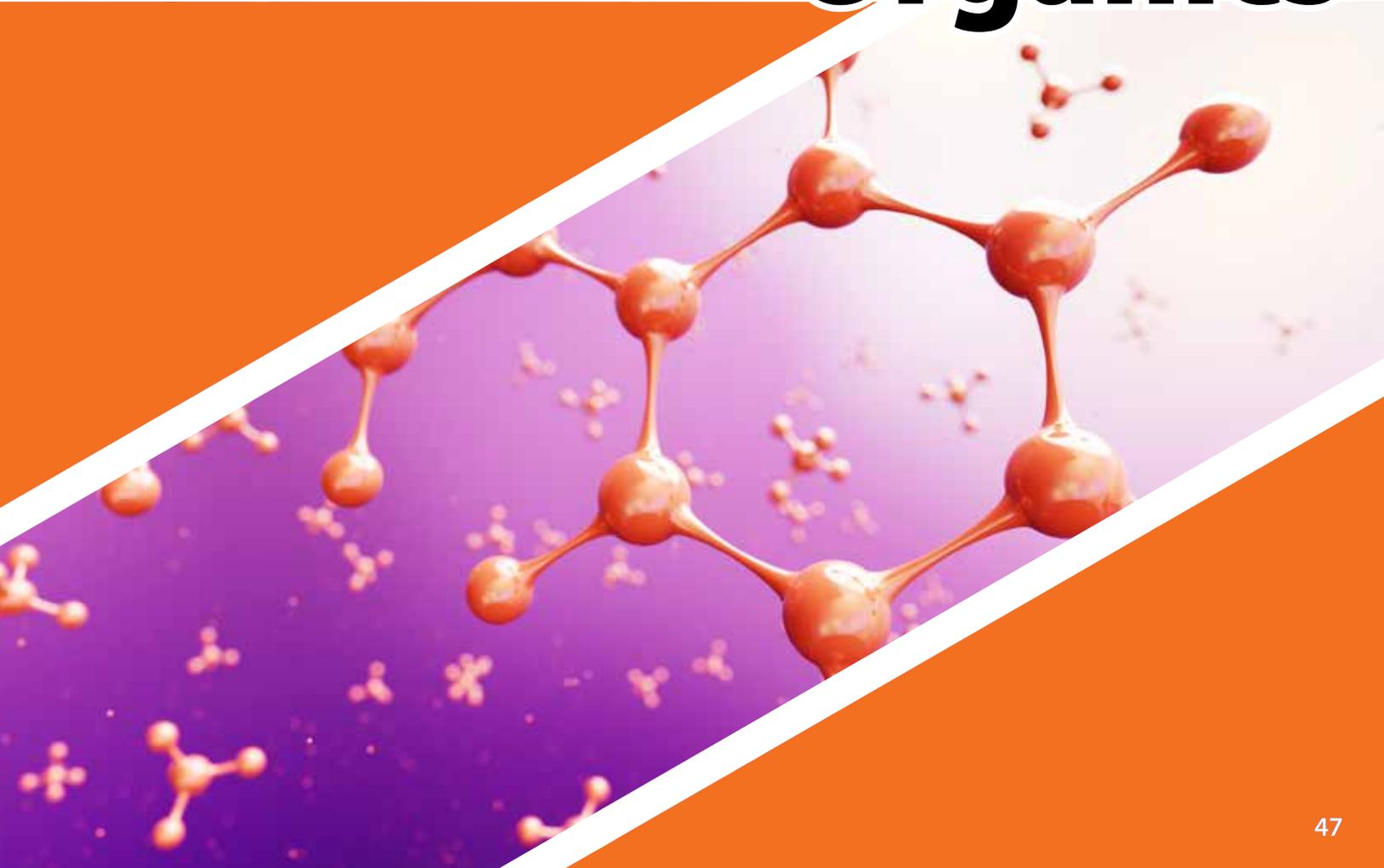


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# Standard Reference Materials for Chemical Composition



Organics

SRM	Description	Unit of Issue
<b>869b</b>	Column Selectivity Test Mixture for Liquid Chromatography	5 x 1.1 mL
<b>870</b>	Column Performance Test Mixture for Liquid Chromatography	5 x 1.1 mL
<b>1491a</b>	Methyl-Substituted Polycyclic Aromatic Hydrocarbons in Toluene	5 x 1.2 mL
<b>1493</b>	Polychlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>1494</b>	Aliphatic Hydrocarbons in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>1543</b>	GC/MS System Performance Standard	4 x 1 mL
<b>1647f</b>	Priority Pollutant Polycyclic Aromatic Hydrocarbons in Acetonitrile	5 x 1.3 mL
<b>1649b</b>	Urban Dust	2 g
<b>1650b</b>	Diesel Particulate Matter	200 mg
<b>1936</b>	Great Lakes Sediment	50 g
<b>1941b</b>	Organics in Marine Sediment	50 g
<b>1945</b>	Organics in Whale Blubber	2 x 15 g
<b>1947</b>	Lake Michigan Fish Tissue	5 x 8 g
<b>1953</b>	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL
<b>1954</b>	Organic Contaminants in Fortified Human Milk	5 x 5 mL
<b>1957</b>	Organic Contaminants in Non-Fortified Human Serum (Freeze Dried)	5 x 10.7 mL
<b>1958</b>	Organic Contaminants in Fortified Human Serum (Freeze Dried)	5 x 10.7 mL
<b>1974c</b>	Organics in Mussel Tissue ( <i>Mytilus edulis</i> )	5 x 10 g
<b>1975</b>	Diesel Particulate Extract	4 x 1.2 mL
<b>1991</b>	Mix Coal Tar/Petroleum Extract in Methylene Chloride	5 x 1.2 mL
<b>2257</b>	PBDE Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2258</b>	BDE 209 in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2259</b>	PCB Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2260a</b>	Aromatic Hydrocarbon in Toluene	5 x 1.2 mL
<b>2261</b>	Chlorinated Pesticides in Hexane (Nominal Mass Concentration 2 µg/mL)	5 x 1.2 mL
<b>2262</b>	Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane (Nominal Mass Concentration 2 µg/mL)	5 x 1.2 mL
<b>2266</b>	Hopanes and Steranes in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2269</b>	Perdeuterated PAH-I Solution in Hexane/Toluene	5 x 1.2 mL
<b>2270</b>	Perdeuterated PAH-II Solution in Hexane/Toluene	5 x 1.2 mL

SRM	Description	Unit of Issue
<b>2274</b>	PCB Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2275</b>	Chlorinated Pesticide Solution-II in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>2585</b>	Organic Contaminants in House Dust	10 g
<b>2706</b>	New Jersey Soil, Organics and Trace Elements	50 g
<b>2777</b>	Weathered Gulf of Mexico Crude Oil in Toluene	5 x 1.2 mL
<b>2779</b>	Gulf of Mexico Crude Oil	5 x 1.2 mL
<b>2781</b>	Domestic Sludge	40 g
<b>2786</b>	Fine Atmospheric Particulate Matter (<4 µm)	100 mg to 140 mg
<b>2787</b>	Fine Atmospheric Particulate Matter (<10 µm)	100 mg to 140 mg
<b>2860</b>	Phthalates in Polyvinyl Chloride	2 levels, 1 blank, 2 g each
<b>2974a</b>	Organics in Freeze-Dried Mussel Tissue ( <i>Mytilus edulis</i> )	5 g
<b>2975</b>	Diesel Particulate Matter	1 g
<b>3060</b>	Monoester Phthalates in Acetonitrile	5 x 1.2 mL
<b>3262</b>	St. John's Wort ( <i>Hypericum perforatum</i> L.) Aerial Parts	5 x 3.3 g
<b>3672</b>	Organic Contaminants in Smokers' Urine (Frozen)	5 x 10 mL
<b>3673</b>	Organic Contaminants in Non-Smokers' Urine (Frozen)	5 x 10 mL
<b>8182</b>	Fatty Acid Methyl Esters in 2,2,4-Trimethylpentane	5 x 1.2 mL
<b>8210</b>	Hemp	3 x 1.5 g
<b>8446</b>	Perfluorinated Carboxylic Acids and Perfluorooctane Sulfonamide in Methanol	4 x 1.2 mL
<b>8447</b>	Perfluorinated Sulfonic Acids in Methanol	3 x 1.2 mL
<b>8690</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation I	4 x 1.2 mL
<b>8691</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation II	4 x 1.2 mL
<b>8692</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation III	4 x 1.2 mL
<b>8693</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation IV	4 x 1.2 mL

See [Table 109.1](#) on the website for more information.

## 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
<b>3077</b>	Aroclor 1242 in Transformer Oil	5 x 1.2 mL
<b>3079</b>	Aroclor 1254 in Transformer Oil	5 x 1.2 mL
<b>3080</b>	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
<b>1936</b>	Great Lakes Sediment	50 g
<b>1947</b>	Lake Michigan Fish Tissue	5 x 8 g
<b>1950</b>	Metabolites in Frozen Human Plasma	5 x 1 mL
<b>1957</b>	Organic Contaminants in Non-Fortified Human Serum (Freeze-Dried)	5 x 10.7 mL
<b>1958</b>	Organic Contaminants in Fortified Human Serum (Freeze-Dried)	5 x 10.7 mL
<b>2585</b>	Organic Contaminants in House Dust	10 g
<b>2586</b>	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction of 500 mg/kg Lead)	55 g
<b>2781</b>	Domestic Sludge	40 g
<b>8446</b>	Perfluorinated Carboxylic Acids and Perfluorooctane Sulfonamide in Methanol	4 x 1.2 mL
<b>8447</b>	Perfluorinated Sulfonic Acids in Methanol	3 x 1.2 mL
<b>8690</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation I	4 x 1.2 mL
<b>8691</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation II	4 x 1.2 mL
<b>8692</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation III	4 x 1.2 mL
<b>8693</b>	PFAS in Aqueous Film-Forming Foams (AFFF) Formulation IV	4 x 1.2 mL

See [Table 109.5](#) on the website for more information.

## Crime Scene Investigations

SRM	Description	Unit of Issue
<b>2460a</b>	Standard Bullet Replica	each
<b>2461</b>	Standard Cartridge Case	each

See [Table 109.4](#) on the website for more information.

# PFAS

## Reference Materials 8690 to 8693 Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous Film-Forming Foams (AFFF)

### RMs 8690 to 8693

Aqueous film forming foams (AFFFs) containing PFAS have been used since the 1960s for fire control and training for aviation crash and jet fuel spills at military/civilian sites. Due to limited containment of AFFF release in past events, groundwater and drinking water have been contaminated with PFAS.

The Department of Defense's Strategic Environmental Research and Development Program supported the effort by NIST to develop AFFF reference materials (RMs) containing PFAS representative of the AFFFs which were historically used. These RMs were made as four formulations, consisting of different legacy commercial AFFF products, and include modifications to the formulations to achieve specific PFAS levels. PFAS were identified and quantified in each RM using mass spectrometry. These RMs will aid the development and validation of analytical methods for laboratories monitoring PFAS in complex matrices.

A unit of each RM (8690 to 8693, Formulations I to IV, respectively) consists of four ampoules containing approximately 1.2 mL of solution.

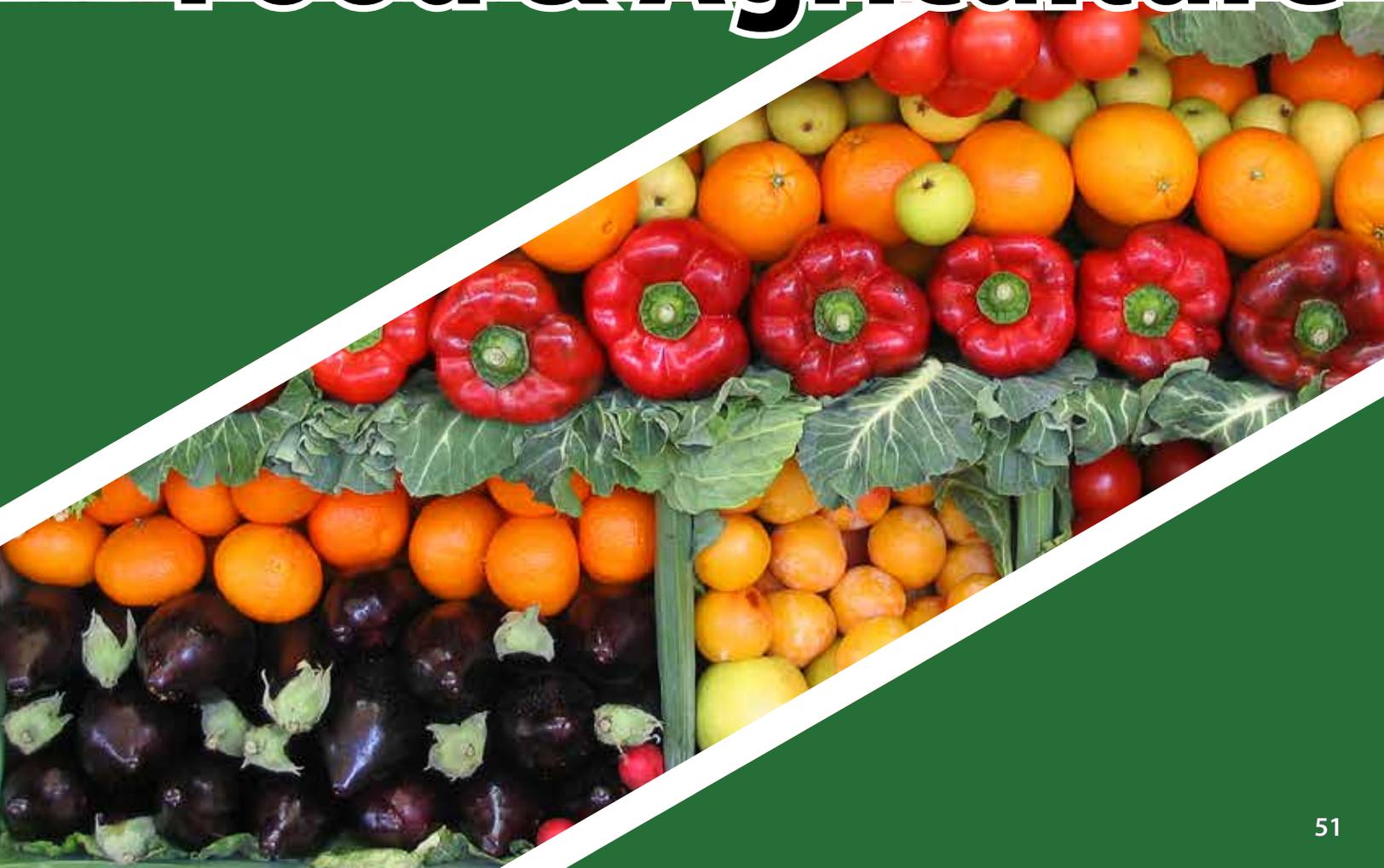
Learn more:

Reiner JL, Place BJ, Heckert NA, Peter KT, Rodowa AE (2023) Characterization of Reference Materials 8690 to 8693 Per- and Polyfluoroalkyl Substances (PFAS) in Four Formulations of Aqueous Film-Forming Foams (AFFF). (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-234.

<https://doi.org/10.6028/NIST.SP.260-234>



# Standard Reference Materials for Chemical Composition



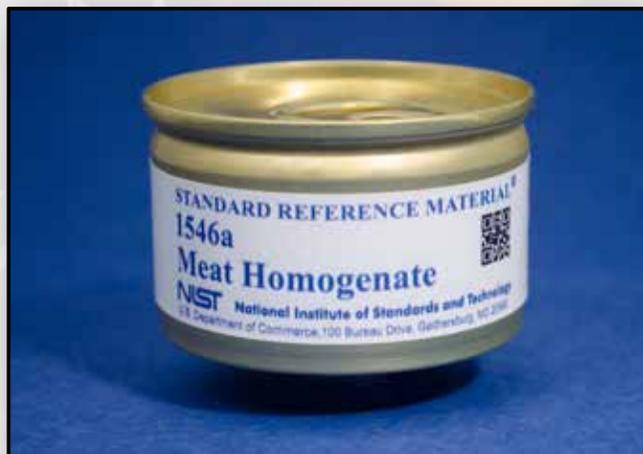
**Foods and Beverages - Macro and Micronutrients**

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
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
2983	Inorganics in Geoduck Clam Tissue ( <i>Panopea generosa</i> )	12 g
3035	Arsenic Species in Apple Juice	5 x 1.5 mL
3233	Fortified Breakfast Cereal	60 g each
3234	Soy Flour	50 g

SRM	Description	Unit of Issue
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 ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
3255	Green Tea ( <i>Camellia sinensis</i> ) 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.



## 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
<b>1548b</b>	Typical Diet	2 x 5 g
<b>1565</b>	Mycotoxins in Corn	2 x 60 g
<b>1566b</b>	Oyster Tissue	25 g
<b>1849a</b>	Infant/Adult Nutritional Formula I (milk-based)	10 pouches x 10 g each
<b>1869</b>	Infant/Adult Nutritional Formula II (milk/whey/soy-based)	10 pouches x 10 g each
<b>1946</b>	Lake Superior Fish Tissue	5 x 7-9 grams
<b>2386</b>	Avocado Powder	5 x 10 g
<b>2387</b>	Peanut Butter	3 x 170 g
<b>3233</b>	Fortified Breakfast Cereal	60 g each
<b>3234</b>	Soy Flour	50 g
<b>3235</b>	Soy Milk	10 x 10 mL
<b>3253</b>	Yerba Mate Leaves	2 x 10 g
<b>3254</b>	Green Tea ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
<b>3255</b>	Green Tea ( <i>Camellia sinensis</i> ) Extract	5 x 1 g
<b>3278</b>	Tocopherols in Edible Oils	5 x 1 mL
<b>3281</b>	Cranberry (Fruit)	5 x 6 g
<b>3282</b>	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
<b>3287</b>	Blueberry (Fruit)	5 pouches x 5 g each
<b>8260</b>	Infant Nutritional Formula (hydrolyzed milk-based)	400 g
<b>8261</b>	Adult Nutritional Formula (high-protein)	400 g
<b>8403</b>	Cocoa Flavanol Extract	5 x 2 g

See [Table 110.1](#) on the website for more information.

## Food Contaminants and Allergens

SRM	Description	Unit of Issue
<b>1566b</b>	Oyster Tissue	25 g
<b>1947</b>	Lake Michigan Fish Tissue	5 x 8 g
<b>1953</b>	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL
<b>1954</b>	Organic Contaminants in Fortified Human Milk	5 x 5 mL
<b>2387</b>	Peanut Butter	3 x 170 g
<b>2983</b>	Inorganics in Geoduck Clam Tissue ( <i>Panopea generosa</i> )	12 g
<b>3256</b>	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g
<b>8210</b>	Hemp	3 x 1.5 g
<b>8238</b>	Glyphosphate in Oat Flour (High Level)	100 g
<b>8239</b>	Glyphosphate in Oat Flour (Low Level)	100 g
<b>8404</b>	Almond Flour for Allergen Detection	3 x 170 g
<b>8405</b>	Hazelnut Flour for Allergen Detection	5 x 8 g
<b>8642a</b>	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
<b>1515</b>	Apple Leaves	50 g
<b>1570a</b>	Trace Elements in Spinach Leaves	60 g
<b>1573a</b>	Tomato Leaves	50 g
<b>1575a</b>	Trace Elements in Pine Needles ( <i>Pinus taeda</i> )	50 g

See [Table 110.4](#) on the website for more information.

### Fertilizers (powder form)

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

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

See [Table 110.5](#) on the website for more information.

### Tobacco-Related Materials

SRM	Description	Unit of Issue
<b>3222</b>	Cigarette Tobacco Filler	20 x 10 g

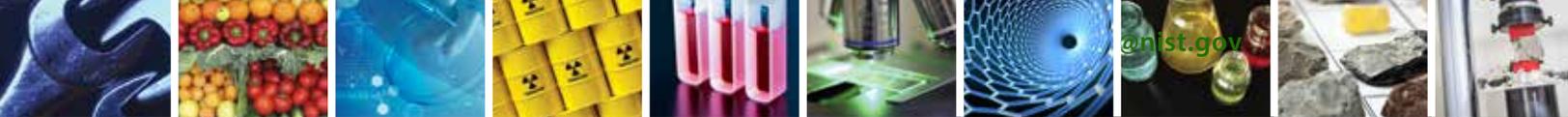
See [Table 110.10](#) on the website for more information.

### Dietary Supplement Materials (includes nutraceuticals and herbs)

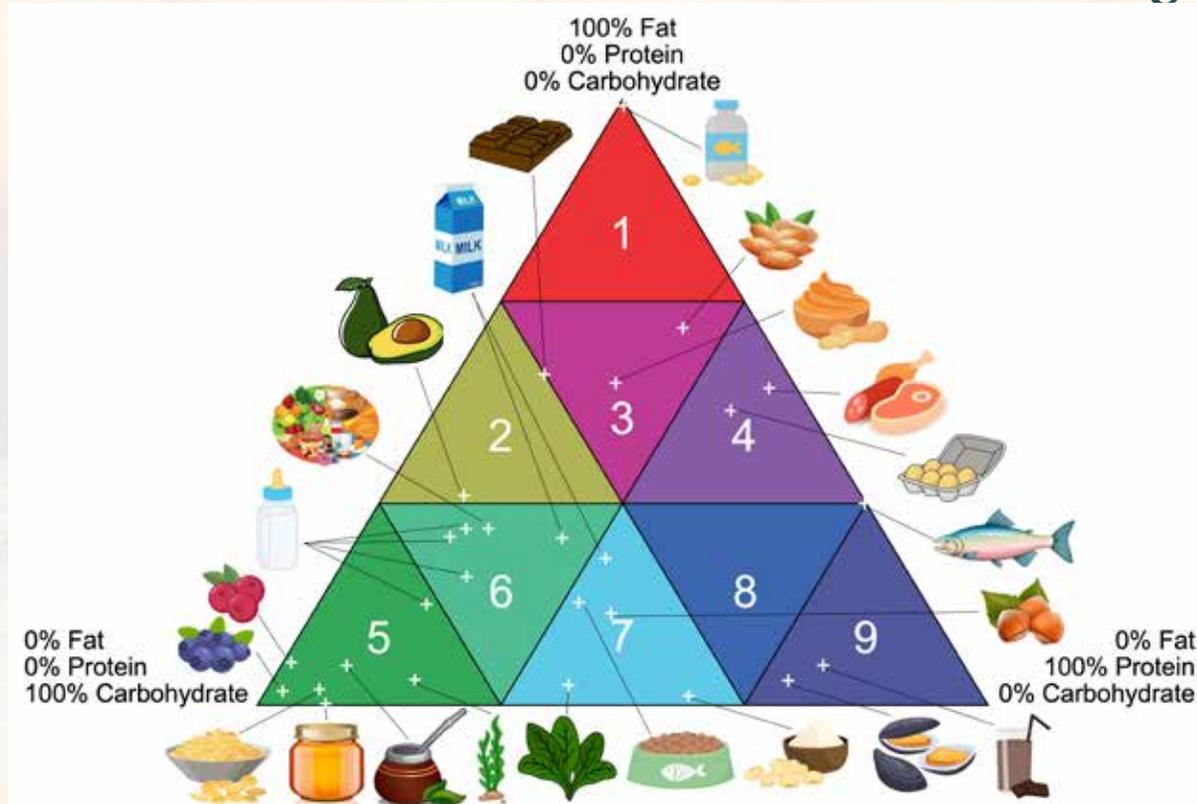
SRM	Description	Unit of Issue
<b>3232</b>	Kelp Powder ( <i>Thallus laminariae</i> )	3 x 5 g
<b>3235</b>	Soy Milk	10 x 10 mL
<b>3246</b>	<i>Ginkgo biloba</i> (Leaves)	5 x 3 g
<b>3247</b>	<i>Ginkgo biloba</i> (Extract)	5 x 1 g
<b>3248</b>	Ginkgo-Containing Tablets	5 x 1 g
<b>3250</b>	Saw Palmetto ( <i>Serenoa repens</i> ) Fruit	5 x 6 g
<b>3251</b>	Saw Palmetto ( <i>Serenoa repens</i> ) Extract	5 x 1 mL
<b>3254</b>	Green Tea ( <i>Camellia sinensis</i> ) Leaves	5 x 3 g
<b>3255</b>	Green Tea ( <i>Camellia sinensis</i> ) Extract	5 x 1 g
<b>3256</b>	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g
<b>3262</b>	St. John's Wort ( <i>Hypericum perforatum</i> L.) Aerial Parts	5 x 3.3 g
<b>3268</b>	Kudzu ( <i>Pueraria montana var. lobata</i> ) Extract	5 x 1 g

SRM	Description	Unit of Issue
<b>3275</b>	Omega-3 and Omega-6 Fatty Acids in Fish Oil	3 ea 2 x 1.2 mL
<b>3279</b>	Chromium Dietary Supplement	5 x 6 g
<b>3281</b>	Cranberry (Fruit)	5 x 6 g
<b>3282</b>	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
<b>3283</b>	Cranberry Extract	5 x 2.5 g
<b>3284</b>	Cranberry-Containing Solid Oral Dosage Form	5 x 2.5 g
<b>3285</b>	Mixed-Berry Containing Solid Oral Dosage Form	5 x 2.5 g
<b>3289</b>	Multivitamin Tablets	30 x 5 bottles
<b>3291</b>	Bilberry Extract	5 x 1 g
<b>3294</b>	Multielement Tablets	30 x 5 bottles
<b>3299</b>	Ground Turmeric ( <i>Curcuma longa</i> L.) Rhizome	5 x 3 g
<b>3300</b>	Curcumin Extract of Turmeric ( <i>Curcuma longa</i> L.) Rhizome	5 x 1 g
<b>3383</b>	Yohimbe-Containing Solid Oral Dosage Form	5 x 1.1 g
<b>3384</b>	Ground Asian Ginseng ( <i>Panax ginseng</i> C.A. Meyer) Rhizome	5 x 3 g
<b>3385</b>	Asian Ginseng ( <i>Panax ginseng</i> ) Extract	5 x 1 g
<b>3389</b>	Ginsenosides Calibration Solutions	5 x 1 mL
<b>3398</b>	Ginger ( <i>Zingiber officinale</i> ) Rhizome	5 x 1.6 g
<b>3530</b>	Iodized Table Salt (Iodide)	1 x 200 g
<b>8037</b>	Krill Oil	3 x 4.5 mL
<b>8183</b>	Omega-3 and Omega-6 Fatty Acids in Botanical Oils	4 x 1.2 mL
<b>8186</b>	Soy Protein Isolate	5 x 10 g
<b>8187</b>	Soy Protein Concentrate	5 x 10 g
<b>8188</b>	Soy-Containing Solid Oral Dosage Form	5 x 2.6 g
<b>8210</b>	Hemp	3 x 1.5 g
<b>8650</b>	Ground Kudzu ( <i>Pueraria montana var. lobata</i> ) Rhizome	5 x 3 g
<b>8652</b>	Kudzu-Containing Solid Oral Dosage Form	5 x 2.6 g
<b>8644</b>	Ginseng-Containing Solid Oral Dosage Form	5 x 2.6 g
<b>8666</b>	Ginger ( <i>Zingiber officinale</i> ) 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<sup>1</sup>, 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 3275 Fatty Acids in Fish Oils       | 6 SRM 1548b Typical Diet                   |
| 2 SRM 2384 Baking Chocolate               | SRM 1549a Whole Milk Powder                |
| SRM 2386 Avocado Powder                   | SRM 1849a Infant/Adult Nutritional Formula |
| 3 SRM 2387 Peanut Butter                  | 7 SRM 1566b Oyster Tissue                  |
| 4 SRM 1546a Meat Homogenate               | SRM 2385 Slurried Spinach                  |
| SRM 1845a Whole Egg Powder                | SRM 3234 Soy Flour                         |
| 5 SRM 1568b Rice Flour                    | SRM 3290 Dry Cat Food                      |
| SRM 2383a Baby Food Composite             | 9 SRM 1946 Lake Superior Fish Tissue       |
| SRM 3233 Fortified Breakfast Cereal       | SRM 1947 Lake Michigan Fish Tissue         |
| SRM 3287 Blueberries                      | SRM 2974a Mussel Tissue                    |
| SRM 1869 Infant/Adult Nutritional Formula | SRM 3252 Protein Drink Mix                 |

<sup>1</sup> W.R. Wolf, K.W. Andrews (1995) *Fresenius J. Anal Chem* 352:73-76.

# An SRM for Measuring Cannabinoids and Toxic Elements in Hemp

## Reference Material 8210 Hemp Plant

The Hemp Plant reference material (RM 8210) provides values for cannabinoids and toxic elements in a dried ground hemp plant material to help cannabis and forensic laboratories for use as a control and research material. The need to accurately measure cannabinoids and moisture in hemp gained greater importance following the passage of the 2018 Farm Bill. Toxic elements have been identified as high priority measurands due to the public health concerns associated with exposure.

Hemp has been removed from the DEA Schedule 1 controlled substance list and defined as *Cannabis sativa* with a  $\Delta^9$  tetrahydrocannabinol ( $\Delta^9$  THC) concentration of less than or equal to 0.3 % on a dry weight basis. In 2021, the United States Department of Agriculture published a final rule providing regulation on hemp production in the US clarifying these measurements must be based on total  $\Delta^9$  THC (including its acidic precursor  $\Delta^9$ -tetrahydrocannabinolic acid [THCA]). The National Institute of Standards and Technology (NIST) has developed a Cannabis Research Program that includes development of analytical methods, the Cannabis Laboratory Quality Assurance Program (CannaQAP), and the development of the reference material RM 8210 Hemp Plant to aid in research and regulation.

RM 8210 is dried hemp plant, *Cannabis sativa L.*, containing materials obtained from two sources. The level of cannabinoids and toxic elements in the RM was targeted to represent typical levels found in hemp plant from conventional agriculture practices. NIST prepared the RM by grinding the hemp plant materials, sieving the resulting materials to ensure a particle size between 250  $\mu\text{m}$  and 710  $\mu\text{m}$ , packaging, and storing at  $-80\text{ }^\circ\text{C}$ . Mass fractions were assigned for toxic elements using ICP-OES, ICP-MS, and direct mercury analyzer methods. Cannabinoid

mass fractions were assigned using NIST's published liquid chromatographic with a photodiode array detector (LC-PDA) method.

A unit of RM 8210 contains three sample packets (approximately 1.5 g each), each sealed with a desiccant pouch in an aluminized polyester bag.

### Learn More:

Bryan Sallee CE, Wilson WB, Barber CA, Johnson ME, Klingsick JR, Mulloor J, Toman B, Wood ESC, Wood LJ, Yarberr AJ (2024) Characterization of Reference Material 8210 Hemp Plant. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) NIST SP 260 248. <https://doi.org/10.6028/NIST.SP.260-248>

**Technical Contacts:** Colleen E. Bryan Sallee (Inorganic Information) and Walter B. Wilson (Organic Information)





# An SRM for Measuring Arsenic in Shellfish

## SRM 2983 Inorganics in Tissue (*Panopea generosa*)

NIST has developed many environmentally relevant Standard Reference Materials (SRMs) over the years, including whale blubber, fish and mussel tissues, human blood, house dust, and a variety of sediments, with a broad range of individual organic and inorganic contaminants characterized to suit the needs of the environmental community. However, a higher order reference material is needed for quality assurance of measurements conducted for arsenic species assessment in matrix-rich shellfish.

Several agencies, including the National Oceanic and Atmospheric Administration (NOAA) Fisheries, Washington Department of Health (WA DOH), and the Southeast Alaska Regional Dive Fisheries Association (SARDA) have requested

the production of a geoduck clam reference material containing naturally representative levels of inorganic arsenic (iAs). In compliance with the recent trade agreement between the US and the People's Republic of China, individual states are now required to routinely monitor iAs contamination in geoduck clams as part of NOAA Fisheries' Seafood Inspection Program. SRM 2983 fulfills this requirement, providing quality assurance and validating measurement methods for assessing potential health risks associated with shellfish. In addition to the mandated monitoring in geoduck clams, the SRM material may be used worldwide for environmental and foodstuff assessments.

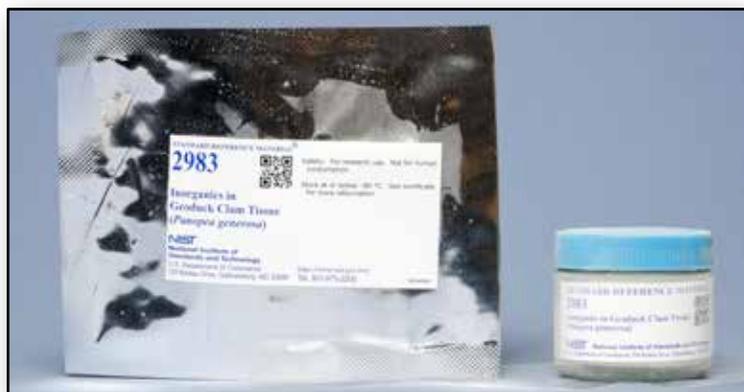
A unit of SRM 2983 consists of one jar sealed inside an aluminized pouch. The jar contains approximately 12 g of cryogenically homogenized frozen tissue material.

### Learn More:

Bryan Sallee CE, Bachman MJ, Christopher SJ, Ellisor DL, Ellisor MB, Hoguet JC, Huntington SL, Luvonga C, Moors AJ, Nadarajan D, Narukawa T, Ness JM, Pugh RS, Yen JH, Yu LL (2024) Certification of Standard Reference Material® 2983 Inorganics in Geoduck Clam Tissue (*Panopea generosa*). (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-246.

<https://doi.org/10.6028/NIST.SP.260-246>

Technical Contact: Colleen E. Bryan Sallee





# A Standard for Quantifying Yohimbe in Dietary Supplements

## SRM 3383 -Containing Solid Oral Dosage Form

SRM 3383 Yohimbe-Containing Solid Oral Dosage Form is part of a continuing collaboration with NIH-Office of Dietary Supplements to develop dietary supplement reference materials. Yohimbe bark and its extract are derived from a tree native to tropical West Africa. These materials are popular herbal supplements used as a general tonic, performance enhancer, and as an aphrodisiac. In 2017, the American Botanical Council reported that the mainstream market of herbal supplements in the United States in 2016 was 7.45 billion dollars. Yohimbe represents almost 21 million dollars of these sales and ranked 13th in their listing of the top 40 bestselling herbs/supplements in the US. Yohimbine is the major and most active alkaloid present in yohimbe bark and yohimbine HCl is available in the United States as a prescription drug. SRM 3383 was produced from multiple commercial dietary supplements containing yohimbe to replicate typical analytical challenges associated with the measurement of yohimbine in a finished product sample matrix.

SRM 3383 is a finely ground powdered prepared from a mixture of four commercially available yohimbine containing finished products. The material was prepared at NIST and packaged by High Purity Standards, an experienced contract manufacturer.

A unit of SRM 3383 consists of 5 packets, each containing approximately 1.1 g of material.

### Learn More:

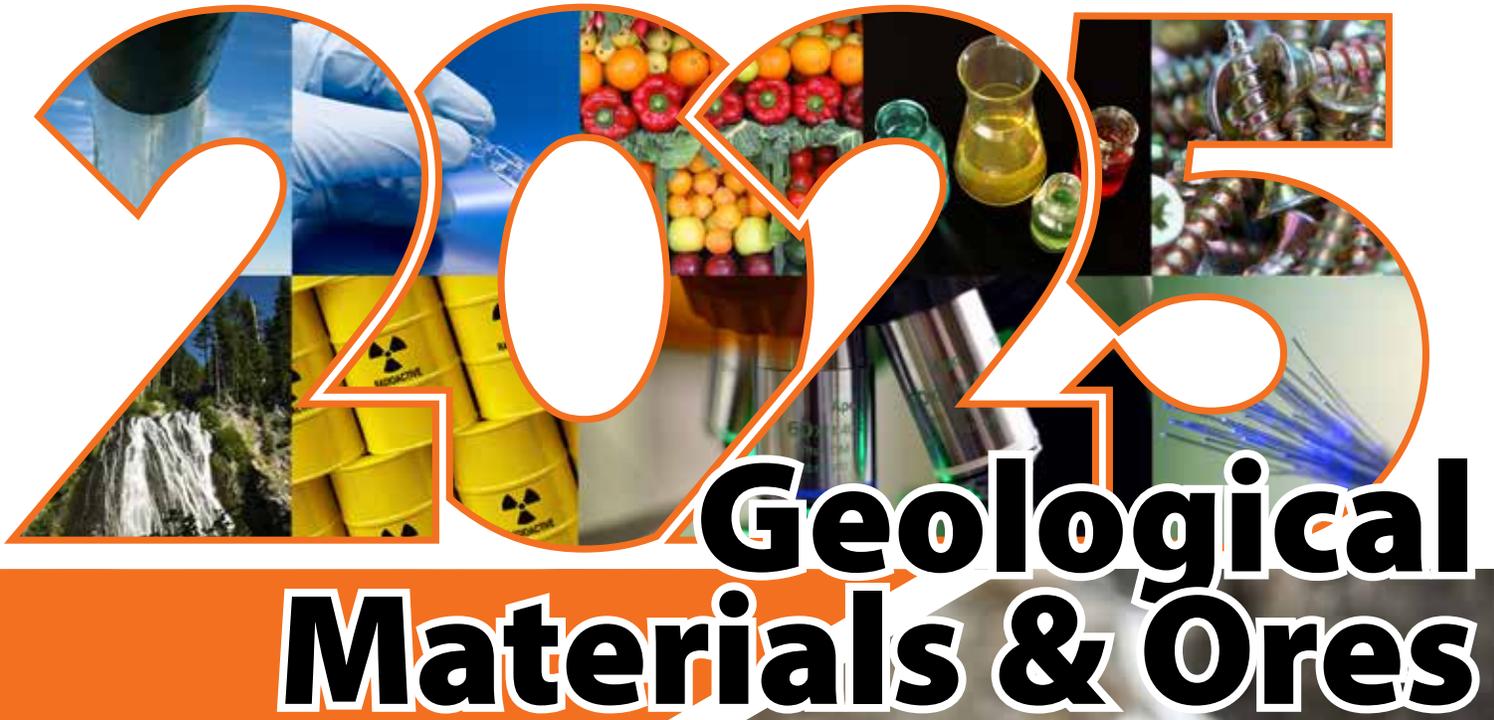
Wilson WB, Coskun SH, Mulloor J, Nelson MA, Yen J (2023) Certification of Standard Reference Materials® 3389 Yohimbe Containing Solid Oral Dosage Form. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-240.

<https://doi.org/10.6028/NIST.SP.260-240>

**Technical Contact:** Walter Brent Wilson



## Standard Reference Materials for Chemical Composition



# Geological Materials & Ores



# Chemical Composition Geological Materials & Ores

## Ores (powder form)

SRM	Description	Unit of Issue
<b>25d</b>	Manganese Ore	60 g
<b>180</b>	Fluorspar, High Grade	120 g
<b>183</b>	Lithium Ore (Lepidolite)	45 g
<b>277</b>	Tungsten Concentrate	100 g
<b>330a</b>	Copper Ore Mill Heads	90 g
<b>331a</b>	Copper Ore Mill Tails	40 g
<b>423</b>	Molybdenum Oxide Concentrate	50 g
<b>670</b>	Rutile Ore	90 g
<b>690</b>	Iron Ore Canada	100 g
<b>691</b>	Iron Oxide, Reduced	100 g
<b>692</b>	Iron Ore, Labrador	100 g
<b>693</b>	Iron Ore (Nimba)	100 g
<b>886</b>	Refractory Gold Ore	200 g
<b>1835</b>	Borate Ore	60 g
<b>2430</b>	Scheelite Ore	100 g

See [Table 111.2](#) on the website for more information.

## Ores (powder form) Phosphate Rocks and Bauxites

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

See [Table 111.2](#) on the website for more information.

## Clays (powder form)

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

See [Table 111.4](#) on the website for more information.

## Rock and Minerals (powder form)

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

See [Table 111.5](#) on the website for more information.

## Refractories (powder form)

SRM	Description	Unit of Issue
<b>76a</b>	Burnt Refractory (Nominal Mass Fraction 40 % Al <sub>2</sub> O <sub>3</sub> )	75 g
<b>77a</b>	Burnt Refractory (Nominal Mass Fraction 60 % Al <sub>2</sub> O <sub>3</sub> )	75 g
<b>78a</b>	Burnt Refractory (Nominal Mass Fraction 70 % Al <sub>2</sub> O <sub>3</sub> )	75 g
<b>198</b>	Silica Brick	45 g
<b>199</b>	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.

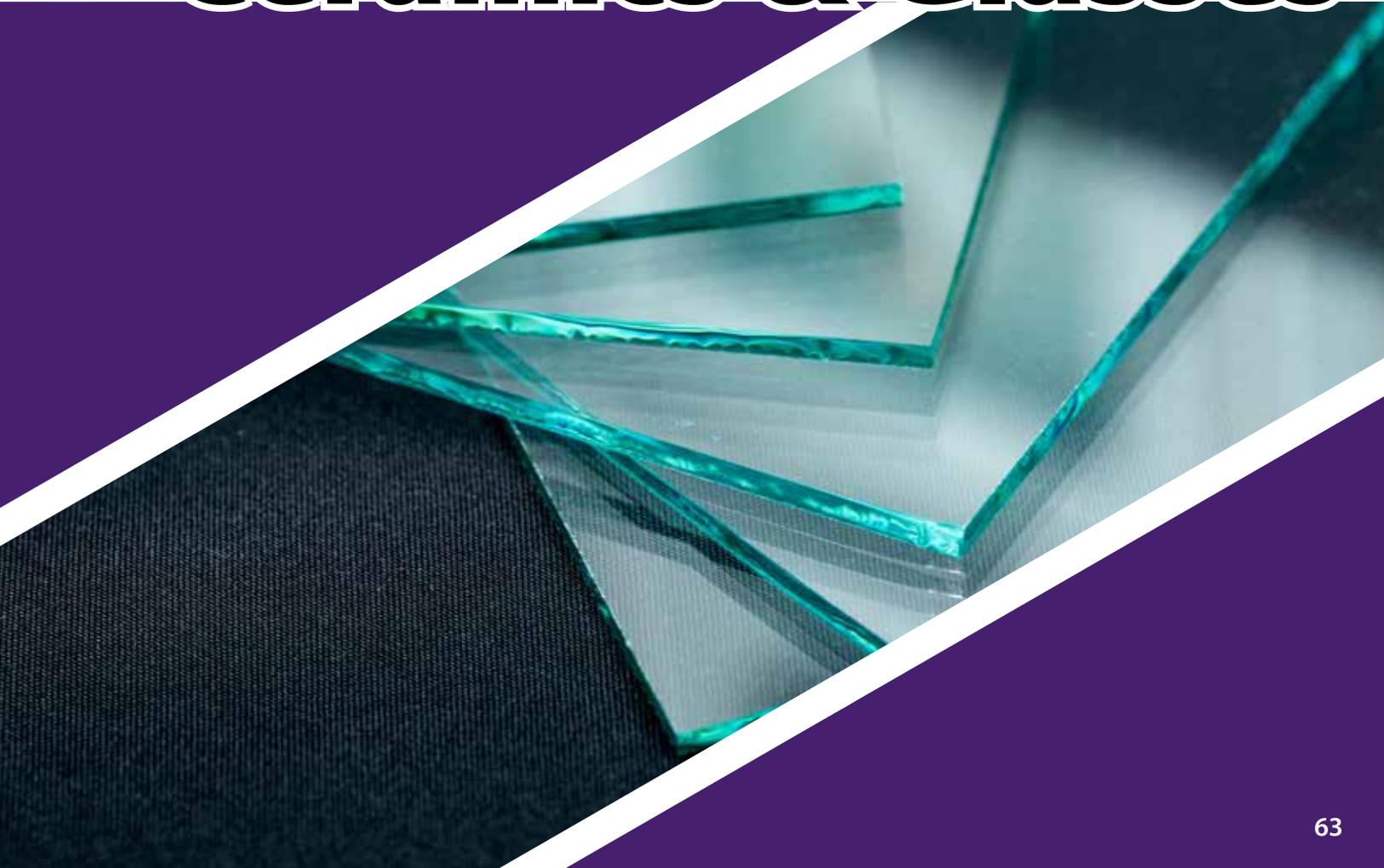
SRM	Description	Unit of Issue
<b>1646a</b>	Estuarine Sediment	70 g
<b>2586</b>	Trace Elements in Soil Containing Lead From Paint (Nominal Mass Fraction of 500 mg/kg Lead)	55 g
<b>2587</b>	Trace Elements in Soil Containing Lead from Paint (Nominal Mass Fraction of 3000 mg/kg Lead)	55 g
<b>2700</b>	Hexavalent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



# Chemical Composition Ceramics & Glasses

## Nitrides (powder form)

SRM	Description	Unit of Issue
<b>8983</b>	Silicon Nitride Powder	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
<b>887</b>	Cemented Carbide (W-83,Co-10)	100 g
<b>888</b>	Cemented Carbide (W-64,Co-25,Ta-5)	100 g
<b>889</b>	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
<b>80a</b>	Soda-Lime Glass (beads)	45 g
<b>81a</b>	Glass Sand	75 g
<b>89</b>	Glass, Lead Barium	45 g
<b>92</b>	Soda-Lime Glass, Low Boron (powder)	45 g
<b>93a</b>	Borosilicate Glass	1 wafer
<b>165a</b>	Glass Sand	75 g
<b>606</b>	Trace Elements in Basalt Glass	glass mounted in epoxy
<b>620</b>	Soda-Lime, Flat	3 platelets
<b>1411</b>	Soft Borosilicate Glass	10 platelets
<b>1412a</b>	Multicomponent Glass (disk form)	disk
<b>1413</b>	High Alumina Sand	75 g
<b>1830</b>	Soda-Lime Float Glass (Nominal Mass Fraction 0.1 % Al <sub>2</sub> O <sub>3</sub> )	3 platelets
<b>1831</b>	Soda-Lime Sheet Glass (Nominal Mass Fraction 1.2 % Al <sub>2</sub> O <sub>3</sub> )	3 platelets
<b>2696</b>	Silica Fume (powder form)	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<sub>2</sub>, 12 % CaO, 14 % Na<sub>2</sub>O, and 2% Al<sub>2</sub>O<sub>3</sub>.

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

See [Table 112.4](#) on the website for more information.



# Standard Reference Materials for Chemical Composition



### 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
<b>633a</b>	Portland Cement	4 x 5 g
<b>634a</b>	Portland Cement	100 g
<b>635a</b>	Portland Cement (Blended with Slag)	5 x 5 g
<b>1880b</b>	Portland Cement	5 x 5 g
<b>1881b</b>	Portland Cement (Blended with Fly Ash)	5 x 5 g
<b>1882a</b>	Calcium Aluminate Cement	4 x 5 g
<b>1883a</b>	Calcium Aluminate Cement	4 x 5 g
<b>1884b</b>	Portland Cement	5 x 4.5 g
<b>1885b</b>	Portland Cement	5 x 5 g
<b>1886a</b>	Portland Cement (White Portland Cement with Low Iron)	4 x 5 g
<b>1886b</b>	White Portland Cement	5 x 5 g
<b>1887b</b>	Portland Cement	5 x 4 g
<b>1888b</b>	Portland Cement	4 x 5 g
<b>1889b</b>	Portland Cement (Blended with Limestone)	5 x 5 g
<b>2429</b>	Flue Gas Desulfurization Gypsum	1 x 200 g
<b>2696</b>	Silica Fume (powder form)	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
<b>2686b</b>	Portland Cement Clinker	50 g
<b>2687a</b>	Portland Cement Clinker	5 x 8 g
<b>2688</b>	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

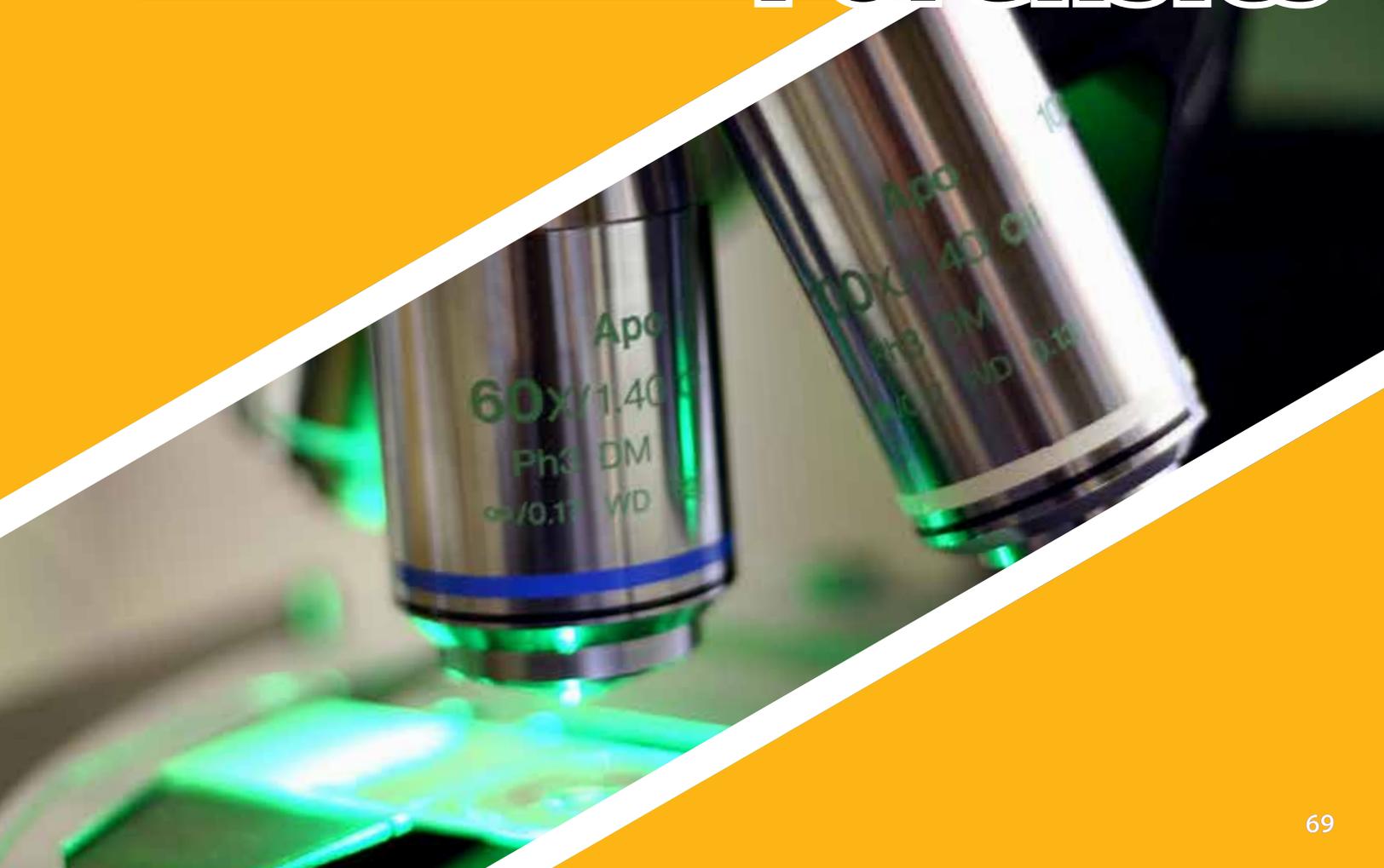


## Lubricating Oils

SRM	Description	Unit of Issue
<b>1085c</b>	Wear Metals in Lubricating Oil	10 ampoules (1.2 g each)
<b>1818a</b>	Chlorine in Lubricating Base Oils	set (5)
<b>1819a</b>	Sulfur in Lubricating Base Oil	set (5)
<b>1848</b>	Lubricating Oil Additive Package	100 g

See [Table 114.2](#) on the website for more information.

# Standard Reference Materials for Chemical Composition



### Ethanol Solutions

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

See [Table 115.1](#) on the website for more information.

### Drugs of Abuse

SRM	Description	Unit of Issue
<b>1507b</b>	THC-9-COOH in Freeze-Dried Urine	set (3)

See [Table 115.1](#) on the website for more information.

### Crime Scene Investigations

SRM	Description	Unit of Issue
<b>2460a</b>	Standard Bullet Replica	each
<b>2461</b>	Standard Cartridge Case	each

See [Table 115.1](#) on the website for more information.

### DNA Profiling and Nucleic Acid Materials

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).

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).

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
<b>8391 (QTY10)</b>	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	10 vials of RM 8391
<b>8392</b>	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
<b>8393</b>	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	1 vial
<b>8393 (QTY10)</b>	Human DNA for Whole-Genome Variant Assessment (Son of Chinese Ancestry) (HG-005)	10 vials of RM 8393
<b>8398</b>	Human DNA for Whole-Genome Variant Assessment (Daughter of Utah/European Ancestry)(HG-001)	1 vial
<b>8398 (QTY10)</b>	Human DNA for Whole-Genome Genome Variant Assessment (Daughter of Utah/European Ancestry) (HG-001)	10 vials of RM 8398

See [Table 115.1](#) on the website for more information.

SRM	Description	Unit of Issue
<b>2372a</b>	Human DNA Quantitation Standard	3 x 55 µL
<b>2374</b>	DNA Sequence Library for External RNA Controls	96 tubes
<b>2391d</b>	PCR-Based DNA Profiling Standard	5 vials
<b>8230</b>	Saccharomyces cerevisiae NE095 Cells for Cell Counting and DNA-based Detection (freeze dried)	16 vials (12 yeast, 4 matrix)
<b>8375</b>	Microbial Genomic DNA Standards for Sequencing Performance Assessment (MG-001, MG-002, MG-003, MG-004)	4 vials, 1 each
<b>8376</b>	Microbial Pathogen DNA Standards for Detection and Identification	20 tubes
<b>8391</b>	Human DNA for Whole-Genome Variant Assessment (Son of Eastern European Ashkenazi Jewish Ancestry) (HG-002)	1 vial



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# Standard Reference Materials for Physical Properties



### 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
<b>185i</b>	Potassium Hydrogen Phthalate, pH Standard	60 g
<b>186g</b>	pH Standards Potassium Dihydrogen Phosphate (186-I-g) Disodium Hydrogen Phosphate (186-II-g)	set
<b>187f</b>	Sodium Tetraborate Decahydrate (Borax) pH Standard	30 g
<b>188</b>	Potassium Hydrogen Tartrate (pH Standard)	60 g
<b>189c</b>	Potassium Tetroxalate Dihydrate pH Standard	65 g
<b>191d</b>	Sodium Bicarbonate (191d-I) Sodium Carbonate (191d-II) (pH Standard)	1 x 25g 1 x 30g
<b>2193b</b>	Calcium Carbonate pH Standard (used as saturated calcium hydroxide solution) (pH Standard)	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 2191a and 2192a are certified for use as admixtures only.

SRM	Description	Unit of Issue
<b>2185</b>	Potassium Hydrogen Phthalate pD Standard	60 g
<b>2191a</b>	Sodium Bicarbonate	30 g
<b>2192a</b>	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
<b>2201</b>	Sodium Chloride (Ion-Selective)	125 g
<b>2203</b>	Potassium Fluoride (Standard for Ion-Selective Electrodes)	125 g

See [Table 201.4](#) on the website for more information.

# Standard Reference Materials for Physical 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
<b>705a</b>	Polystyrene (Narrow Molecular Weight Distribution)	5 g
<b>706a</b>	Polystyrene (Broad Molecular Mass Distribution)	18 g
<b>1473c</b>	Low Density Polyethylene Resin	60 g
<b>1474b</b>	Polyethylene Resin	60 g
<b>1475a</b>	Polyethylene, Linear	50 g
<b>1476a</b>	Branched Polyethylene Resin	12 g
<b>1478</b>	Polystyrene (Narrow Molecular Weight Distribution)	2 g
<b>1479</b>	Polystyrene (Narrow Molecular Weight Distribution)	2 g
<b>1482a</b>	Linear Polyethylene Narrow Molecular Mass Distribution (Nominal Mass-Average Molar Mass of 13 600 g/mol)	0.3 g
<b>1483a</b>	Linear Polyethylene Narrow Molecular Mass Distribution (Nominal Mass-Average Molar Mass of 32 100 g/mol)	0.3 g
<b>1488</b>	Poly (Methyl Methacrylate) (29 K Narrow Molecular Weight Distribution)	2 g
<b>2885</b>	Polyethylene (Mass-Average Molar Mass [Mw] 6 280 g/mol)	0.3 g
<b>2886</b>	Polyethylene (Mass-Average Molar Mass [Mw] 87 000 g/mol)	0.3 g
<b>2887</b>	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
<b>1473c</b>	Low Density Polyethylene Resin	60 g
<b>1474b</b>	Polyethylene Resin	60 g
<b>1475a</b>	Polyethylene, Linear	50 g
<b>1476a</b>	Branched Polyethylene Resin	12 g
<b>1496</b>	Unpigmented Polyethylene Gas Pipe Resin	0.9 kg

See [Table 202.1](#) on the website for more information.

### Viscosity

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

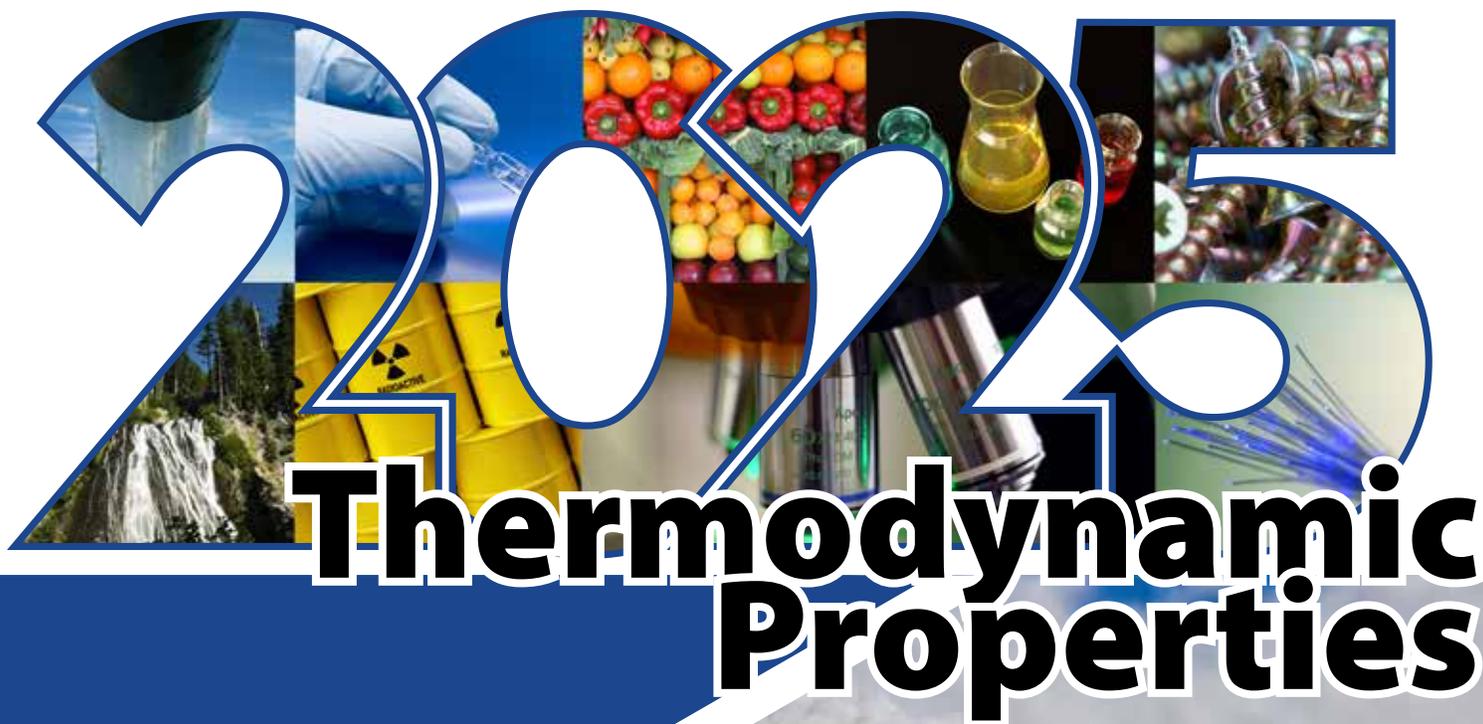
See [Table 202.1](#) on the website for more information.

### Elements in Polymers

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

See [Table 202.2](#) on the website for more information.

# Standard Reference Materials for Physical Properties



### 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
<b>39j</b>	Benzoic Acid (Calorimetric Standard)	30 g
<b>1657</b>	Synthetic Refuse-Derived Fuel Combustion Calorimetric Standard	100 g
<b>2152</b>	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
<b>2232a</b>	Indium for DSC Temperature and Enthalpy Calibration	1 g
<b>2234</b>	Gallium for Thermal Analysis	2 g
<b>2235</b>	Bismuth for Thermal Analysis	1.5 g

See [Table 203.5](#) on the website for more information.

### Temperature and Enthalpy of Transition

SRM	Description	Unit of Issue
<b>8103</b>	Adamantane for Subambient DSC Temperature and Enthalpy Calibration	1 g

See [Table 203.5](#) on the website for more information.

### Enthalpy and Heat Capacity

SRM	Description	Unit of Issue
<b>705a</b>	Polystyrene (Narrow Molecular Weight Distribution)	5 g
<b>720</b>	Sapphire Heat Capacity	15 g

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
<b>1514</b>	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
<b>741a</b>	Tin Freezing-Point Standard	200 g

See [Table 203.8](#) on the website for more information.

### 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
<b>742</b>	Aluminum Oxide Pyrometric Standard	10 g

See [Table 203.10](#) on the website for more information.

### Thermocouple Materials and Thermometers

SRM	Description	Unit of Issue
<b>1749</b>	Gold versus Platinum Thermocouple Certified Thermometer	each
<b>1967a</b>	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
<b>1450e</b>	Thermal Conductivity - Fibrous Glass Board	each
<b>1453</b>	Thermal Conductivity - Expanded Polystyrene Board	each
<b>8420</b>	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
<b>731L1</b>	Borosilicate Glass - Thermal Expansion	5 cm
<b>731L2</b>	Borosilicate Glass - Thermal Expansion	10 cm
<b>731L3</b>	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
<b>1452</b>	Thermal Resistance - Fibrous Glass Blanket for High-Precision Measurements	each

See [Table 203.17](#) on the website for more information.

### Thermoelectric Materials

SRM	Description	Unit of Issue
<b>3451</b>	Low-Temperature Seebeck Coefficient Standard	bar
<b>3452</b>	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

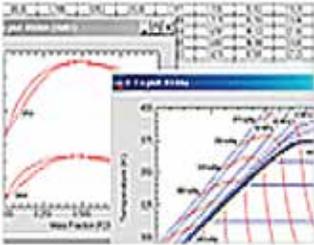
<https://www.nist.gov/srm>

### Historical Archived Certificates/Reports of Investigation

<https://shop.nist.gov/ccrz>

[CCPage?pageKey=SRMArchive&cclcl=en\\_US](https://shop.nist.gov/ccrz/CCPage?pageKey=SRMArchive&cclcl=en_US)

## Standard Reference Data



### NIST Scientific and Technical Databases

<https://www.nist.gov/srd>

## Calibrations



### Calibrations Services

<https://www.nist.gov/calibrations>

## Standard Reference Instruments



### Standard Reference Instruments

<https://www.nist.gov/sri>

# Standard Reference Materials for Physical 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
<b>931h</b>	Liquid Absorbance Standard for Ultraviolet and Visible Spectrophotometry	set (12)
<b>1921b</b>	Infrared Transmission Wavelength/Wavenumber Standard	1 card
<b>1928</b>	Infrared Specular High Reflectance Standard (Nominal Diameter 51 mm)	disk
<b>1929</b>	Infrared Specular High Reflectance Standard (Nominal Diameter 25 mm)	disk
<b>2031c</b>	Metal-on-Fused-Silica Neutral Density Filters (250 nm to 635 nm)	set (3)
<b>2034</b>	Holmium Oxide Solution Wavelength Standard (240 nm to 650 nm)	cuvette
<b>2035b</b>	Ultraviolet-Visible-Near-Infrared Wavelength/Wavenumber Transmission Standard	each

See [Table 204.1](#) on the website for more information.

**Optical Properties**

SRM	Description	Unit of Issue
<b>17g</b>	Sucrose Optical Rotation	60 g
<b>1010a</b>	Microcopy Resolution Test Charts	set (5)
<b>1928</b>	Infrared Specular High Reflectance Standard (Nominal Diameter 51 mm)	disk
<b>1929</b>	Infrared Specular High Reflectance Standard (Nominal Diameter 25 mm)	disk
<b>1932</b>	Fluorescein Solution	3 x 2 mL
<b>2241</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 785 nm Excitation	each
<b>2242a</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 532 nm Excitation	each
<b>2244</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 1064 nm Excitation	each
<b>2246a</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 830 nm Excitation	each
<b>2940a</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Orange Emission	each
<b>2941a</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Green Emission	each
<b>2942</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Ultraviolet Emission	each
<b>2943</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Blue Emission	each
<b>2944</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Red Emission	each

See [Table 204.2](#) on the website for more information.

## Fluorescence and Raman Spectroscopy

SRM	Description	Unit of Issue
<b>1932</b>	Fluorescein Solution	3 x 2 mL
<b>2241</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 785 nm Excitation	each
<b>2242a</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 532 nm Excitation	each
<b>2244</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 1064 nm Excitation	each
<b>2246</b>	Relative Intensity Correction Standard for Raman Spectroscopy: 830 nm Excitation	each
<b>2940a</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Orange Emission	each
<b>2941a</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Green Emission	each
<b>2942</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Ultraviolet Emission	each
<b>2943</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Blue Emission	each
<b>2944</b>	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Red Emission	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
<b>17g</b>	Sucrose Optical Rotation	60 g

See [Table 204.2](#) on the website for more information.

## Photography (chart form)

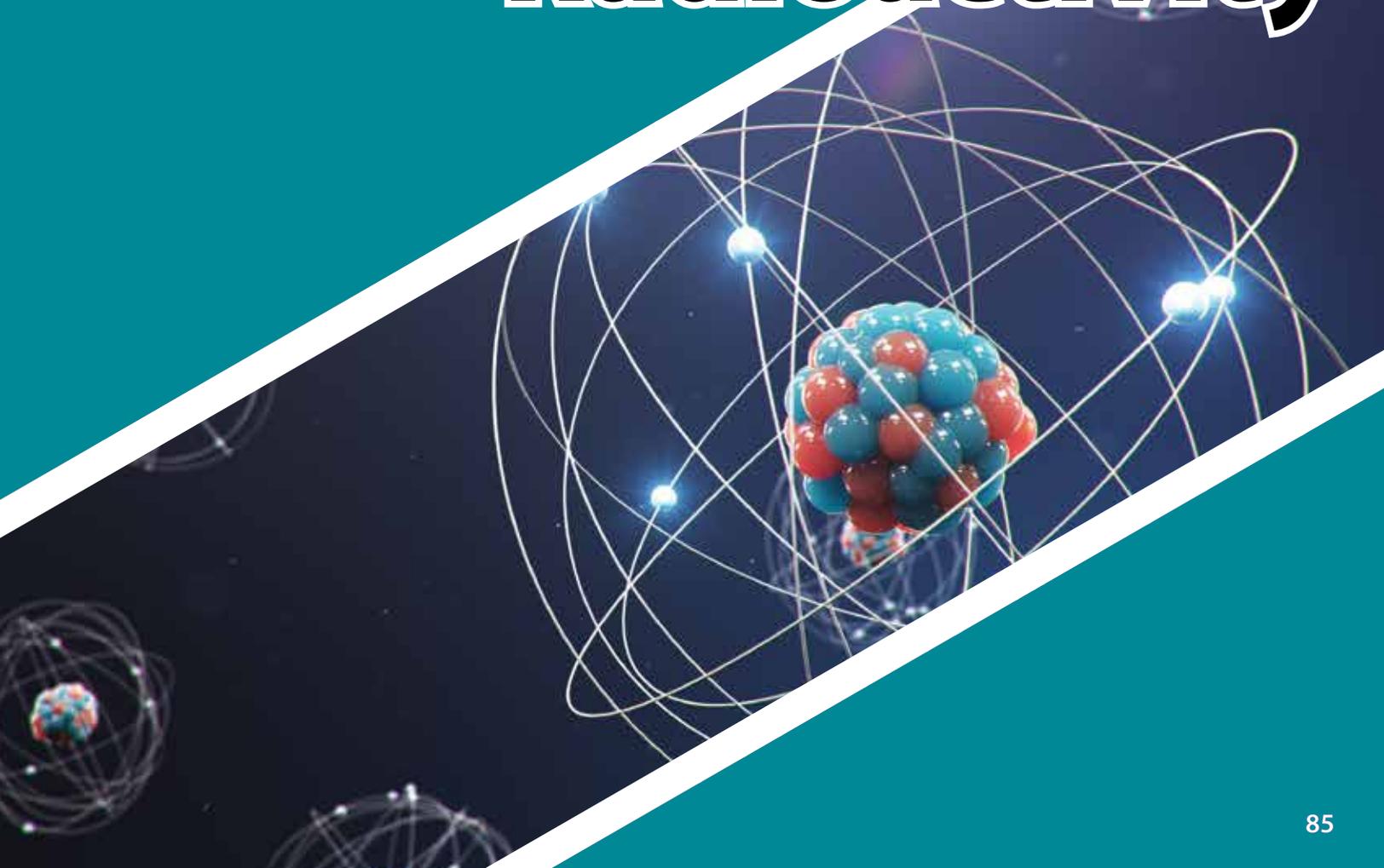
SRM 1010a is used to test the resolving power of cameras or of whole microcopying systems. It consists of 5 charts printed photographically on paper, that have 26 high-contrast, 5-line patterns ranging in spatial frequency of  $1 \text{ mm}^{-1}$  to  $18 \text{ mm}^{-1}$ .

SRM	Description	Unit of Issue
<b>1010a</b>	Microcopy Resolution Test Charts	set (5)

See [Table 204.2](#) on the website for more information.

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# Standard Reference Materials for Physical Properties



## 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](mailto: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 NRMAMP, 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*
<b>4401L</b>	Iodine-131 Radioactivity Standard	5 mL	5 MBq/g	8	February
<b>4404L</b>	Thallium-201 Radioactivity Standard	5 mL	10 MBq/g	3	June
<b>4407L</b>	Iodine-125 Radioactivity Standard	5 mL	5 MBq/g	59.4	December
<b>4410H</b>	Technetium-99m Radioactivity Standard	5 mL	1.0 GBq/g	0.3	September
<b>4412L</b>	Molybdenum-99 Radioactivity Standard	5 mL	10 MBq/g	2.74	April
<b>4415L</b>	Xenon-133 Radioactivity Standard	5 mL	150 MBq/g	5.243	September
<b>4416L</b>	Gallium-67 Radioactivity Standard	5 mL	5 MBq/g	3.3	May
<b>4417L</b>	Indium-111 Radioactivity Standard	5 mL	10 MBq/g	2.8	August
<b>4427L</b>	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 NRMAMP/NIST Program, see <https://www-s.nist.gov/srmors/certificates/documents/NRMAMP-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
<a href="#">4222d</a>	Carbon-14-n-hexadecane Radioactivity Standard	5 mL
<a href="#">4226d</a>	Nickel-63 Radioactivity Standard	5 mL
<a href="#">4233f</a>	Cesium-137 Radioactivity Standard	5 mL
<a href="#">4239a</a>	Strontium-90 Radioactivity Standard	5 mL
<a href="#">4251d</a>	Barium-133 Radioactivity Standard	5 mL
<a href="#">4274</a>	Holmium-166m Gamma-ray Emission Rate Standard	5 mL
<a href="#">4288b</a>	Technetium-99 Radioactivity Standard	5 mL
<a href="#">4320b</a>	Curium-244 Radioactivity Standard	5 mL
<a href="#">4321d</a>	Natural Uranium Radioactivity Standard	5 mL
<a href="#">4322d</a>	Americium-241 Radioactivity Standard	5 mL
<a href="#">4323c</a>	Plutonium-238 Radioactivity Standard	5 mL
<a href="#">4324b</a>	Uranium-232 Radioactivity Standard	5 mL
<a href="#">4326a</a>	Polonium-209 Radioactivity Standard	5 mL
<a href="#">4328d</a>	Thorium-229 Radioactivity Standard	5 mL
<a href="#">4329a</a>	Curium-243 Radioactivity Standard	5 mL

SRM	Description	Unit of Issue
<a href="#">4330c</a>	Plutonium-239 Radioactivity Standard	3 mL
<a href="#">4332e</a>	Americium-243 Radioactivity Standard	5 mL
<a href="#">4334j</a>	Plutonium-242 Radioactivity Standard	5 mL
<a href="#">4337</a>	Lead-210 Radioactivity Standard	5 mL
<a href="#">4338b</a>	Plutonium-240 Radioactivity Standard	5 mL
<a href="#">4339b</a>	Radium-228 Radioactivity Standard	5 mL
<a href="#">4340b</a>	Plutonium-241 Radioactivity Standard	5 mL
<a href="#">4341a</a>	Neptunium-237 Radioactivity Standard	5 mL
<a href="#">4342a</a>	Thorium-230 Radioactivity Standard	5 mL
<a href="#">4361c</a>	Hydrogen-3 Radioactivity Standard	500 mL
<a href="#">4370d</a>	Europium-152 Radioactivity Standard	5 mL
<a href="#">4915f</a>	Cobalt-60 Radioactivity Standard	5 mL
<a href="#">4919l</a>	Strontium-90 Radioactivity Standard	5 mL
<a href="#">4926e</a>	Hydrogen-3 Radioactivity Standard	20 mL
<a href="#">4927g</a>	Hydrogen-3 Radioactivity Standard	5 mL
<a href="#">4929f</a>	Iron-55 Radioactivity Standard	5 mL
<a href="#">4943</a>	Chlorine-36 Radioactivity Standard	3 mL
<a href="#">4949d</a>	Iodine-129 Radioactivity Standard	5 mL
<a href="#">4965a</a>	Radium-226 Radioactivity Standard	5 mL
<a href="#">4966a</a>	Radium-226 Radioactivity Standard	5 mL
<a href="#">4967a</a>	Radium-226 Radioactivity Standard	5 mL
<a href="#">4969</a>	Radium-226 Radioactivity Standard	5 mL

See [Table 205.4](#) on the website for more information.

### 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](mailto: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.

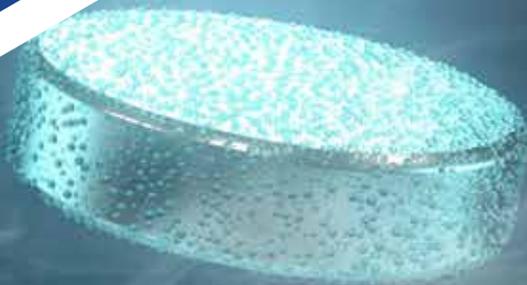
If you have any technical questions, please contact the NIST Radiation Physics Division at [radsrms@nist.gov](mailto:radsrms@nist.gov).

# Standard Reference Materials for Physical Properties



**2025**

# Electrical Properties



### 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 Properties

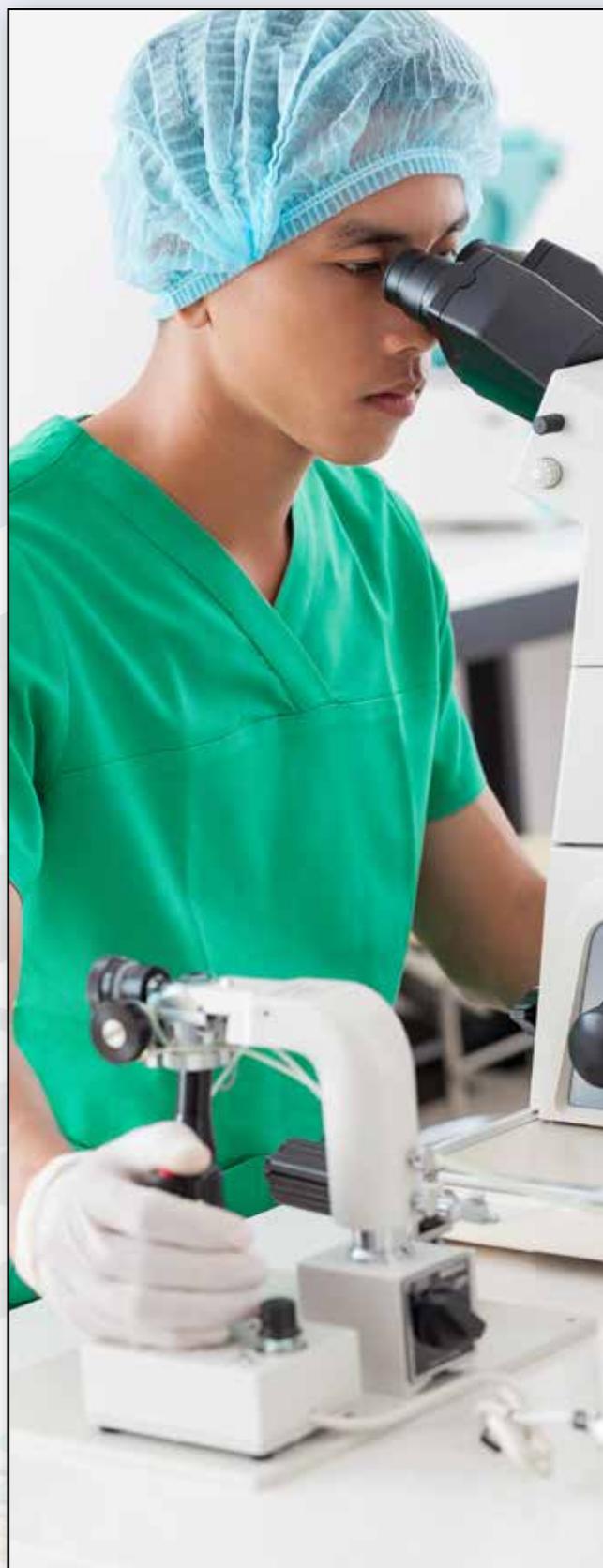


### Depth Profiling (wafer form)

SRMs 2133 and 2134 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 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

See [Table 207.3](#) on the website for more information.

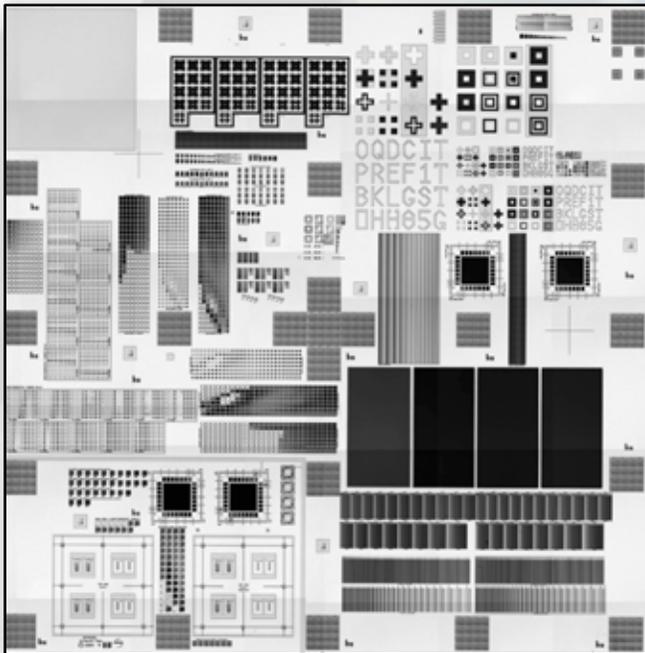


## Microscale Dimensional Measurement Standards

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
<b>2196</b>	Axial Resolution Standard for Optical Medical Imaging	each
<b>8820</b>	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](http://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 Properties



### 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
<b>622</b>	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
<b>717a</b>	Hi Boron Glass Viscosity	disk

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
<b>1416</b>	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
<b>709</b>	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
<b>624</b>	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
<b>709</b>	Extra Dense Lead Glass	block
<b>717a</b>	Hi Boron Glass Viscosity	disk

See [Table 208.5](#) on the website for more information.

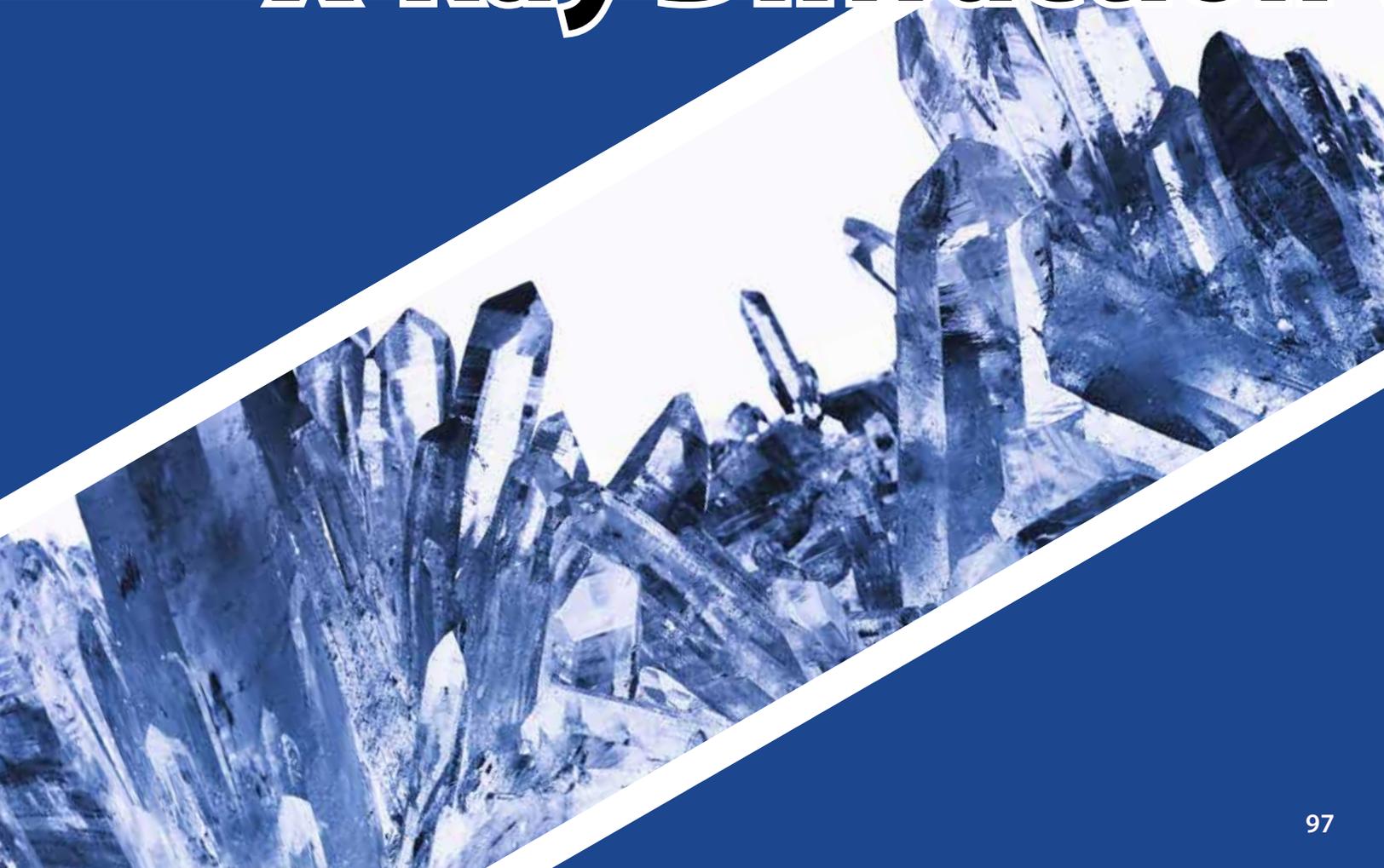
### Density

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
<b>211d</b>	Toluene Liquid Density Extended Range	4 x 5 mL
<b>2214</b>	Isooctane Liquid Density	4 x 5 mL

See [Table 208.8](#) on the website for more information.

# Standard Reference Materials for Physical Properties



## Diffraction and Scattering

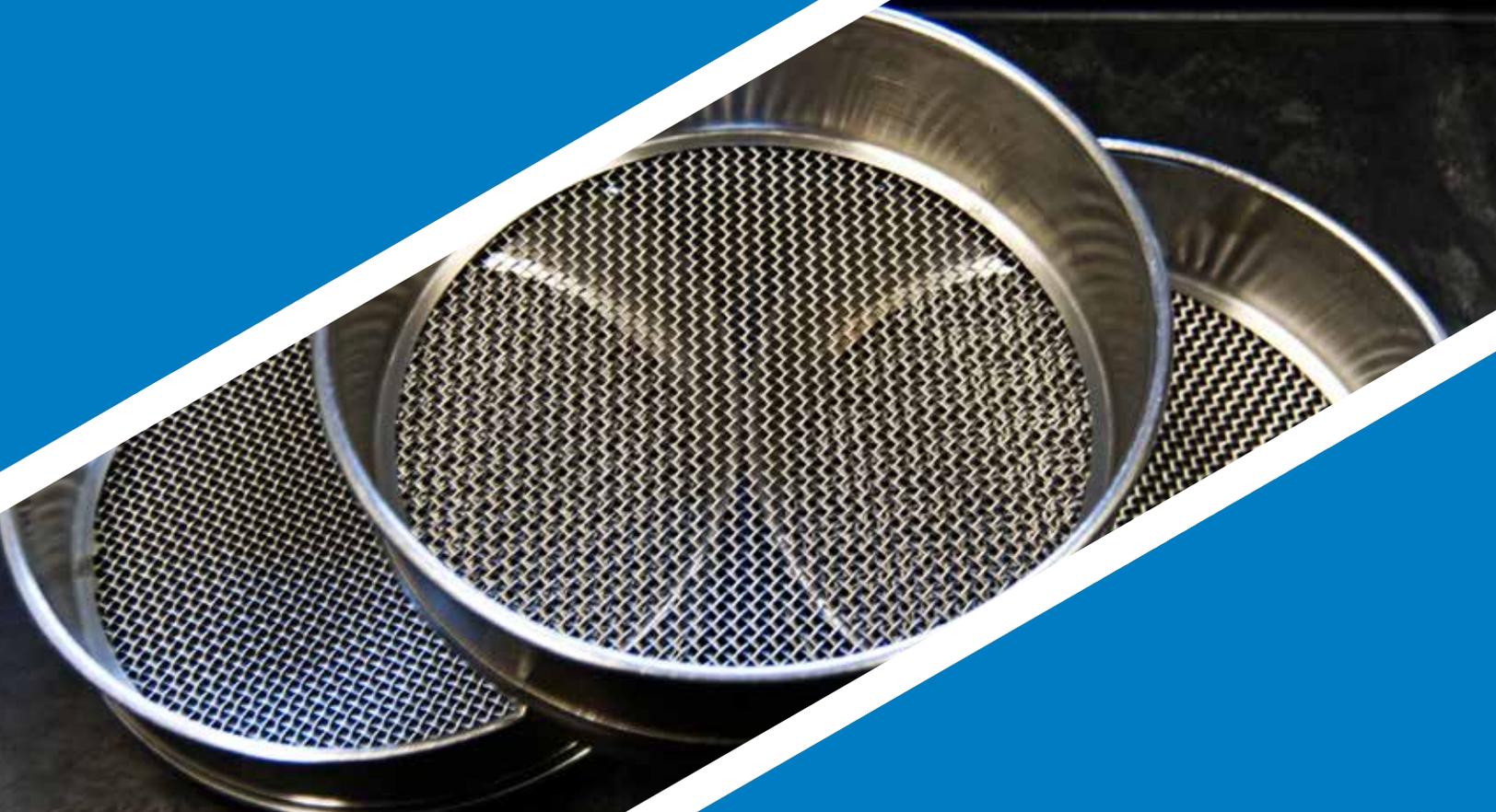
SRMs 676a, 674b, 1878b, and 1879b consist of high phase purity materials for use in the quantitative analysis of samples by the internal standard method. SRMs 640f, 660c, 675, and 1976c consist of materials with select crystallographic and microstructure properties used in the evaluation of diffraction 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
<b>640f</b>	Line Position and Line Shape Standard for Powder Diffraction (Silicon Powder)	7.5 g
<b>660c</b>	Line Position and Line Shape Standard for Powder Diffraction (Lanthanum Hexaboride Powder)	6 g
<b>674b</b>	X-Ray Powder Diffraction Intensity Set (Quantitative Powder Diffraction Standard)	10 g
<b>675</b>	Line Position, Mica (XRD)	7.5 g
<b>676a</b>	Alumina Powder for Quantitative Analysis by X-Ray Diffraction	20 g
<b>1878b</b>	Respirable Alpha Quartz (Quantitative X-Ray Powder Diffraction Standard)	5 g
<b>1879b</b>	Respirable Cristobalite (Quantitative X-Ray Powder Diffraction Standard)	5 g
<b>1976c</b>	Instrument Response Standard for X-Ray Powder Diffraction	disc
<b>1979</b>	Powder Diffraction Line Profile Standard for Crystallite Size Analysis (Nano-Crystalline ZnO Powder)	2 x 3 g
<b>1990</b>	Single Crystal Diffractometer Alignment Standard - Ruby Sphere	3 spheres
<b>2000</b>	Calibration Standard for High-Resolution X-Ray Diffraction	block
<b>3600</b>	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 Materials



**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 1017b and 1019b each consist of soda-lime glass beads covering a particular size distribution (PSD) range.

SRM 1978 consists of granular, irregular shaped zirconium oxide particles measured using sedimentation.

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

SRMs 8012 and 8013 are gold nanoparticles in water.

SRM	Description	Unit of Issue
<b>1017b</b>	Glass Beads - Particle Size Distribution (100 µm to 400 µm diameter range)	70 g
<b>1019b</b>	Glass Beads - Particle Size Distribution (750 µm to 2450 µm diameter range)	200 g
<b>1021</b>	Glass Beads - Particle Size Distribution (2 µm to 12 µm diameter range)	4 g
<b>1690</b>	Polystyrene Spheres (1 µm Diameter Particle Size)	5 mL
<b>1691</b>	Polystyrene Spheres (0.3 µm Diameter Particle Size)	5 mL
<b>1961</b>	Polystyrene Spheres (30 µm Diameter Particle Size)	5 mL
<b>1963a</b>	Polystyrene Spheres (100 nm Diameter Particle Size)	5 mL
<b>1978</b>	Particles Size Distribution Standard for Gravity Sedimentation	5 g
<b>1984</b>	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Acicular)	14 g
<b>1985</b>	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Spheroidal)	14 g
<b>8012</b>	Gold Nanoparticles, Nominal 30 nm Diameter	2 x 5 mL
<b>8013</b>	Gold Nanoparticles, Nominal 60 nm Diameter	2 x 5 mL

SRM	Description	Unit of Issue
<b>8634</b>	Ethylene Tetrafluoroethylene for Particle Size Distribution and Morphology	20 mL
<b>8988</b>	Titanium Dioxide Powder - Particle Size Distribution	6 g

See [Table 301.1](#) on the website for more information.



## Cement and Coal Fly Ash Fineness

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
<b>114r</b>	Portland Cement Fineness Standard	20 x 5 g
<b>2689</b>	Coal Fly Ash	3 x 10 g
<b>2690</b>	Coal Fly Ash	3 x 10 g
<b>2691</b>	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
<b>2806d</b>	Medium Test Dust (MTD) in Hydraulic Fluid	3 x 400 mL
<b>8631b</b>	Medium Test Dust (MTD)	20 g
<b>8632a</b>	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
<b>1980</b>	Positive Electrophoretic (+ $\mu\text{E}$ ) Mobility Standard (500 mg/L)	40 mL
<b>1992</b>	Zeta Potential - Colloidal Silica (Nominal Mass Fraction 0.15 %)	4 x 5 mL
<b>1993</b>	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
<b>1898</b>	Titanium Dioxide Nanomaterial	15 g
<b>1900</b>	Specific Surface Area Standard	4 g
<b>1917</b>	Mercury Porosimetry Standard	10 g
<b>2207</b>	Controlled Pore Glass - BET Specific Surface Area (Nominal Pore Diameter 18 nm)	5 g
<b>2696</b>	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](https://www.nist.gov/srm_reg)



# Standard Reference Materials for Engineering Materials



### 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
<b>1893</b>	Copper Microhardness Test Block (Knoop)	each
<b>1894a</b>	Vickers Microhardness of Copper	each
<b>1895</b>	Nickel Microhardness Test Block (Knoop)	each
<b>1896b</b>	Vickers Microhardness of Nickel	each
<b>1905</b>	Nickel Microhardness Test Block (Knoop)	each
<b>1906</b>	Nickel Microhardness Test Block (Knoop)	each
<b>1907</b>	Nickel Microhardness Test Block (Knoop)	each
<b>1908</b>	Vickers Microhardness of Nickel	each
<b>1909</b>	Vickers Microhardness of Nickel	each
<b>2798a</b>	Vickers Microhardness of Nickel	each
<b>2828</b>	Knoop Microhardness of Steel	each
<b>2829</b>	Vickers Microhardness of Steel	each
<b>2830</b>	Knoop Hardness of Ceramics	each
<b>2831</b>	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
<b>1857</b>	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
<b>2073a</b>	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
<b>2810</b>	Rockwell C Hardness - Low Range	1 block
<b>2811</b>	Rockwell C Hardness - Mid Range	1 block
<b>2812</b>	Rockwell C Scale Hardness - High Range	1 block
<b>2816</b>	Rockwell Hardness 15N Scale - Low Range (Nominal 72 HR15N)	1 block
<b>2817</b>	Rockwell Hardness 15N Scale - Mid Range (Nominal 83 HR15N)	1 block
<b>2818</b>	Rockwell Hardness 15N Scale - High Range (Nominal 91 HR15N)	1 block
<b>2819</b>	Rockwell Hardness 30N Scale - Low Range (Nominal 45 HR30N)	1 block
<b>2820</b>	Rockwell Hardness 30N Scale - Mid Range (Nominal 64 HR30N)	1 block
<b>2821</b>	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 Materials



### 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
<b>1012</b>	Flooring Radiant Panel	set (3)

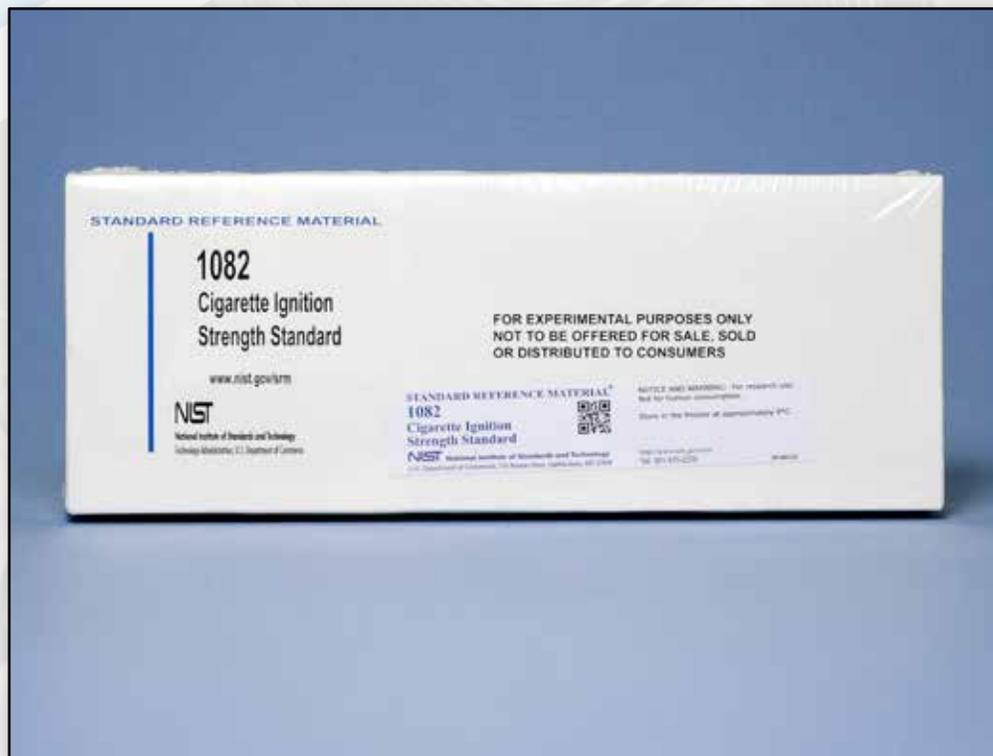
See [Table 305.4](#) on the website for more information.

### Standard Cigarettes for Ignition Strength and Ignition Resistance Testing

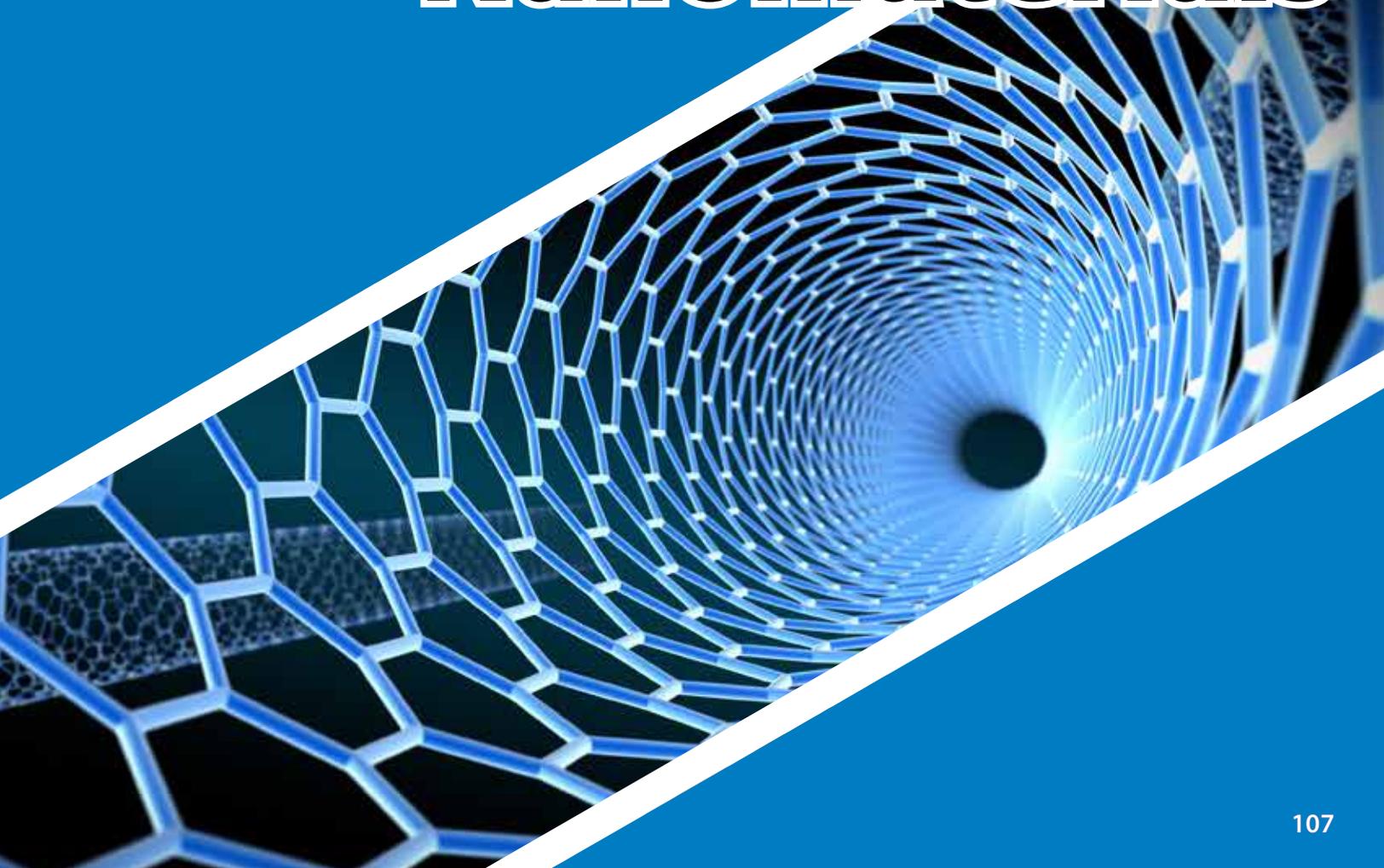
SRM 1082 is intended for use by test laboratories to assess, and control their testing of cigarette ignition in accordance with ASTM Standard Methods E 2187-16. SRM 1196a is intended for use by test laboratories to test mattresses, upholstered furniture, and its components, and thermal insulation for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

SRM	Description	Unit of Issue
<b>1082</b>	Cigarette Ignition Strength Standard (200 cigarettes)	1 carton
<b>1196a</b>	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 Materials



## Nanomaterials (less than or equal to 100 nm)

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



## 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 2098, 2561, and 2563 are NIST-Verification Charpy V-notch specimens that have a post-test evaluation service and proficiency test data available. SRMs 2098, 2561, and 2563 are to be tested at 21 °C. These SRMs should be impact tested (broken) consecutively in the same time frame (i.e., not on separate days). A completed questionnaire and digital pictures of the broken samples should be then emailed 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, 2097, 2099, 2562, and 2564 are Self-Verification Charpy V-notch specimens that do not have any post-test services available. These SRMs provide a lower cost option for a Self-Service indirect verification of a user's machine equipped with an 8 mm striker. SRMs 2093 and 2097 are to be tested at -40 °C. SRMs 2099, 2562, and 2564 are to be tested at 21 °C. These SRMs are not returned to NIST Boulder for evaluation, and no questionnaire needs to be completed.

SRMs 2112 and 2113 are NIST-Verification Charpy V-notch specimens that are certified for absorbed energy at -40 °C and 21 °C, and for maximum force at 21 °C. These SRMs provide a means to verify the performance of both the energy and force scales of an instrumented Charpy impact machine at 21 °C. They can also be used to verify just the energy scale of a machine at -40 °C. 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.

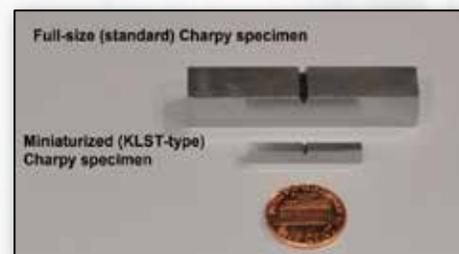
SRMs 2216, 2218, and 2219 are intended for the verification of maximum force and absorbed energy values measured at room temperature using a small-scale Charpy impact machine, in accordance with the current standards ASTM E2248 or ISO 14556. Each SRM unit consists of a set of three KLST-type specimens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

SRMs 2237, 2238, and 2239 are intended for the verification of absorbed energy values measured at 21 °C using a small-scale Charpy impact machine, in accordance with the current ASTM E2248 or ISO 14556 standards. Each SRM unit consists of a set of five RHS-type specimens needed to perform a single verification.

SRM	Description	Unit of Issue
<b>2093</b>	Low-Energy Charpy V-Notch Specimens (Self-Verification, 8-mm Striker)	set
<b>2097</b>	High-Energy Charpy V-Notch Specimens (Self-Verification, 8-mm Striker)	set

<b>2098</b>	Super-High-Energy Charpy V-Notch Specimens (NIST-Verification, 8-mm Striker)	set
<b>2099</b>	Super-High-Energy Charpy V-Notch Specimens (Self-Verification, 8 mm Striker)	set
<b>2112</b>	Dynamic Impact Force Verification Specimens (Self-Verification, 8-mm Striker, 24 kN nominal)	set
<b>2113</b>	Dynamic Impact Force Verification Specimens (Self-Verification, 8-mm Striker, 33 kN nominal)	set
<b>2197</b>	Low-Energy Charpy V-Notch Specimens (Self-Verification, 2-mm Striker)	set
<b>2198</b>	High-Energy Charpy V-Notch Specimens (Self-Verification, 2-mm Striker)	set
<b>2199</b>	Super-High-Energy Charpy V-Notch Specimens (Self-Verification, 2 mm Striker)	set
<b>2216</b>	Miniaturized Low-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
<b>2218</b>	Miniaturized High-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
<b>2219</b>	Miniaturized Super-High-Energy Charpy V-Notch KLST Specimens (Self-Verification)	set
<b>2237</b>	Miniaturized Low-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set
<b>2238</b>	Miniaturized High-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set
<b>2239</b>	Miniaturized Super-High-Energy Charpy V-Notch RHS Specimens (Self-Verification)	set
<b>2561</b>	Low-Energy Charpy V-Notch Specimens (NIST-Verification, 21° C, 8 mm Striker)	set
<b>2562</b>	Low-Energy Charpy V-Notch Specimens (Self-Verification, 21° C, 8 mm Striker)	set
<b>2563</b>	High-Energy Charpy V-Notch Specimens (NIST-Verification, 21° C, 8 mm Striker)	set
<b>2564</b>	Self-Energy Charpy V-Notch Specimens (NIST-Verification, 21° C, 8 mm Striker)	set

See [Table 309.1](#) on the website for more information.



## 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
<b>1810a</b>	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
<b>8495</b>	Northern Softwood	10 sheets
<b>8496</b>	Eucalyptus Hardwood	10 sheets

See [Table 309.5](#) on the website for more information.

## Secondary Ferrite Standards

Reference Materials RM8480 and RM8481, 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
<b>8480</b>	Secondary Ferrite Number Standard - Low Range	10x12x20
<b>8481</b>	Secondary Ferrite Number Standard - High Range	set (8)

See [Table 309.6](#) on the website for more information.

### 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
<b>2100a</b>	Fracture Toughness of Ceramic	5 bars
<b>2100b</b>	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
<b>762</b>	Magnetic Moment Standard - Nickel Disk	6 mm D
<b>764a</b>	Magnetic Susceptibility Standard - Platinum Cylinder	3 mm D x 3.42 mm
<b>772a</b>	Magnetic Moment Standard - Nickel Sphere	each
<b>2853</b>	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
<b>2460a</b>	Standard Bullet Replica	each
<b>2461</b>	Standard Cartridge Case	each

See [Table 309.11](#) on the website for more information.

### Force Calibration

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

See [Table 309.12](#) on the website for more information.



