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ENGINEERING MATERIALS



HIGH PURITY MATERIALS



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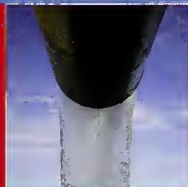
## NIST Standard Reference Materials® Catalog

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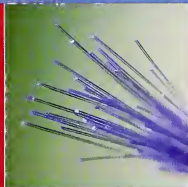
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SRMs find use in calibrating instruments and in assuring the long-term integrity of quality assurance programs. They are also key mechanisms for verifying important measurement results and in developing new measurement methods. SRMs provide users with tools to assist in establishing traceability of measurement results to NIST.

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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.

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Materials





## SIZING

### Particle Size

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

| SRM   | Particle Diameter (Mesh Size)                              | Unit Size (g)    |
|---|--|------------------|
| <b>Glass Beads, Soda Lime</b>                 |  |                  |
| 1021  | 2 $\mu\text{m}$ to 12 $\mu\text{m}$                        | 4                |
| 1003c   | 20 $\mu\text{m}$ to 50 $\mu\text{m}$ (No. 635 to No. 325)  | 28               |
| 1004b   | 53 $\mu\text{m}$ to 125 $\mu\text{m}$ (No. 270 to No. 120) | 43               |
| 1017b   | 106 $\mu\text{m}$ to 355 $\mu\text{m}$ (No. 140 to No. 45) | 70               |
| 1018b   | 250 $\mu\text{m}$ to 710 $\mu\text{m}$ (No. 60 to No. 25)  | 87               |
| 1019b   | 850 $\mu\text{m}$ to 2000 $\mu\text{m}$ (No. 20 to No. 10) | 200              |
| <b>Sand</b>                                   |  |                  |
| RM 8010                                       | (No. 30 to No. 325)  | 3 $\times$ 150 g |
| <b>Silicon Nitride (equiaxed)</b>             |  |                  |
| 659   | 0.2 $\mu\text{m}$ to 10 $\mu\text{m}$                      | 5 $\times$ 2.5 g |
| <b>Zirconium Oxide (Irregular)</b>            |  |                  |
| 1978  | 0.2 $\mu\text{m}$ to 10 $\mu\text{m}$                      | 5                |
| 1982  | 10 $\mu\text{m}$ to 150 $\mu\text{m}$                      | 10               |
| <b>Tungsten Carbide/Cobalt (spheroidal)</b>   |  |                  |
| 1984  | 9 $\mu\text{m}$ to 30 $\mu\text{m}$                        | 14               |
| 1985  | 18 $\mu\text{m}$ to 55 $\mu\text{m}$                       | 14               |
| <b>Polystyrene Spheres</b>                    |  |                  |
| Unit Size: 5 mL vial (unless otherwise noted) |  |                  |
| 1690 (0.5 % in H <sub>2</sub> O)              | 0.895 $\mu\text{m}$  |                  |
| 1691 (0.5 % in H <sub>2</sub> O)              | 0.269 $\mu\text{m}$  |                  |
| 1692 (0.25 % in H <sub>2</sub> O)             | 2.982 $\mu\text{m}$  |                  |
| 1961* (0.5 % in H <sub>2</sub> O)             | 29.64 $\mu\text{m}$  |                  |
| 1963** (0.5 % in H <sub>2</sub> O)            | 0.1007 $\mu\text{m}$                                       |                  |
| 1965 (Slide Mounted: 1 slide)                 | 9.94 $\mu\text{m}$ (hexagonal array)                       |                  |
|   | 9.89 $\mu\text{m}$ (unordered clusters)                    |                  |

\*Developed in cooperation with NASA

\*\*This SRM is limited to the calibration of electron microscope and surface scanning inspection systems (not suitable for applications where monosize, unagglomerated spheres are necessary).

## Cement Turbidity and Fineness

This SRM is suitable for use with ASTM C 430-92, C 115-93, and C 204-92.

| SRM  | Description     | Properties Certified                             | Value                                  | Unit Size                |
|------|-----------------|--|--|--------------------------|
| 114q | Portland Cement | Sieve Residue (45 $\mu\text{m}$ (No. 325) Sieve) | 8.24 %                                 | 20 pouches $\times$ 10 g |
|      |                 | Specific Surface Area (Wagner Turbidimeter)      | 2086 $\text{cm}^2 \cdot \text{g}^{-1}$ |                          |
|      |                 | Specific Surface Area (Blaine Air Permeability)  | 3774 $\text{cm}^2 \cdot \text{g}^{-1}$ |                          |

## Specific Surface Area (SSA) of Powders (Brunauer, Emmett, and Teller Method)

| SRM  | Description                    | Surface Area ( $\text{m}^2/\text{g}$ ) |            |              | Unit Size (g) |
|------|--------------------------------|--|------------|--------------|---------------|
|      |                                | Multi-point                            | Calculated | Single Point |               |
| 1897 | Specific Surface Area Standard | 258.32                                 |            | 253.08       | 7             |
| 1899 | Specific Surface Area Standard | 10.52                                  |            | 10.67        | 4             |
| 1900 | Specific Surface Area Standard | 2.85                                   |            | 2.79         | 4             |
| 2696 | Silica Fume                    |  | (22.92)*   |              | 70            |

\*The surface area for 2696 was calculated from a combination of single-point, and multi-point calibrations.

## Mercury Porosimetry Standards

| SRM  | Description  | Unit Size (g) |
|------|--|---------------|
| 1917 | Mercury Porosimetry Standard (Alumina Beads)           | 10            |
| 1918 | Mercury Porosimetry Standard (Extruded Silica-Alumina) | 12            |



## Particle Count Materials

These SRMs are suitable for use with particle sizing instrumentation, including optical counters, in accordance with National Fluid Power Association (NFPA) T2.9.6 R2-1998 and ISO/DIS 11171.

| SRM     | Description                         | Particle Concentration              | Unit Size |
|---------|-------------------------------------|-------------------------------------|-----------|
| 2806a   | Medium Test Dust in Hydraulic Fluid | 2.8 mg/L                            | 400 mL    |
| RM 8631 | Medium Test Dust                    | 1 $\mu\text{m}$ to 50 $\mu\text{m}$ | 20 g      |
| RM 8632 | Ultrafine Test Dust                 | 1 $\mu\text{m}$ to 20 $\mu\text{m}$ | 20 g      |



## SURFACE FINISH

### Abrasive Wear

This SRM is suitable for use with ASTM G 65, Procedure A.

| SRM  | Description    | Unit Size                              |
|------|----------------|--|
| 1857 | D-2 Tool Steel | 2 blocks:<br>0.78 cm × 2.5 cm × 7.6 cm |

### Surface Roughness

Unit Size: 25 mm × 34 mm × 12 mm

These SRMs are used 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  | Roughness,<br>$R_a$ ( $\mu\text{m}$ ) | Wavelength,<br>$D$ ( $\mu\text{m}$ ) |
|--|---------------------------------------|--------------------------------------|
| <b>Sinusoidal Roughness (Knoop Hardness 500)</b> |                                       |                                      |
| 2071b  | 0.3137                                | 100                                  |
| 2073a  | 0.034                                 | 100                                  |
| 2074   | 0.025                                 | 40                                   |
| 2075   | 0.012                                 | 800                                  |

## FIRE RESEARCH

### Surface Flammability

This SRM is suitable for checking the operation of radiant panel test equipment in accordance with ASTM E 162-78.

| SRM   | Description     | Certification  | Unit Size (cm)                 |
|-------|-----------------|--|--------------------------------|
| 1002d | Hardboard Sheet | Flame Spread Index, I = 203<br>Heat Evolution Factor, Q = 42.0 | 4 sheets:<br>15.2 × 45.7 × 0.6 |



## Smoke Density Chamber

These SRMs are suitable for use with National Fire Protection Agency (NFPA) 258-1998. SRM 1006d is also suitable for use with ASTM E 662-95.

| SRM   | Description                            | Maximum Specific Optical Density ( $D_m$ (corr.)) | Unit Size (cm)                   |
|-------|--|---|----------------------------------|
| 1006d | Non-Flaming Exposure Condition (paper) | 193   | 9 sheets:<br>17.2 × 25.4 × 0.165 |
| 1007b | Flaming Exposure Condition (plastic)   | 388 to 512  | 1 sheet:<br>25.4 × 25.4 × 0.076  |



## Smoke Toxicity

| SRM  | Description   | Combustion on Mode | Observation Time                           | Values           |       | Unit Size                        |
|------|---|--------------------|--|------------------|-------|----------------------------------|
|      |   |                    |  | LC <sub>50</sub> | N-Gas |                                  |
| 1048 | Cup Furnace Smoke Toxicity Method Standard (ABS copolymer)            | Flaming            | WE*  | 27               | 1.4   | 8 sheets:<br>(16 × 16 × 0.76) mm |
|      |   |                    | WE & PE**                                  | 25               | 1.5   |                                  |
|      |   | NonFlaming         | WE*  | 58               | 1.2   |                                  |
|      |   |                    | WE & PE**                                  | 53               | 1.4   |                                  |
| 1049 | University of Pittsburgh I Smoke Toxicity Method Standard (Nylon 6/6) |                    | 30 min exposure, plus 10 min post-exposure | 4.4              |       | 150 g                            |

\*WE = within 30 minutes

\*\*WE & PE = 30 minutes + 14 days

## Flooring Radiant Panel

This SRM is suitable for use with ASTM E 648-78 and NFPA 253-1978.

| SRM  | Description                               | Critical Radiant Flux  | Unit Size (cm)                    |
|------|---|------------------------|-----------------------------------|
| 1012 | Flooring Radiant Panel (Kraft Paperboard) | 0.36 W/cm <sup>2</sup> | 3 sheets:<br>104.1 × 25.4 × 0.305 |



## NONDESTRUCTIVE EVALUATION

### Artificial Flaw for Eddy Current NDE

| RM   | Description                      | Flaw Size       | Unit Size          |
|------|----------------------------------|-----------------|--------------------|
| 8458 | Artificial Flaw (Aluminum Alloy) | 3.0 mm × 0.1 mm | 7 cm × 7 cm × 2 cm |

## PERFORMANCE ENGINEERING MATERIALS

### Fracture Toughness of Steels (Charpy V-Notch Test Blocks) and Izod Impact

Unit Size: set of 10 mm × 10 mm × 54 mm specimens

These SRMs are suitable for use with ASTM E 23 and ISO/DIS 12736.

| SRM  | Description                        | Energy Range (J) |
|------|------------------------------------|------------------|
| 2092 | Low Energy (4340 Alloy Steel)      | 13 to 20         |
| 2096 | High Energy (4340 Alloy Steel)     | 88 to 136        |
| 2098 | Super High Energy (Maraging Steel) | 176 to 244       |
| 2115 | Low Energy Izod                    | 13 to 25         |



### Rockwell Hardness

Unit size: 60 mm diameter × 15 mm

| SRM  | Description                            | Nominal Hardness (HRC) |
|------|--|------------------------|
| 2810 | Rockwell C Scale Hardness - Low Range  | 25                     |
| 2811 | Rockwell C Scale Hardness - Mid Range  | 45                     |
| 2812 | Rockwell C Scale Hardness - High Range | 62                     |

## Microindentation Hardness (Knoop and Vickers Test Blocks)

Unit Size: 1.15 cm × 1.15 cm (unless otherwise noted)

These SRMs are suitable for use with ASTM E 384.

| SRM                              | Description | Load (N)          | Hardness (kg/mm <sup>2</sup> ) |
|----------------------------------|-------------|-------------------|--------------------------------|
| <b>Copper, Bright</b>            |             |                   |                                |
| 1893                             | Knoop       | 0.245, 0.49, 0.98 | 125                            |
| <b>Nickel, Bright</b>            |             |                   |                                |
| 1894a                            | Vickers     | 0.245, 0.49, 0.98 | 125                            |
| 1895                             | Knoop       | 0.245, 0.49, 0.98 | 600                            |
| 1896b                            | Vickers     | 0.245, 0.49, 0.98 | 600                            |
| 1905                             | Knoop       | 2.943             | 600                            |
| 1906                             | Knoop       | 4.905             | 600                            |
| 1907                             | Knoop       | 9.81              | 600                            |
| 1908                             | Vickers     | 2.943             | 500                            |
| 1909                             | Vickers     | 9.81              | 500                            |
| 2798a                            | Vickers     | 4.905             | 600                            |
| <b>Silicon Nitride, Ceramic</b>  |             |                   |                                |
| 2830 (22 mm diameter × 9.54 mm)  | Knoop       | 19.6              | 1500                           |
| <b>Tungsten Carbide, Ceramic</b> |             |                   |                                |
| 2831 (25 mm diameter × 9.5 mm)   | Vickers     | 9.8               | 1530                           |

## Tape Adhesion Testing

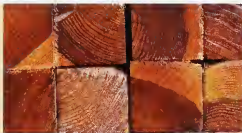
This SRM is suitable for use with ASTM D 2860 and ASTM D 3654.

| SRM   | Description                          | Unit Size                  |
|-------|--------------------------------------|----------------------------|
| 1810a | Linerboard for Tape Adhesion Testing | 50 sheets: 21.6 cm × 28 cm |



## Bleached Kraft Pulps

These RMs are intended primarily for use in fundamental studies on the physical properties of fibers and paper sheets. No extensive property measurements have been made on these materials beyond ensuring that they were within the control limits of the normal production run.

| RM    | Description         | Unit Size                           |   |
|-------|---------------------|-------------------------------------|---|
| 8495* | Northern Softwood   | 10 standard lap sheets: 0.5 kg each |  |
| 8496* | Eucalyptus Hardwood | 10 standard lap sheets: 0.5 kg each |   |

\*Developed in cooperation with the Pulp Material Research Committee

## Secondary Ferrite Number (FN) Materials

The RMs are suitable for use with ANSI/AWS A4.2 and ISO 8249.

| RM   | Ferrite Number | Unit Size (mm) |
|------|----------------|----------------|
| 8480 | 0 to 30        | 10 × 12 × 20   |
| 8481 | 30 to 120      | 10 × 12 × 20   |

## Fracture Toughness of Ceramics

Unit Size: 3 mm × 4 mm × (45 to 47) mm

| SRM  | Description                       | Fracture Toughness (MPa · m <sup>1/2</sup> ) | No. of Specimens |
|------|-----------------------------------|--|------------------|
| 2100 | Silicon Nitride Flexure Specimens | 4.57   | 5                |

## Magnetic Moment Standards

| SRM  | Description           | Certified Property     | Unit Size                        |
|------|-----------------------|------------------------|----------------------------------|
| 762  | Nickel Disk           | Specific Magnetization | disk: 6 mm diameter × 0.13 mm    |
| 772a | Nickel Sphere         | Magnetic Moment        | sphere: 2.383 mm diameter sphere |
| 2853 | Yttrium Garnet Sphere | Magnetic Moment        | sphere: 1 mm diameter (2.8 mg)   |

# FOOD & AGRICULTURE

- 9 Nutrition Composition
- 10 Dietary Supplement Material
- 10 Trace Elements in Food and Agricultural Products
- 10 Fertilizers
- 11 Wheat Hardness
- 11 Trace Elements in Botanicals
- 11 Whole Biomass Feedstock





# FOOD & AGRICULTURE

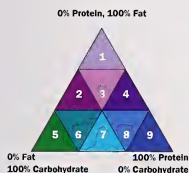
## Nutrition Composition

These SRMs and RMs are for use in determining the nutritional content of foods. The SRMs have values assigned for such dietary constituents as proximates (solids, ash, protein, carbohydrate, and fat), calories, cholesterol, selected fatty acids, selected vitamins, minerals and trace elements. NOTE: Only selected constituents are shown for information. Consult the relevant certificate or report of investigation for all available certified and reference values.

| SRM      | Description  | Certified Constituents**  | Unit Size (g)                             |
|----------|--|---|---|
| 1544     | Fatty Acids and Cholesterol in Frozen Diet Composite | Cholesterol, Fatty Acids, Calcium, Iron, Sodium                                       | 4 × 15 g                                  |
| 1546     | Meat Homogenate                                      | Cholesterol, Fatty Acids, Proximates, Minerals  | 4 × 85 g                                  |
| 1548a    | Typical Diet   | Minerals, Trace Elements,   | 2 × 6.5 g                                 |
| 1563     | Cholesterol and Fat-Soluble Vitamins in Coconut Oil  | Cholesterol, dl- $\alpha$ -Tocopheryl Acetate   | 10 ampoules:<br>5 fortified,<br>5 natural |
| 1566b    | Oyster Tissue  | Trace Elements  | 25 g                                      |
| 1570a    | Trace Elements in Spinach Leaves                     | Trace Elements, Minerals  | 60 g                                      |
| 1845     | Cholesterol in Whole Egg Powder                      | Cholesterol   | 35 g                                      |
| 1846     | Infant Formula (milk-based)                          | Vitamins, Iodine  | 10 × 30 g                                 |
| 1946     | Lake Superior Fish Tissue                            | Fat, Fatty Acid, Pesticides, Polychlorinated Biphenyls (PCBs), Mercury, Methylmercury | 5 × 7 g to 9 g                            |
| 2383     | Baby Food Composite                                  | Carotenoids, Vitamins   | 4 × 70 g                                  |
| 2384     | Baking Chocolate                                     | Fat, Fatty Acids, Calcium, Iron, Caffeine, Theobromine, Catechins                     | 5 × 91 g                                  |
| 2385     | Slurried Spinach                                     | Elements, Carotenoids,  | 4 × 70 g                                  |
| 2387     | Peanut Butter  | Fat, Fatty Acids, Elements, Tocopherols   | 3 × 170 g                                 |
| 3244     | Ephedra-Containing Protein Powder                    | Ephedrine Alkaloids, Caffeine, Elements, Vitamins                                     | 12 g × 10                                 |
| RM 8415* | Whole Egg Powder                                     | —   | 35 g                                      |
| RM 8418* | Wheat Gluten   | —   | 50 g                                      |
| RM 8432* | Corn Starch  | —   | 50 g                                      |
| RM 8433* | Corn Bran  | —   | 50 g                                      |
| RM 8435* | Whole Milk   | —   | 40 g                                      |
| RM 8436* | Durum Wheat Flour                                    | —   | 50 g                                      |

\* Developed by Agriculture Canada in cooperation with NIST: reference values assigned for proximates and elements

\*\* Proximates are provided as reference values.



### NIST Food-Matrix SRMs and RMs

1. SRM 1563
2. SRM 2384
3. SRM 2387
4. SRM 1546  
RM 8415
5. SRM 2383  
RM 8432  
RM 8433  
RM 8436
6. SRM 1846  
RM 8435  
SRM 1548a  
SRM 1544
7. SRM 1566b  
SRM 1570a  
SRM 2385
9. SRM 1946  
SRM 1947  
SRM 3244  
RM 8418



### Trace Elements in Food and Agricultural Products

For more information, see Table 110.3 USA/Canada Collaborative Materials on our website [www.nist.gov/srm](http://www.nist.gov/srm). These SRMs and RMs are for use in evaluating analytical methods and instruments used for the determination of major, minor, and trace constituent elements.

| SRM      | Description                     | Unit Size (g) |
|----------|---------------------------------|---------------|
| 1548a    | Typical Diet                    | 2 × 6.5 g     |
| 1549     | Non-fat Milk Powder             | 100           |
| 1566b    | Oyster Tissue                   | 25            |
| 1567a    | Wheat Flour                     | 80            |
| 1568a    | Rice Flour                      | 80            |
| 1570a    | Spinach Leaves                  | 60            |
| 1577b    | Bovine Liver                    | 50            |
| RM 8412* | Corn Stalk ( <i>Zea mays</i> )  | 34            |
| RM 8413* | Corn Kernel ( <i>Zea mays</i> ) | 47            |
| RM 8414* | Bovine Muscle Powder            | 50            |
| RM 8436* | Durum Wheat Flour               | 50            |
| RM 8437* | Hard Red Spring Wheat Flour     | 50            |
| RM 8438* | Soft Winter Wheat Flour         | 50            |

\* Developed by Agriculture Canada in cooperation with NIST; reference values assigned

### Dietary Supplement Materials

| SRM  | Description                                    | Unit Size (g)                             |
|------|--|---|
| 3240 | <i>Ephedra sinica</i> Stapf Aerial Parts       | 10 × 5 g                                  |
| 3241 | <i>Ephedra sinica</i> Stapf Native Extract     | 10 × 1.2 g                                |
| 3242 | <i>Ephedra sinica</i> Stapf Commercial Extract | 10 × 1.2 g                                |
| 3243 | Ephedra-Containing Solid Oral Dosage Form      | 10 × 2.5 g                                |
| 3244 | Ephedra-Containing Protein Powder              | 10 × 12 g                                 |
| 3245 | Ephedra Dietary Supplement Suite               | 2 bottles each of<br>of SRMs 3240 to 3244 |

### Fertilizers (powder form)

These SRMs are intended for use as working standards in the calibration and standardization of procedures employed in the fertilizer industry.

| SRM  | Description                    | Unit Size (g) |
|------|--------------------------------|---------------|
| 120c | Phosphate Rock (Florida)       | 90            |
| 193  | Potassium Nitrate              | 90            |
| 194  | Ammonium Dihydrogen Phosphate  | 90            |
| 200a | Potassium Dihydrogen Phosphate | 90            |
| 694  | Phosphate Rock (Western)       | 90            |
| 695  | Multi-Nutrient Fertilizer      | 70            |



## Wheat Hardness

This Reference Material (RM) was prepared and analyzed by the Federal Grain Inspection Service (FGIS) program, Grain Inspection Packers and Stockyards Administration of the U.S. Department of Agriculture. It is intended primarily for use in calibrating instruments used for determination of hardness of bulk or single kernel wheat.

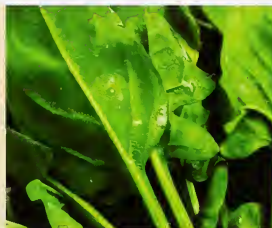
| RM     | Description    | Wheat Numbers  |
|--------|----------------|--|
| 8441a* | Wheat Hardness | Hard-1 through Hard-5;<br>5 × 5 pouches each (20 g/pouch)<br><br>Soft-1 through Soft-5;<br>5 × 5 pouches each (20 g/pouch) |

\* Developed by the U.S. Department of Agriculture

## Trace Elements in Botanicals

These SRMs and RMs are for use in evaluating the reliability of analytical methods for the determination of major, minor, and trace elements in botanical materials, agriculture food products, and materials of similar matrix. The materials can be used for quality assurance when assigning values to in-house control materials.

| SRM   | Description            | Unit Size (g) |
|-------|------------------------|---------------|
| 1515  | Apple Leaves           | 50            |
| 1547  | Peach Leaves           | 50            |
| 1570a | Spinach Leaves         | 60            |
| 1573a | Tomato Leaves          | 50            |
| 2695* | Fluoride in Vegetation | 2 × 25 g      |



\* Developed in cooperation with Aluminum Association, Inc.

## Whole Biomass Feedstock\*

These RMs are intended for use in evaluating analytical methods for the determination of summative composition of lignocellulosic materials (hardwood, softwood, herbaceous biomass, and agriculture residues). The RMs can also be used for quality assurance when assigning values to in-house control materials.

| RM   | Description       | Reference Constituents   |
|------|-------------------|--|
| 8491 | Sugarcane Bagasse | Ash, Ethanol Extractives, Acid-Soluble Lignin,<br>Acid-Insoluble Lignin, Total Lignin, Glucuronic Acid,<br>Arabinan, Xylan, Mannan, Galactan, Glucan |
| 8492 | Populus Deltoides |  |
| 8493 | Monterey Pine     |  |
| 8494 | Wheat Straw       |  |

\* Developed by the International Atomic Energy Agency (IAEA) Biomass Annex, and NIST

# HEALTH & CLINICAL

**13 Pure, Crystalline Standards**

**13 Human Serum**

**14 Bovine Serum**

**14 Calibration Solutions**

**15 Toxic Substances in Urine**

**15 Biomaterials**

**15 Miscellaneous Health-  
Related Standards**





## Pure Crystalline Standards

The materials in the table are primary reference compounds that can be used to calibrate reference measurement procedures and some field methods. These substances are traceable to the mole and thus, provide high order traceability.

| SRM  | Description                                | Purity (%) | Unit Size (g) |
|------|--|------------|---------------|
| 998  | Angiotensin I (Human)                      | 94.1       | 0.5           |
| 916a | Bilirubin                                  | 98.3       | 0.1           |
| 915a | Calcium Carbonate                          | 99.9       | 20            |
| 911b | Cholesterol                                | 99.8       | 2             |
| 921  | Cortisol (Hydrocortisone)                  | 98.9       | 1             |
| 914a | Creatinine                                 | 99.7       | 10            |
| 917b | D-Glucose (Dextrose)                       | 99.7       | 50            |
| 920  | D-Mannitol                                 | 99.8       | 50            |
| 937  | Iron Metal (Clinical)                      | 99.90      | 50            |
| 928  | Lead Nitrate                               | 100.00     | 30            |
| 924a | Lithium Carbonate                          | 99.9       | 30            |
| 929a | Magnesium Gluconate Dihydrate              | 5.403 Mg   | 5             |
| 918a | Potassium Chloride                         | 99.9817    | 30            |
| 919a | Sodium Chloride                            | 99.8       | 30            |
| 1595 | Tripalmitin                                | 99.5       | 2             |
| 912a | Urea                                       | 99.9       | 25            |
| 913a | Uric Acid                                  | 99.6       | 10            |
| 925  | VMA (4-hydroxy-3-methoxy-DL-mandelic acid) | 99.4       | 1             |

\* Values in parentheses are not certified and are given for information only.

## Human Serum

NIST has a number of human serum based SRMs shown in the table below. These are intended to be used as accuracy checks to determine if a measurement system is in control. If they are to be used as control materials or as calibrators, one must be sure that these materials are commutable with fresh serum in the measurement system. The SRMs in frozen serum are generally more commutable across the various commercial systems than are the lyophilized materials. However, the lyophilized materials may work as well as the frozen materials when analyzed with more robust field methods or with higher order reference measurement procedures.

| SRM  | Description | Certified Constituents  | Reference | Form        | No. of Levels |
|------|-------------|---|-----------|-------------|---------------|
| 909b | Human Serum | Calcium, Chloride, Cholesterol, Creatinine, Lithium, Magnesium, Potassium, Sodium, Total Glycerides, Triglycerides, Urea, and Uric Acid | Bilirubin | Lyophilized | 2             |

## Human Serum (continued)

| SRM   | Description   | Certified Constituents  | Reference  | Form        | No. of Levels |
|-------|---|---|--|-------------|---------------|
| 1951b | Lipids in Frozen Human Serum                                      | Total Cholesterol, Total Glycerides, Triglycerides                |  | Frozen      | 2             |
| 956b  | Electrolytes in Frozen Human Serum                                | Total Ca, Li, Mg, K, Na   | Ionized Ca   | Frozen      | 3             |
| 965a  | Glucose in Frozen Human Serum                                     | Glucose   |  | Frozen      | 3             |
| 970   | Ascorbic Acid in Frozen Human Serum                               | Total Ascorbic Acid   |  | Frozen      | 2             |
| 1952a | Cholesterol in Human Serum (Freeze-dried)                         | Cholesterol   |  | Lyophilized | 3             |
| 968c  | Fat-Soluble Vitamins, Carotenoids, and Cholesterol in Human Serum | Vitamins (4), Cholesterol, Carotenoids (4)                        | Carotenoids (8), Vitamin D   | Lyophilized | 2             |
| 1589a | PCBs, Pesticides, and Dioxins/Furans in Human Serum               | PCB Congeners (16), Chlorinated Pesticides (5), Total Cholesterol | PCB Congeners (9), Chlorinated Pesticides (5), Total Cholesterol, Triglycerides, "Free" Cholesterol, Phospholipids | Lyophilized | 1             |
| 1599  | Anticonvulsant Drug Level Assay (valproic acid and carbamazepine) | valproic acid<br>carbamazepine                                    |  | Lyophilized | 1             |
| 900   | Antiepilepsy Drug Level Assay                                     | Antiepileptics (4)  |  | Lyophilized | 3             |
| 1955  | Homocysteine and Folate in Human Serum                            | Homocysteine<br>5-Methyltetrahydrofolic acid                      | Total Folate, Folic Acid   | Frozen      | 3             |

## Bovine Serum

| SRM  | Description                            | Certified Constituents | Reference Constituents         | Form   | No. of Levels |
|------|--|------------------------|--------------------------------|--------|---------------|
| 1598 | Inorganic Constituents in Bovine Serum | Elements (13)          | —                              | Frozen | 1             |
| 955b | Lead in Bovine Blood                   | Pb                     | —                              | Frozen | 4             |
| 966  | Toxic Elements in Bovine Blood         | Pb, Cd                 | Pb, Cd, Total Hg, Inorganic Hg | Frozen | 2             |

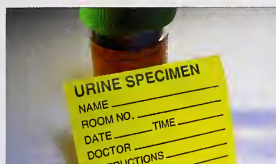
## Calibration Solutions for Determination of Proteins and Amino Acids

| SRM  | Description                         | Certified Constituents | Reference Values | Form     | No. of Levels |
|------|-------------------------------------|------------------------|------------------|----------|---------------|
| 927d | Bovine Serum Albumin (7 % Solution) | Protein Concentration  | 11 values        | Solution | 1             |
| 2921 | Cardiac Troponin Complex            | cTnI Concentration     | cTnT, cTnC       | Solution | 1             |
| 2389 | Amino Acids in HCl                  | 17 Amino Acids         | —                | Solution | 1             |



## Toxic Substances in Urine

SRMs 2670a, 2671a and 2672a are for determining toxic substances in human urine. They consist of freeze-dried urine and are provided in sets of four 30 mL bottles - two each at low and elevated levels.



| SRM   | Description | Unit Size |
|-------|-------------|-----------|
| 2670a | 14 Elements | 2 × 20 mL |
| 2671a | Fluoride    | 2 × 20 mL |
| 2672a | Mercury     | 2 × 20 mL |

## Biomaterials

Biomaterials are materials that are applied for use in medical devices that require intimate contact with tissues and body fluids. SRM 2910 is intended for use in evaluating the physical and chemical properties of calcium apatites of biological, geological, and synthetic origins. RM 8456 an ultra high molecular weight polyethylene is used in mechanical characterization of material properties and laboratory-simulated performance.

| SRM/RM | Description                              | Certified Properties  | Reference Properties   | Unit Size  |
|--------|--|---|--|--|
| 2910   | Calcium Hydroxyapatite                   | Calcium Phosphorus<br>Specific Surface Area<br>Ca/P Molar Ratio<br>Solubility Product |  | 5 g (powder)   |
| 8456   | Ultra High Molecular Weight Polyethylene |   | Young's Modulus<br>Yield Strength<br>Ultimate Strength<br>Elongation | 3 in diameter × 60 in (bar)<br>(7.62 cm diameter × 152.4 cm) |
| 8457   | Ultra High Molecular Weight Polyethylene |   | Young's Modulus<br>Yield Strength<br>Ultimate Strength<br>Elongation | 10 (0.5 cm) c  |

## Miscellaneous Health -Related Materials

SRM 2389 is a solution of 17 amino acids used in the calibration of chromatographic instrumentation. SRM 1400, and 1486 are intended for use in evaluating analytical methods for the determination of selected major, minor, and trace elements in bone and in material of a similar matrix.

| SRM  | Description                  | Certified Constituents | Form     | Unit Size  |
|------|------------------------------|------------------------|----------|------------|
| 2389 | Amino Acids in 0.1 mol/L HCl | Amino Acids (17)       | Solution | 5 ampoules |
| 1400 | Bone Ash                     | Elements (8)           | Powdered | 50 g       |
| 1486 | Bone Meal                    | Elements (8)           | Powdered | 50 g       |

# FORENSICS

17 Ethanol Solutions

18 Crime Scene  
Investigations

18 DNA Profiling

19 Drugs of Abuse  
in Human Hair

19 Drugs of Abuse  
in Urine





## 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   | Description   |
|-------|---|
| 1828b | Ethanol-water Solution (Blood-alcohol Testing: six levels)    |
| 1847  | Ethanol-water Solution (Breath-alcohol Testing: three levels) |
| 2891  | Ethanol-water Solution (nominal 0.02% by mass)                |
| 2892  | Ethanol-water Solution (nominal 0.04% by mass)                |
| 2893  | Ethanol-water Solution (nominal 0.08% by mass)                |
| 2894  | Ethanol-water Solution (nominal 0.1% by mass)                 |
| 2895  | Ethanol-water Solution (nominal 0.2% by mass)                 |
| 2896  | Ethanol-water Solution (nominal 0.3% by mass)                 |
| 2897  | Ethanol-water Solution (nominal 2% by mass)                   |
| 2898  | Ethanol-water Solution (nominal 6% by mass)                   |
| 2899  | Ethanol-water Solution (nominal 25% by mass)                  |
| 2900  | Ethanol-water Solution (nominal 95.6% by mass)                |



## SRM/RMs for Crime Scene Investigations

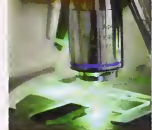
| SRM     | Description                              | Certified/Reference Constituents | Unit Size |
|---------|--|----------------------------------|-----------|
| 2285    | Arson Test Mixture in Methylene Chloride | 15 components                    | 5 x 1.2mL |
| RM 8107 | Additives in Smokeless Powder            | 4 components                     | 5g        |

## DNA Profiling/Crime Scene Investigations

SRMs 2390, and 2391 b are intended for use in the standardization of forensic and paternity quality assurance procedures and instructional law enforcement or non-clinical research purposes.



| SRM    | Description   | Unit Size            |
|--------|---|----------------------|
| 2390   | DNA Profiling Standard - RFLP                               | 20 components        |
| 2391b  | PCR-Based DNA Profiling Standard                            | 12 components        |
| 2392   | Human Mitochondrial DNA Sequencing                          | 3 components         |
| 2392-I | Human Mitochondrial DNA Sequencing                          | 1 component          |
| 2394   | Heteroplasmic Mitochondrial DNA Mutation Detection Standard | 10 components        |
| 2395   | Human Y-Chromosome DNA Profiling Standard                   | 6 components         |
| 2396   | Oxidative DNA Damage Mass Spectrometry Standard             | 12 components: 1 box |
| 2399   | Fragile X Human DNA Triplet Repeat Standard                 | 9 components: 1 box  |

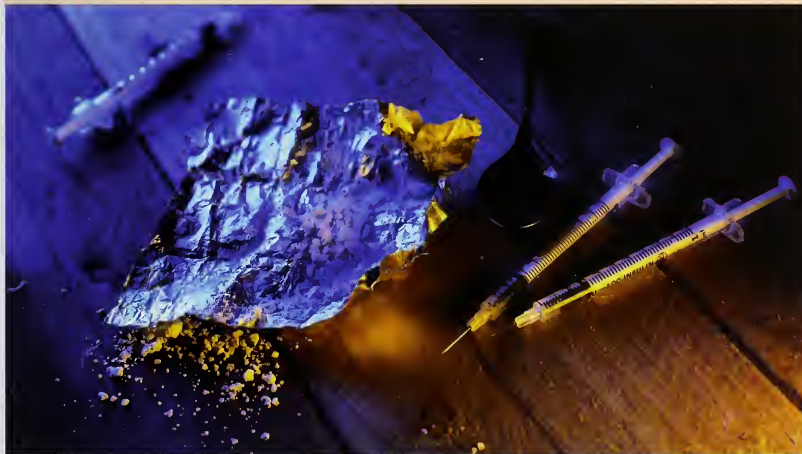


## Drugs of Abuse in Human Hair

| SRM  | Description                     | Certified Constituents | Unit Size |  |
|------|---------------------------------|------------------------|-----------|---|
| 2379 | Drugs of Abuse in Human Hair I  | 6                      | 100mg     |   |
| 2380 | Drugs of Abuse in Human Hair II | 4                      | 100mg     |   |

## Drugs of Abuse in Urine

| SRM     | Description                   | Certified Constituents | Reference Constituent          | Form        | Unit Size              |
|---------|-------------------------------|------------------------|--------------------------------|-------------|------------------------|
| 1508a   | Cocaine Metabolite in Urine   | Benzoyllecgonine       | Cotinine (nicotine metabolite) | Lyophilized | 3 levels, plus 1 blank |
| RM 8444 | Cotinine in Urine             |                        |                                | Lyophilized | 2 levels, plus 1 blank |
| 1507b   | Marijuana Metabolite in Urine | THC-9-COOH             |                                | Lyophilized | 3 levels, plus 1 blank |
| 2381    | Morphine and Codeine in Urine | Morphine and Codeine   |                                | Lyophilized | 3 levels, plus 1 blank |
| 2382    | Morphine Glucuronide in Urine | Free Morphine          |                                | Lyophilized | 3 levels, plus 1 blank |
| 1511    | Multi Drugs of Abuse in Urine | Drugs of Abuse (5)     |                                | Lyophilized | 1 level                |



# ENVIRONMENTAL

- 21 Calibration Materials
- 27 Biological Tissues
- 28 Soils, Sediments, Particulates  
and Water
- 30 Geological Materials  
and Ores
- 32 Microanalysis
- 33 Fossil Fuels and Related  
Materials
- 36 Gases
- 40 Industrial Hygiene



# CALIBRATION MATERIALS

## Calibration Solutions, Organic



# ENVIRONMENTAL

| SRM/RM | Description  | Certified Constituents | Reference Constituents | Unit Size  |
|--------|--|------------------------|------------------------|------------|
| 3000   | Benzene in Methanol  | 1                      | —                      | 2 x 2.5 mL |
| 3001   | Toluene in Methanol  | 1                      | —                      | 2 x 2.5 mL |
| 3002   | Ethylbenzene in Methanol                                       | 1                      | —                      | 2 x 2.5 mL |
| 3003   | o-Xylene in Methanol   | 1                      | —                      | 2 x 2.5 mL |
| 3004   | m-Xylene in Methanol   | 1                      | —                      | 2 x 2.5 mL |
| 3005   | p-Xylene in Methanol   | 1                      | —                      | 2 x 2.5 mL |
| 3006   | Carbon Tetrachloride in Methanol                               | 1                      | —                      | 2 x 2.5 mL |
| 3008   | Methylene Chloride in Methanol                                 | 1                      | —                      | 2 x 2.5 mL |
| 3009   | 1,2-Dichloropropane in Methanol                                | 1                      | —                      | 2 x 2.5 mL |
| 3010   | Tetrachloroethene (Tetrachloroethylene) in Methanol            | 1                      | —                      | 2 x 2.5 mL |
| 3011   | 1,1,1-Trichloroethane in Methanol                              | 1                      | —                      | 2 x 2.5 mL |
| 3012   | 1,2-Dichloroethane in Methanol                                 | 1                      | —                      | 2 x 2.5 mL |
| 3014   | 1,2,3-Trichloropropane in Methanol                             | 1                      | —                      | 2 x 2.5 mL |
| 3015   | Isopropylbenzene in Methanol                                   | 1                      | —                      | 2 x 2.5 mL |
| 3016   | sec-Butylbenzene in Methanol                                   | 1                      | —                      | 2 x 2.5 mL |
| 3061   | Chloral Hydrate in Methanol                                    | 1                      | —                      | 5 x 1.2 mL |
| 3063   | 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) in Methanol | 1                      | —                      | 5 x 1.2 mL |
| 3064   | Endothall in Water   | 1                      | —                      | 5 x 1.2 mL |
| 3065   | Chlorinated Herbicides-1 in Methanol                           | 8                      | —                      | 5 x 1.2 mL |
| 3066   | Chlorinated Herbicides-11 in Methanol                          | 3                      | —                      | 5 x 1.2 mL |
| 3067   | Toxaphene in Methanol  | Total Toxaphene        | —                      | 5 x 1.2 mL |
| 3068   | Chlordane in Methanol  | Total Chlordane        | —                      | 5 x 1.2 mL |
| 3071   | Glyphosate in Water  | 1                      | —                      | 5 x 1.2 mL |
| 3072   | Diquat Dibromide Monohydrate in Water                          | 1                      | —                      | 5 x 1.2 mL |
| 3074   | Phalates/Adipate in Methanol                                   | 6                      | 1                      | 5 x 1.2 mL |
| 3075   | Aroclor 1016 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3076   | Aroclor 1232 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3077   | Aroclor 1242 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3078   | Aroclor 1248 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3079   | Aroclor 1254 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3080   | Aroclor 1260 in Transformer Oil                                | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3081   | Aroclor 1016 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3082   | Aroclor 1232 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3083   | Aroclor 1242 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3084   | Aroclor 1248 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3085   | Aroclor 1254 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3086   | Aroclor 1260 in Methanol                                       | Total Aroclor          | —                      | 5 x 1.2 mL |
| 3090   | Aroclors in Transformer Oil (set SRMs 3075-3080)               | Total Aroclor          | —                      | 6 x 1.2 mL |
| 3091   | Aroclors in Methanol (set SRMs 3081-3086)                      | Total Aroclor          | —                      | 6 x 1.2 mL |

## Calibration Solutions, Organic (continued)

For more information, see Table 109.2 on our website [www.nist.gov/srm](http://www.nist.gov/srm)

| SRM/RM  | Description  | Certified Constituents      | Reference Constituents          | Unit Size    |
|---------|--|-----------------------------|---------------------------------|--------------|
| 1582    | Petroleum Crude Oil  | PAHs (5), PASH (1)          | PAHs (5), Phenols (2), PANH (1) | 5 ampoules   |
| 1584    | Priority Pollutant Phenols in Methanol                             | Phenols (10)                | Phenols (1)                     | 5 x 1.2 mL   |
| 1586    | Isotopically Labeled and Unlabeled Priority Pollutants in Methanol | Priority pollutants (10)    | —                               | 6 x 1.2 mL   |
| 1639    | Halocarbons (in Methanol) for Water Analysis                       | Halocarbons (7)             | —                               | 5 x 1.2 mL   |
| 1494    | Aliphatic Hydrocarbons in 2, 2, 4- Trimethylpentane                | (20)                        | —                               | 5 x 1.2 mL   |
| 1647e   | Priority Pollutant PAHs (in Acetonitrile)                          | PAHs (16)                   | —                               | 5 x 1.2 mL   |
| 1491a   | Methyl-substituted Polycyclic Aromatic Hydrocarbons in Toluene     | PAHs (18)                   | —                               | 5 x 1.2 mL   |
| 2260a   | Aromatic Hydrocarbons in Toluene                                   | PAHs (36)                   | —                               | 5 x 1.2 mL   |
| 2269    | Perdeuterated PAH-I  | Perdeuterated PAHs (5)      | —                               | 5 x 1.2 mL   |
| 2270    | Perdeuterated PAH-II   | Perdeuterated PAHs (6)      | —                               | 5 x 1.2 mL   |
| 1587    | Nitrated PAHs in Methanol  | Nitro-PAHs (6)              | Nitro-PAHs (1)                  | 4 x 1.2 mL   |
| 1596    | Dinitropyrene Isomers and 1-Nitropyrene in Methylene Chloride      | Nitro-PAHs (4)              | —                               | 5 x 1.2 mL   |
| 1493    | Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane           | PCBs (18)                   | PCBs (2)                        | 5 x 1.2 mL   |
| 2262    | Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane           | PCBs (25)                   | PCBs (4)                        | 5 x 1.2 mL   |
| 2274    | PCB Congener Solution-II   | PCBs (11)                   | —                               | 5 x 1.2 mL   |
| 2276    | Three Planar PCBs in Solution                                      | PCBs (3)                    | —                               | 5 x 1.2 mL   |
| RM 8466 | g-HCH (Lindane) (neat)   | —                           | —                               | Vial: 100 mg |
| RM 8467 | 4,4'-DDE (neat)  | —                           | —                               | Vial: 100 mg |
| RM 8469 | 4,4'-DDT (neat)  | —                           | —                               | Vial: 100 mg |
| 1492    | Chlorinated Pesticides in Hexane                                   | Pesticides (15)             | —                               | 5 x 1.2 mL   |
| 2261    | Chlorinated Pesticides in Hexane                                   | Pesticides (15)             | —                               | 5 x 1.2 mL   |
| 2273    | DDTs and Metabolites in Solution                                   | DDTs, Metabolites (7)       | —                               | 5 x 1.2 mL   |
| 2275    | Chlorinated Pesticide Solution-II                                  | Pesticides (9)              | —                               | 5 x 1.2 mL   |
| 1614    | Dioxin (2,3,7,8-TCDD) in Isooctane                                 | Dioxins (2)                 | Dioxins (2)                     | 6 x 1.2 mL   |
| 869a    | Column Performance Test Mixture for Liquid Chromatography (PAHs)   | Shape Selectivity: PAHs (3) | Acetonitrile                    | 5 x 1 mL     |



## Calibration Solutions, Organic (continued)

| SRM/RM | Description  | Certified Constituents   | Reference Constituents | Unit Size |
|--------|--|--|------------------------|-----------|
| 870    | Mixtures for Liquid Chromatography Column Performance Test Mixture for Liquid Chromatography | Silanol Activity, Trace Metal Activity, Hydrophobic Retention, Methylene Selectivity | Methanol               | 15 × 1 mL |
| 877    | Chiral Selectivity Test  | various Chiral components  | Ethanol                | 5 × 1 mL  |
| 1543   | GC/MS System Performance Standard  | (20)   | —                      | 4 × 1 mL  |

## Calibration Solutions, Inorganic

| SRM/RM | Description                  | Certified Constituents | Unit Size  |
|--------|------------------------------|------------------------|------------|
| 1641d  | Mercury in Water             | Mercury                | 10 × 10 mL |
| 3101a  | Aluminum Standard Solution   | Aluminum               | 50 mL      |
| 3102a  | Antimony Standard Solution   | Antimony               | 50 mL      |
| 3103a  | Arsenic Standard Solution    | Arsenic                | 50 mL      |
| 3104a  | Barium Standard Solution     | Barium                 | 50 mL      |
| 3105a  | Beryllium Standard Solution  | Beryllium              | 5 × 10 mL  |
| 3106   | Bismuth Standard Solution    | Bismuth                | 5 × 10 mL  |
| 3107   | Boron Standard Solution      | Boron                  | 50 mL      |
| 3108   | Cadmium Standard Solution    | Cadmium                | 50 mL      |
| 3109   | Calcium Standard Solution    | Calcium                | 50 mL      |
| 3110   | Cerium Standard Solution     | Cerium                 | 5 × 10 mL  |
| 3111a  | Cesium Standard Solution     | Cesium                 | 50 mL      |
| 3112a  | Chromium Standard Solution   | Chromium               | 5 × 10 mL  |
| 3113   | Cobalt Standard Solution     | Cobalt                 | 5 × 10 mL  |
| 3114   | Copper Standard Solution     | Copper                 | 5 × 10 mL  |
| 3115a  | Dysprosium Standard Solution | Dysprosium             | 5 × 10 mL  |
| 3116a  | Erbium Standard Solution     | Erbium                 | 5 × 10 mL  |
| 3117a  | Europium Standard Solution   | Europium               | 5 × 10 mL  |

# Calibration Solutions, Inorganic (continued)

| SRM/RM | Description                    | Certified Constituents | Unit Size |
|--------|--------------------------------|------------------------|-----------|
| 3118a  | Gadolinium Standard Solution   | Gadolinium             | 5 x 10 mL |
| 3119a  | Gallium Standard Solution      | Gallium                | 5 x 10 mL |
| 3120a  | Germanium Standard Solution    | Germanium              | 50 mL     |
| 3121   | Gold Standard Solution         | Gold                   | 5 x 10 mL |
| 3122   | Hafnium Standard Solution      | Hafnium                | 50 mL     |
| 3123a  | Holmium Standard Solution      | Holmium                | 5 x 10 mL |
| 3124a  | Indium Standard Solution       | Indium                 | 5 x 10 mL |
| 3126a  | Iron Standard Solution         | Iron                   | 5 x 10 mL |
| 3127a  | Lanthanum Standard Solution    | Lanthanum              | 5 x 10 mL |
| 3128   | Lead Standard Solution         | Lead                   | 50 mL     |
| 3129a  | Lithium Standard Solution      | Lithium                | 5 x 10 mL |
| 3130a  | Lutetium Standard Solution     | Lutetium               | 5 x 10 mL |
| 3131a  | Magnesium Standard Solution    | Magnesium              | 50 mL     |
| 3132   | Manganese Standard Solution    | Manganese              | 5 x 10 mL |
| 3133   | Mercury Standard Solution      | Mercury                | 5 x 10 mL |
| 3134   | Molybdenum Standard Solution   | Molybdenum             | 5 x 10 mL |
| 3135a  | Neodymium Standard Solution    | Neodymium              | 5 x 10 mL |
| 3136   | Nickel Standard Solution       | Nickel                 | 5 x 10 mL |
| 3137   | Niobium Standard Solution      | Niobium                | 50 mL     |
| 3138   | Palladium Standard Solution    | Palladium              | 5 x 10 mL |
| 3139a  | Phosphorous Standard Solution  | Phosphorous            | 5 x 10 mL |
| 3140   | Platinum Standard Solution     | Platinum               | 5 x 10 mL |
| 3141a  | Potassium Standard Solution    | Potassium              | 50 mL     |
| 3142a  | Praseodymium Standard Solution | Praseodymium           | 5 x 10 mL |
| 3143   | Rhenium Standard Solution      | Rhenium                | 50 mL     |
| 3144   | Rhodium Standard Solution      | Rhodium                | 5 x 10 mL |
| 3145a  | Rubidium Standard Solution     | Rubidium               | 5 x 10 mL |
| 3147a  | Samarium Standard Solution     | Samarium               | 5 x 10 mL |
| 3148a  | Scandium Standard Solution     | Scandium               | 5 x 10 mL |
| 3149   | Selenium Standard Solution     | Selenium               | 5 x 10 mL |
| 3150   | Silicon Standard Solution      | Silicon                | 5 x 10 mL |
| 3151   | Silver Standard Solution       | Silver                 | 5 x 10 mL |
| 3152a  | Sodium Standard Solution       | Sodium                 | 5 x 10 mL |
| 3153a  | Strontium Standard Solution    | Strontium              | 5 x 10 mL |
| 3154   | Sulfur Standard Solution       | Sulfur                 | 5 x 10 mL |
| 3155   | Tantalum Standard Solution     | Tantalum               | 50 mL     |



## Calibration Solutions, Inorganic (continued)

| SRM/RM | Description                 | Certified Constituents | Unit Size |
|--------|-----------------------------|------------------------|-----------|
| 3156   | Tellurium Standard Solution | Tellurium              | 5 x 10 mL |
| 3157a  | Terbium Standard Solution   | Terbium                | 5 x 10 mL |
| 3158   | Thallium Standard Solution  | Thallium               | 5 x 10 mL |
| 3159   | Thorium Standard Solution   | Thorium                | 50 mL     |
| 3160a  | Thulium Standard Solution   | Thulium                | 5 x 10 mL |
| 3161a  | Tin Standard Solution       | Tin                    | 50 mL     |
| 3162a  | Titanium Standard Solution  | Titanium               | 50 mL     |
| 3163   | Tungsten Standard Solution  | Tungsten               | 50 mL     |
| 3164   | Uranium Standard Solution   | Uranium                | 5 x 10 mL |
| 3165   | Vanadium Standard Solution  | Vanadium               | 5 x 10 mL |
| 3166a  | Ytterbium Standard Solution | Ytterbium              | 5 x 10 mL |
| 3167a  | Yttrium Standard Solution   | Yttrium                | 5 x 10 mL |
| 3168a  | Zinc Standard Solution      | Zinc                   | 50 mL     |
| 3169   | Zirconium Standard Solution | Zirconium              | 50 mL     |
| 3181   | Sulfate Anion Solution      | Sulfate                | 5 x 10 mL |
| 3182   | Chloride Anion Solution     | Chloride               | 5 x 10 mL |
| 3183   | Fluoride Anion Solution     | Fluoride               | 50 mL     |
| 3184   | Bromide Anion Solution      | Bromide                | 5 x 10 mL |
| 3185   | Nitrate Anion Solution      | Nitrate                | 5 x 10 mL |
| 3186   | Phosphate Anion Solution    | Phosphate              | 5 x 10 mL |



## Organo - Metallic

| SRM   | Description                                   | Elemental Composition (Percent) |
|-------|---|---------------------------------|
| 1075a | Aluminum 2-Ethylhexanoate                     | 8.07 Al                         |
| 1051b | Barium Cyclohexanebutyrate                    | 28.7 Ba                         |
| 1080a | Bis (1-phenyl-1,3-butanediono)copper (II)     | 16.37 Cu                        |
| 1052b | Bis(1-phenyl-1,3-butanediono)oxovanadium (IV) | 13.01 V                         |
| 1053a | Cadmium Cyclohexanebutyrate                   | 24.8 Cd                         |
| 1057b | Dibutyltin bis (2-ethylhexanoate) (tin)       | 22.95 Sn                        |
| 1059c | Lead Cyclohexanebutyrate                      | 37.5 Pb                         |
| 1065b | Nickel Cyclohexanebutyrate                    | 13.89 Ni                        |
| 1066a | Octaphenylcyclotetrasiloxane                  | 14.14 Si                        |
| 1077a | Silver 2-Ethylhexanoate                       | 42.60 Ag                        |
| 1069b | Sodium Cyclohexanebutyrate                    | 12.0 Na                         |
| 1071b | Triphenyl Phosphate                           | 9.48 P                          |
| 1078b | Tris (1-phenyl-1,3-butanediono)chromium (III) | 9.6 Cr                          |
| 1079b | Tris (1-phenyl-1,3-butanediono)iron (III)     | 10.45 Fe                        |
| 1073b | Zinc Cyclohexanebutyrate                      | 16.66 Zn                        |





## BIOLOGICAL TISSUES



| SRM   | Description  | Certified Constituents   | Reference Constituents   | Unit Size  |
|-------|--|--|--|------------|
| 1566b | Oyster Tissue  | 22 Elements, Methylmercury   | 8 Elements, 8 Fatty Acids, Proximates, Caloric Content                                       | 25 g       |
| 1974b | Organics in Mussel Tissue ( <i>Mytilus Edulis</i> ) (Frozen) | PAHs (22), PCBs (31), Pesticides (7), Total Mercury  | Trace Elements (11), PAHs (16), PCBs (8), Pesticides (6), Methylmercury                      | 5 × 8 g    |
| 2976  | Mussel Tissue  | Methylmercury, Total Mercury, Trace Elements (7)   | Trace elements (20)  | 25 g       |
| 2977  | Mussel Tissue  | PAHs (14), PCB Congeners (25), Pesticides (7), Trace Elements (6), Methylmercury                 | PAHs (16), Trace Elements (9)  | 10 g       |
| 1946  | Lake Superior Fish Tissue                                    | PCBs (30), Pesticides (15) Fat and Fatty Acids (14), Total Mercury, Methylmercury, Arsenic, Iron | PCBs (12), Pesticides (2), Fatty Acids (12), Proximates, Caloric Content, Trace Elements (9) | 5 × 7–9 g  |
| 1945  | Organics in Whale Blubber (Frozen)                           | PCBs (27), Pesticides (15)   | PCBs (2), Pesticides (2)   | 2 × 10 g   |
| 1588b | Organics in Cod Liver Oil                                    | PCBs (27), Pesticides (15) Fatty Acids (14)  | PCDDs/PCDFs (7), PCBs (47), Pesticides (3), Fatty Acids (6) PBDEs (6), Toxaphene (3)         | 4 × 1.2 mL |
| 1577b | Bovine Liver   | 18 Elements  | —  | 50 g       |
| 1515  | Apple Leaves   | Elements (24)  | —  | 50 g       |
| 1547  | Peach Leaves   | Elements (24)  | —  | 50 g       |
| 1570a | Trace Elements in Spinach Leaves                             | Elements (18)  | Elements (5), Proximates   | 60 g       |
| 1573a | Tomato Leaves  | Elements (21)  | —  | 50 g       |
| 1575a | Trace Elements in Pine Needles                               | Elements (12)  | Elements (11)  | 50 g       |

## SOILS, SEDIMENTS, PARTICULATES AND WATER

For more information, see Table 111.7 Soils, Sediments and Sludges on our website [www.nist.gov/srm](http://www.nist.gov/srm)

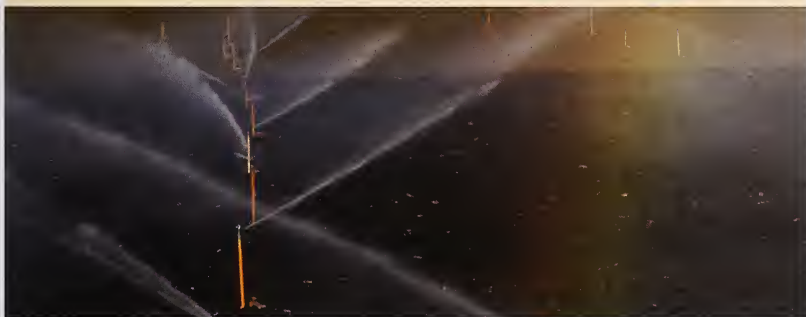


| SRM     | Description   | Certified Constituents                                     | Reference Constituents  | Unit Size |
|---------|---|--|---|-----------|
| 1640    | Natural Water   | Elements (17)  | Elements (10)   | 250 mL    |
| 1643e   | Trace Elements in Water   | —  | Elements (29)   | 250 mL    |
| 2586    | Trace Elements in Soil Containing Lead from Paint (Nominal 500 mg/kg Lead)  | Elements (4)   | Elements (18)   | 55 g      |
| 2587    | Trace Elements in Soil Containing Lead from Paint (Nominal 3000 mg/kg Lead) | Elements (4)   | Elements (14)   | 55 g      |
| 2709    | San Joaquin Soil  | Elements (27)  | Elements (22)   | 50 g      |
| 2710    | Montana Soil Highly Elevated Trace Element Concentrations                   | Elements (22)  | Elements (26)   | 50 g      |
| 2711    | Montana Soil Moderately Elevated Trace Element Concentrations               | Elements (25)  | Elements (26)   | 50 g      |
| 2780    | Hard Rock Mine Waste  | Elements (12)  | Elements (7)  | 50 g      |
| 2781    | Domestic Sludge   | Elements (10)  | Elements (11)   | 40 g      |
| 2782    | Industrial Sludge   | Elements (10)  | Elements (16)   | 70 g      |
| 1646a   | Estuarine Sediment  | Elements (19)  | Elements (20)   | 70 g      |
| 1939a   | PCB (Congeners) in River Sediment   | PCBs (20)<br>Pesticides (3)                                | PCBs (4)  | 50 g      |
| 1941b   | Organics in Marine Sediment   | PAHs (24),<br>PCBs (29),<br>Pesticides (7)                 | PAHs (44),<br>PCBs (13),<br>Pesticides (2), TOC   | 50 g      |
| 1944    | NY/NJ Waterway Sediment   | PAHs (24),<br>PCBs (35),<br>Pesticides (4)<br>Elements (9) | PAHs (32)<br>Pesticides (7),<br>Elements (19),<br>PCDDs/PCDFs (17),<br>TOC, percent extractable,<br>particle-size characteristics | 50 g      |
| 2702    | Inorganics in Marine Sediment   | Elements (25)  | Elements (8)  | 50 g      |
| 2703    | Sediment for Solid Sampling (Small Sample) Analytical Techniques            | Elements (22)  | Elements (7)  | 5 g       |
| RM 8704 | Buffalo River Sediment  |  | Elements (25)   | 50 g      |



## SOILS, SEDIMENTS, PARTICULATES AND WATER (continued)

| SRM     | Description   | Certified Constituents                                      | Reference Constituents  | Unit Size                       |
|---------|---|---|---|---------------------------------|
| 1597a   | Complex Mixture of PAHs from Coal Tar                         | PAHs (34)   | PAHs (36)   | 3 x 1.3 mL                      |
| 1648    | Urban Particulate Matter                                      | Elements (15)   | Elements (21)   | 2 g                             |
| 1649a   | Urban Dust  | PAHs (22),<br>PCBs (35),<br>Pesticides (8),<br>Total carbon | PAHs (22),<br>Pesticides (1),<br>PCDDs/PCDFs (17),<br>Elements (32),<br>Mutagenic activity,<br>Particle-size characteristics,<br>Chemical & isotopic carbon | 2.5g                            |
| 2783    | Air Particulate on Filter Media                               | Elements (18)   | Elements (9)  | 2 loaded and<br>2 blank filters |
| 1650b   | Diesel Particulate Matter                                     | PAHs (31),<br>nitro-PAHs (6)                                | PAHs (20),<br>nitro-PAHs (16),<br>Particle-size distribution  | 200 mg                          |
| 1975    | Diesel Particulate Extract                                    | PAHs(8)   | PAHs (23),<br>nitro-PAHs (18),<br>mutagenicity  | 4 x 1.2 mL                      |
| 2975    | Diesel Particulate Matter (Industrial Forklift)               | PAHs (11)   | PAHs (28)<br>Particle-size distribution,<br>Total extractable mass  | 1 g                             |
| 2583    | Trace Elements in Indoor Dust (nominal 90 mg/kg lead)         | Elements (5)  | —   | 8 g                             |
| 2584    | Trace Elements in Indoor Dust (nominal 1 % lead)              | Elements (5)  | Elements (10)   | 8 g                             |
| 2585    | Organic Contaminants in House Dust                            | PAHs (33),<br>PCBs (30),<br>Pesticides (4),<br>PBDEs (15)   | PAHs (33)<br>PCBs (12),<br>Pesticides (10),<br>PBDEs (12)   | 10 g                            |
| RM 8785 | Air Particulate Matter on Filter Media for Carbon Composition | —   | 2   | 3 filters                       |
| RM 8786 | Blank Filter for RM 8785                                      | —   | —   | 1 blank filter                  |



## GEOLOGICAL MATERIALS AND ORES

### Ores

| SRM  | Description               | Certified Constituents | Reference Constituents | Unit Size (g) |
|------|---------------------------|------------------------|------------------------|---------------|
| 699  | Alumina (Reduction Grade) | 13                     | —                      | 60            |
| 69b  | Bauxite, Arkansas         | 15                     | 3                      | 60            |
| 697  | Bauxite, Dominican        | 15                     | —                      | 60            |
| 698  | Bauxite, Jamaican         | 15                     | —                      | 60            |
| 696  | Bauxite, Surinam          | 15                     | 3                      | 60            |
| 1835 | Borate Ore                | 15                     | 15                     | 60            |
| 330  | Copper Ore Mill Heads     | 3                      | —                      | 100           |
| 331a | Copper Ore Mill Tails     | 3                      | —                      | 100           |
| 79a  | Fluorspar, Customs Grade  | 1                      | —                      | 120           |
| 180  | Fluorspar, High Grade     | 1                      | —                      | 120           |
| 886  | Gold Ore, Refractory      | 2                      | 10                     | 200           |
| 670  | Iron Ore, Canada          | 6                      | —                      | 90            |
| 690  | Iron Ore, Canada          | 11                     | —                      | 100           |
| 692  | Iron Ore, Labrador        | 11                     | —                      | 100           |
| 693  | Iron Ore, Nimba           | 11                     | —                      | 100           |
| 691  | Iron Oxide, Reduced       | 9                      | —                      | 100           |
| 182  | Lithium Ore (Petalite)    | 1                      | —                      | 45            |
| 181  | Lithium Ore (Spodumene)   | 1                      | —                      | 45            |
| 183  | Lithium Ore (Lepidolite)  | 1                      | —                      | 45            |
| 25d  | Manganese Ore             | 8                      | —                      | 60            |
| 120c | Phosphate Rock, Florida   | 8                      | 10                     | 90            |
| 694  | Phosphate Rock, Western   | 13                     | —                      | 90            |
| 600  | Rutile Ore                | 16                     | —                      | 90            |
| 2430 | Scheelite Ore             | 6                      | —                      | 100           |
| 277  | Tungsten Concentrate      | 1                      | —                      | 45            |
| 113b | Zinc Concentrate          | 10                     | —                      | 100           |

### Ore Bioleaching Substrate

This RM is for use as a bioleaching substrate and for testing bioleaching rates.

| RM   | Description | Reference Constituents | Unit Size (g) |
|------|-------------|------------------------|---------------|
| 8455 | Pyrite Ore  | Rate of bioleaching    | 100           |



## Clays

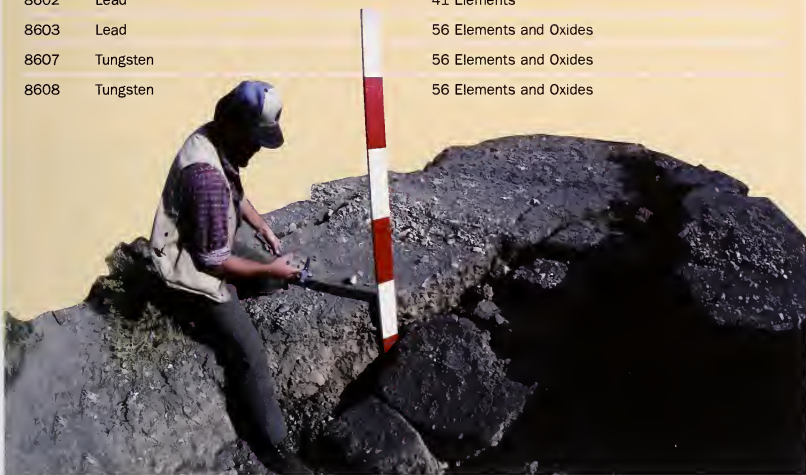
| SRM | Description  | Certified Constituents | Unit Size (g) |
|-----|--------------|------------------------|---------------|
| 679 | Brick Clay   | 12                     | 75            |
| 97b | Flint Clay   | 12                     | 60            |
| 98b | Plastic Clay | 12                     | 60            |

## Chinese Ores

Unit Size: 100 g

These RMs are a well characterized series of skarn deposit ores developed and certified by the Hubei Geological Research Laboratory, Hubei Province, China.

| RM   | Description | Reference Constituents |
|------|-------------|------------------------|
| 8602 | Lead        | 41 Elements            |
| 8603 | Lead        | 56 Elements and Oxides |
| 8607 | Tungsten    | 56 Elements and Oxides |
| 8608 | Tungsten    | 56 Elements and Oxides |



## Rocks and Minerals

| SRM  | Description               | Certified Constituents | Reference Constituents | Unit Size (g) |
|------|---------------------------|------------------------|------------------------|---------------|
| 688  | Basalt Rock               | 14                     | —                      | 60            |
| 70a  | Feldspar, Potash          | 10                     | —                      | 40            |
| 99a  | Feldspar, Soda            | 11                     | —                      | 40            |
| 81a  | Glass Sand                | 5                      | —                      | 75            |
| 165a | Glass Sand (Low Iron)     | 4                      | —                      | 75            |
| 1413 | Glass Sand (High Alumina) | 9                      | —                      | 75            |
| 1d   | Limestone, Argillaceous   | 12                     | 5                      | 70            |
| 88b  | Limestone, Dolomite       | 11                     | —                      | 75            |
| 278  | Obsidian Rock             | 18                     | —                      | 35            |

## Refractories

| SRM  | Description   | Certified Constituents | Unit Size (g) |
|------|---|------------------------|---------------|
| 76a  | Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -40 %) | 12                     | 75            |
| 77a  | Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -60 %) | 12                     | 75            |
| 78a  | Burnt Refractory (Al <sub>2</sub> O <sub>3</sub> -70 %) | 12                     | 75            |
| 198  | Silica Brick  | 12                     | 45            |
| 199  | Silica Brick  | 12                     | 45            |
| 154c | Titanium Dioxide  | 1                      | 90            |

## MICROANALYSIS

### Elements in Metals

| SRM  | Description   | Certified Constituents | Unit Size (g) |
|------|---|------------------------|---------------|
| 482  | Gold-Copper Wires for Microprobe Analysis                   | 2                      | wires: 6      |
| 481  | Gold-Silver Wires for Microprobe Analysis                   | 2                      | wires: 6      |
| 480  | Tungsten-20 % Molybdenum Alloy Electron Microprobe Standard | 2                      | rod:1         |
| 2061 | Ti-Al Alloy for Microanalysis                               | —                      | —             |
| 2062 | Ti-Al Alloy for Microanalysis                               | —                      | —             |

### Elements in Synthetic Glasses

| SRM  | Description  | Certified Constituents   | Unit Size (g)             |
|------|--|--------------------------|---------------------------|
| 1873 | Barium-Zinc Silicate Glasses for Microanalysis (K-458, K-489, K-963) | 2                        | rod: 2 mm × 2 mm × 20 mm  |
| 2066 | Glass Microspheres (K-411)   | 4 certified: 1 reference | glass microspheres: 50 mg |
| 1872 | Lead-Germanate Glasses for Microanalysis (K-453, K-491, K-968)       | 2                        | rod: 2 mm × 2 mm × 20 mm  |



## FOSSIL FUELS AND RELATED MATERIALS

| SRM     | Description/Pb Concentration  | Certified Constituents | Reference Constituents | Unit Size  |
|---------|---|------------------------|------------------------|------------|
| 1634c   | Trace Elements in Fuel Oil "No. 6"<br>(As, Co, Ni, Pb, S, Se, V)                  | 5                      | —                      | 100 mL     |
| 2713    | Lead in Reference Fuels (19.4 µg/g Pb)  | 1                      | —                      | 6 × 20 mL  |
| 2714    | Lead in Reference Fuels (28.1 µg/g Pb)  | 1                      | —                      | 6 × 20 mL  |
| RM 8505 | Vanadium in Crude Oil   | —                      | 1                      | 250 mL     |
| RM 8590 | High Sulfur Gas Oil Feed  | —                      | 1                      | 946 mL     |
| 1580    | Organics in Shale Oil   | 9                      | —                      | 5 × 1.2 mL |
| 1632c   | Trace Elements in Coal (Bituminous)   | 15                     | 26                     | 50 g       |
| 1635    | Trace Elements in Coal (Subbituminous)  | 16                     | —                      | 75 g       |
| 1633b   | Trace Elements in Coal Fly Ash  | 23                     | —                      | 75 g       |
| 2689    | Coal Fly Ash  | 13                     | 19                     | 3 × 10 g   |
| 2690    | Coal Fly Ash  | 13                     | 19                     | 3 × 10 g   |
| 2691    | Coal Fly Ash  | 13                     | 19                     | 3 × 10 g   |
| 2718    | Green Petroleum Coke  | 6                      | 2                      | 50 g       |
| 2719    | Calcined Petroleum Coke   | 6                      | 2                      | 50 g       |
| 2775    | Foundry Coke  | 1                      | 2                      | 50 g       |
| 2776    | Furnace Coke  | 1                      | 2                      | 50 g       |
| 1829    | Alcohols in Reference Fuel  | 4                      | —                      | 6 × 20 mL  |
| 1837    | Methanol (9 volume percent) and t-Butanol<br>(6 volume percent) in Reference Fuel | 2                      | —                      | 5 × 20 mL  |



### High Purity Liquids for Fuel Rating

Unit Size: 100 mL

| SRM   | Description                        | Purity (%) |
|-------|------------------------------------|------------|
| 1816a | Isooctane (2,2,4-Trimethylpentane) | 99.987     |
| 1815a | n-Heptane                          | 99.987     |



# FOSSIL FUELS AND RELATED MATERIALS (continued)

| SRM/RM  | Description/Pb Concentration   | Certified Constituents | Reference Constituents | Unit Size  |
|---------|--|------------------------|------------------------|------------|
| 1838    | Ethanol (10 volume percent) in Reference Fuel                                  | 1                      | —                      | 5 × 20 mL  |
| 1839    | Methanol (0.3 volume percent) in Reference Fuel                                | 1                      | —                      | 5 × 20 mL  |
| 2286    | Ethanol in Reference Gasoline (Nominal 2.0 weight percent oxygen)              | 2                      | —                      | 3 × 20 mL  |
| 2287    | Ethanol in Reference Gasoline (Nominal 3.5 weight percent oxygen)              | 2                      | —                      | 3 × 20 mL  |
| 2288    | t-Amyl Methyl Ether in Reference Gasoline (Nominal 2.0 weight percent oxygen)  | 2                      | —                      | 3 × 20 mL  |
| 2289    | t-Amyl Methyl Ether in Reference Gasoline (Nominal 2.7 weight percent oxygen)  | 2                      | —                      | 3 × 20 mL  |
| 2290    | Ethyl t-Butyl Ether in Reference Gasoline (Nominal 2.0 weight percent oxygen)  | 2                      | —                      | 3 × 20 mL  |
| 2291    | Ethyl t-Butyl Ether in Reference Gasoline (Nominal 2.7 weight percent oxygen)  | 2                      | —                      | 3 × 20 mL  |
| 2292    | Methyl t-Butyl Ether in Reference Gasoline (Nominal 2.0 weight percent oxygen) | 2                      | —                      | 3 × 20 mL  |
| 2293    | Methyl t-Butyl Ether in Reference Gasoline (Nominal 2.7 weight percent oxygen) | 2                      | —                      | 3 × 20 mL  |
| 2294    | Reformulated Gasoline (11 % MTBE)  | 4                      | 26                     | 2 × 20 mL  |
| 2295    | Reformulated Gasoline (15 % MTBE)  | 4                      | 26                     | 2 × 20 mL  |
| 2296    | Reformulated Gasoline (13 % ETBE)  | 4                      | 26                     | 2 × 20 mL  |
| 2297    | Reformulated Gasoline (10 % Ethanol)   | 4                      | 26                     | 2 × 20 mL  |
| 2890    | Water Saturated 1-Octanol  | 1                      | —                      | 5 × 2 mL   |
| RM8506a | Water in Transformer Oil   | —                      | 1                      | 5 × 9.5 mL |
| RM8507  | Moisture in Mineral Oil  | —                      | 1                      | 10 mL      |
| RM8509  | Moisture in Methanol (93 mg/kg)  | —                      | 1                      | 5 mL       |
| RM8510  | Moisture in Methanol (325 mg/kg)   | —                      | 1                      | 5 mL       |
| 2285    | Arson Test Mixture in Methylene Chloride                                       | 15                     | —                      | 5 × 1.2 mL |





## Materials for Sulfur and Mercury

| SRM/RM | Description                                  | %S          | Hg (µg/kg) | Unit Size  |
|--------|--|-------------|------------|------------|
| 1616b  | Sulfur in Kerosine                           | 0.01462     | —          | 100 mL     |
| 1617a  | Sulfur in Kerosine                           | 0.17307     | —          | 100 mL     |
| 1619b  | Sulfur in Residual Fuel Oil                  | 0.6960      | —          | 100 mL     |
| 1620c  | Sulfur in Residual Fuel Oil                  | 4.561       | —          | 100 mL     |
| 1621e  | Sulfur in Residual Fuel Oil                  | 0.9480      | —          | 100 mL     |
| 1622e  | Sulfur in Residual Fuel Oil                  | 2.1468      | —          | 100 mL     |
| 1623c  | Sulfur in Residual Fuel Oil                  | 0.3806      | —          | 100 mL     |
| 1624d  | Sulfur in Diesel Fuel Oil                    | 0.3882      | —          | 10 × 10 mL |
| 1632c  | Trace Elements in Coal Bituminous            | 1.462       | 93.8       | 50 g       |
| 1635   | Trace Elements in Coal (Subbituminous)       | 0.3616      | 10.9       | 75 g       |
| 2294   | Reformulated Gasoline (nominal 11 % MTBE)    | 0.00409     | —          | 2 × 20 mL  |
| 2295   | Reformulated Gasoline (nominal 15 % MTBE)    | 0.0308      | —          | 2 × 20 mL  |
| 2296   | Reformulated Gasoline (nominal 13 % ETBE)    | 0.00400     | —          | 2 × 20 mL  |
| 2297   | Reformulated Gasoline (nominal 10 % Ethanol) | 0.03037     | —          | 2 × 20 mL  |
| 2298   | Reformulated Gasoline                        | 0.00047     | —          | 5 × 20 mL  |
| 2299   | Gasoline (High Octane)                       | 0.00136     | —          | 5 × 20 mL  |
| 2682b  | Sulfur and Mercury in Coal (Subbituminous)   | 0.4917      | 108.8      | 50 g       |
| 2683b  | Sulfur and Mercury in Coal                   | 1.955       | 90.0       | 50 g       |
| 2684b  | Sulfur and Mercury in Coal                   | 3.076       | 97.4       | 50 g       |
| 2685b  | Sulfur and Mercury in Coal                   | 4.730       | 146.2      | 50 g       |
| 2692b  | Sulfur and Mercury in Coal                   | 1.170       | 133.3      | 50 g       |
| 2693   | Sulfur and Mercury in Coal                   | 0.4571      | 37.3       | 50 g       |
| 2717a  | Sulfur in Residual Fuel Oil                  | 2.9957      | —          | 100 mL     |
| 2718   | Trace Elements in Green Petroleum Coke       | 4.7032      | —          | 50 g       |
| 2719   | Trace Elements in Calcined Petroleum Coke    | 0.8877      | —          | 50 g       |
| 2721   | Crude Oil                                    | 1.5832      | 0.0417     | 5 × 10 mL  |
| 2722   | Crude Oil                                    | 0.21037     | 0.1292     | 5 × 10 mL  |
| 2723a  | Sulfur in Diesel Fuel Oil                    | 0.00110     | —          | 10 × 10 mL |
| 2724b  | Sulfur in Diesel Fuel Oil                    | 0.0425      | —          | 10 × 10 mL |
| 2770   | Sulfur in Diesel Fuel Oil                    | 0.004157    | —          | 10 × 10 mL |
| 2775   | Foundry Coke                                 | 0.5816      | —          | 50 g       |
| 2776   | Furnace Coke                                 | 0.825       | —          | 50 g       |
| RM8771 | Sulfur in Diesel Blend                       | 0.071 mg/kg | —          | 100 mL     |

## GASES

| SRM   | Nominal Amount-of-Substance ( $\mu\text{mol/mol}$ ) |
|---|---|
| <i>Ambient Non-Methane Organics in Nitrogen<br/>(15 components in large cylinder)</i> |   |
| 1800b   | 5 nmol/mol  |
| <i>Volatile Organics in Nitrogen<br/>(30 components)</i>                              |   |
| 1804c   | 5 nmol/mol  |
| <i>Carbon Dioxide in Air<br/>(Certified for <math>\text{CO}_2</math>)</i>             |   |
| 1676  | 365   |
| <i>Carbon Monoxide in Air<br/>(Certified for CO)</i>                                  |   |
| 2612a   | 10  |
| 2613a   | 20  |
| 2614a   | 45  |





## GASES (continued)

**SRM**  
( $\mu\text{mol/mol}$ )

**Nominal Amount of  
Substance Fraction**

**Carbon Dioxide in Nitrogen  
(Certified for  $\text{CO}_2$ )**

|        |           |
|--------|-----------|
| 1674b* | 7 mol %   |
| 1675b* | 14 mol %  |
| 2619a  | 0.5 mol % |
| 2620a  | 1.0 mol % |
| 2621a  | 1.5 mol % |
| 2622a  | 2.0 mol % |
| 2623a  | 2.5 mol % |
| 2624a  | 3.0 mol % |
| 2625a* | 3.5 mol % |
| 2626a  | 4.0 mol % |
| 2745*  | 16 mol %  |

**Carbon Monoxide in Nitrogen  
(Certified for CO)**

|        |         |
|--------|---------|
| 1677c* | 10      |
| 1678c* | 50      |
| 1679c* | 100     |
| 1680b* | 500     |
| 1681b* | 1000    |
| 2635a* | 25      |
| 2636a* | 250     |
| 2637a* | 2500    |
| 2638a* | 5000    |
| 2639a  | 1 mol % |
| 2640a  | 2 mol % |
| 2641a  | 4 mol % |
| 2642a* | 8 mol % |



ENVIRONMENTAL

\*Available as a NIST Traceable Reference Material (NTRM); from commercial suppliers. A suppliers list is available on our website.

# GASES (continued)

| SRM  | Nominal Amount of Substance Fraction ( $\mu\text{mol/mol}$ ) |
|--|--|
| <b>Carbon Monoxide in Nitrogen</b><br>(Certified for CO) <i>continued</i>    |  |
| 2740a  | 10 mol %   |
| 2741a  | 13 mol %   |
| <b>Hydrogen Sulfide in Nitrogen</b><br>(Certified for $\text{H}_2\text{S}$ ) |  |
| 2730   | 5  |
| 2731   | 20   |
| <b>Methane in Air</b><br>(Certified for $\text{CH}_4$ )                      |  |
| 1658a  | 1  |
| 1659a  | 10   |
| 1660a (also certified for $\text{C}_3\text{H}_8$ )                           | 4 (methane)<br>1 (propane)                                   |
| 2750   | 50   |
| 2751   | 100  |
| <b>Nitric Oxide in Nitrogen</b><br>(Certified for NO)                        |  |
| 1683b*   | 50   |
| 1684b*   | 100  |
| 1685b*   | 250  |
| 1686b*   | 500  |
| 1687b*   | 1000   |
| 2629a*   | 20   |
| 2630*  | 1500   |
| 2631a*   | 3000   |
| 2735   | 800  |

\*Available as a NIST Traceable Reference Material (NTRM); from commercial suppliers. A suppliers list is available on our website.





## GASES (continued)

| SRM | Nominal Amount of Substance<br>Fraction ( $\mu\text{mol/mol}$ ) |
|-----|---|
|-----|---|

**Nitric Oxide in Nitrogen  
(Certified for NO)**

|       |      |
|-------|------|
| 2736a | 2000 |
| 2737  | 0.5  |
| 2738  | 1.0  |

**Oxygen in Nitrogen (Certified for O<sub>2</sub>)**

|        |          |
|--------|----------|
| 2657a* | 2 mol %  |
| 2658a* | 10 mol % |
| 2659a* | 21 mol % |

**Propane in Air (Certified for CH<sub>4</sub>)**

|  |                            |
|--|----------------------------|
| 1660a<br>(also certified for C <sub>3</sub> H <sub>8</sub> ) | 4 (methane)<br>1 (propane) |
| 1665b  | 3                          |
| 1666b  | 10                         |
| 1667b  | 50                         |
| 1668b*   | 100                        |
| 1669b  | 500                        |
| 2764   | 0.25                       |

**Propane in Nitrogen (Certified for C<sub>3</sub>H<sub>8</sub>)**

|       |      |
|-------|------|
| 2644a | 250  |
| 2646a | 1000 |
| 2647a | 2500 |
| 2648a | 5000 |

**Oxides of Nitrogen in Air (Certified for NO<sub>2</sub>)**

|        |     |
|--------|-----|
| 2660a* | 100 |
|--------|-----|

\*Available as a NIST Traceable Reference Material (NTRM); from commercial suppliers.  
A suppliers list is available on our website.

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.

## GASES (continued)

| SRM  | Nominal Amount of Substance Fraction ( $\mu\text{mol/mol}$ ) |
|--|--|
| <b>Sulfur Dioxide in Nitrogen (Certified for <math>\text{SO}_2</math>)</b> |  |
| 1661a*   | 500  |
| 1662a*   | 1000   |
| 1663a*   | 1500   |
| 1664a*   | 2500   |
| 1693a*   | 50   |
| 1694a*   | 100  |
| 1696a*   | 3500   |

\*Available as a NIST Traceable Reference Material (NTRM); from commercial suppliers. A suppliers list is available on our website.

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.

## INDUSTRIAL HYGIENE

### Materials on Filter Media

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



| SRM/RM | Description                   | Set Size                 | Elemental Composition                     | Diameter (mm) | Pore Size ( $\mu\text{m}$ ) |
|--------|-------------------------------|--------------------------|---|---------------|-----------------------------|
| 2783   | Air Particulate on Filter     | 2 filters, plus 2 blanks | 18 certified values<br>9 reference values | 47            | 0.4                         |
| 8785   | Particulate Matter on Filters | 3 filters                | 1 reference value<br>2 information values | 37            | —                           |
| 8786   | Filter Blank for RM 8785      | 2 filters,               | 1 blank filter                            | 37            | —                           |



## Trace Constituent Elements in Blank Filters

SRMs 2678 and 2681 are for use in evaluating the performance of air sampling filter methods with either certified values (in  $\mu\text{g}$ ) or limits of detection ( $X_{\text{LOD}}$ ) for each of 30 constituent elements, as well as six leachable anions and cations.

| SRM  | Description                | Diameter (mm) | Pore Size ( $\mu\text{m}$ ) | Filter Weight (g) |
|------|----------------------------|---------------|-----------------------------|-------------------|
| 2678 | Cellulose Acetate Membrane | 47            | 0.45                        | 0.09              |
| 2681 | Ashless Blank Filter       | 42.5          | —                           | 0.14              |

## Respirable Silica

These SRMs are intended for use in determining, by X-ray diffraction, the levels of respirable silica in an industrial atmosphere according to the National Institute for Occupational Safety and Health (NIOSH) Analytical Method 7500 or equivalent methods.

| SRM   | Description                                   | Mass Fraction/Mass Loading                              | Unit Size            |
|-------|---|---|----------------------|
| 1878a | Respirable Alpha Quartz                       | 100.00% $\pm$ 0.21%                                     | 5 g                  |
| 1879a | Respirable Cristobalite                       | 95.6% $\pm$ 0.4%  | 5 g                  |
| 2950  | Respirable Alpha Quartz on Filter Media       | (10, 20, 50, 100, 250, 500) $\mu\text{g}/\text{filter}$ | set SRMs 2952-57     |
| 2951  | Respirable Alpha Quartz on Filter Media       | 5 $\mu\text{g}/\text{filter}$                           | 5 filters (5 blanks) |
| 2952  | Respirable Alpha Quartz on Filter Media       | 10 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2953  | Respirable Alpha Quartz on Filter Media       | 20 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2954  | Respirable Alpha Quartz on Filter Media       | 50 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2955  | Respirable Alpha Quartz on Filter Media       | 100 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |
| 2956  | Respirable Alpha Quartz on Filter Media       | 250 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |
| 2957  | Respirable Alpha Quartz on Filter Media       | 500 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |
| 2958  | Respirable Alpha Quartz on Filter Media       | 1000 $\mu\text{g}/\text{filter}$                        | 5 filters (5 blanks) |
| 2960  | Respirable Alpha Cristobalite on Filter Media | (5, 10, 20, 50, 100, 250) $\mu\text{g}/\text{filter}$   | set SRMs 2961-66     |
| 2961  | Respirable Alpha Cristobalite on Filter Media | 5 $\mu\text{g}/\text{filter}$                           | 5 filters (5 blanks) |
| 2962  | Respirable Alpha Cristobalite on Filter Media | 10 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2963  | Respirable Alpha Cristobalite on Filter Media | 20 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2964  | Respirable Alpha Cristobalite on Filter Media | 50 $\mu\text{g}/\text{filter}$                          | 5 filters (5 blanks) |
| 2965  | Respirable Alpha Cristobalite on Filter Media | 100 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |
| 2966  | Respirable Alpha Cristobalite on Filter Media | 250 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |
| 2967  | Respirable Alpha Cristobalite on Filter Media | 500 $\mu\text{g}/\text{filter}$                         | 5 filters (5 blanks) |

## Lead in Paint, Dust, and Soil

These SRMs and RM have been developed in conjunction with the U.S. EPA to monitor paint, dust, and soil sources of lead.

| SRM  | Lead Concentration               | Unit Size                          |
|--|----------------------------------|------------------------------------|
| <b>Paint Film</b>  |                                  |                                    |
| 2570   | <0.001 mg/cm <sup>2</sup>        | 1 blank film                       |
| 2571   | 3.58 mg/cm <sup>2</sup>          | 1 film, plus 1 blank               |
| 2572   | 1.527 mg/cm <sup>2</sup>         | 1 film, plus 1 blank               |
| 2573   | 1.040 mg/cm <sup>2</sup>         | 1 film, plus 1 blank               |
| 2574   | 0.714 mg/cm <sup>2</sup>         | 1 film, plus 1 blank               |
| 2575   | 0.307 mg/cm <sup>2</sup>         | 1 film, plus 1 blank               |
| 2576 (High Level)  | 5.59 mg/cm <sup>2</sup>          | 1 film, plus 1 blank               |
| 2579a (Set of 6: SRMs 2570 to 2575)                        | 0.307 to 3.58 mg/cm <sup>2</sup> | 5 films, plus 1 blank              |
| <b>Powdered Paint</b>                                      |                                  |                                    |
| 2580   | 4.34 %                           | 30 g                               |
| 2581   | 0.449 %                          | 35 g                               |
| 2582   | 209.8 mg/kg                      | 20 g                               |
| 2589   | 9.99 %                           | 35 g                               |
| <b>Indoor Dust, Trace Elements in (As, Cd, Cr, Hg, Pb)</b> |                                  |                                    |
| 2583   | 85.9 mg/kg                       | 8 g                                |
| 2584   | 9761 mg/kg                       | 8 g                                |
| <b>Soil, Trace Elements in</b>                             |                                  |                                    |
| 2586   | 432 mg/kg                        | 50 g                               |
| 2587   | 3242 mg/kg                       | 50 g                               |
| <b>Paint on Fiberboard</b>                                 |                                  |                                    |
| RM 8680  | 1 to 2 mg/cm <sup>2</sup>        | 1 sheet:<br>(10.2 × 15.2 × 1.3) cm |



## Asbestos

| SRM     | Description                    | Asbestos Type   | Unit Size                   |
|---------|--------------------------------|---|-----------------------------|
| 1866b   | Common Commercial Asbestos     | chrysotile<br>grunerite (Amosite)<br>riebeckite (Crocidolite) | 3 × 4 g                     |
| 1867a   | Uncommon Commercial Asbestos   | anthophyllite<br>tremolite<br>actinolite                      | set (3)                     |
| 1876b   | Chrysotile Asbestos for TEM    | —   | 10 sections:<br>3 mm × 3 mm |
| RM 8411 | Mixed Asbestos Research Filter | chrysotile asbestos<br>grunerite (Amosite)                    | 1 cm <sup>2</sup>           |



## Zeolites (powder form)

| RM   | Type           | Unit Size (in g) | Na     | Al     | Si**  | Si***  | LOI    | LOF   |
|------|----------------|------------------|--------|--------|-------|--------|--------|-------|
| 8850 | Zeolite Y      | 35 - 40          | 7.225  | 8.49   | 22.52 | 30.336 | 25.679 | 25.37 |
| 8851 | Zeolite A      | 35 - 40          | 12.732 | 14.766 | 15.27 | 19.541 | 21.464 | 22.1  |
| 8852 | Ammonium ZSM-5 | 35 - 40          | -      | 1.396  | 41.18 | 45.19  | 8.5    | 8.47  |

\*See current certificate of analysis for exact assigned values and estimates of uncertainty.

\*\*Value relative to the hydrated sample mass.

\*\*\*Value relative to sample mass ignited at 1000 °C

# HIGH PURITY MATERIALS

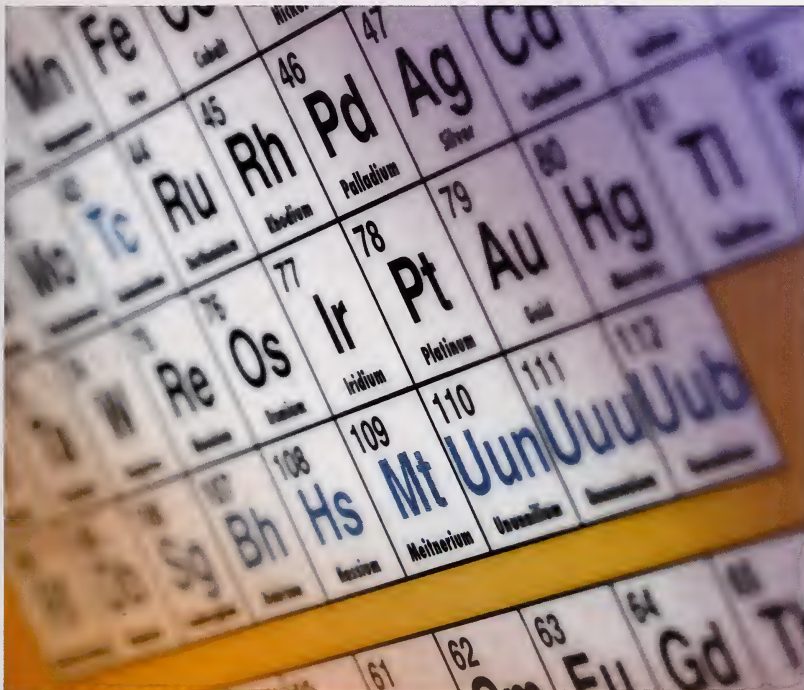
- 45 Elemental Composition  
in High Purity Metals
- 46 Fine Gold Standards
- 46 Stoichiometric Standards
- 47 Microchemistry
- 48 Spectrometric Single  
Element Solutions
- 50 Anion Chromatography Solutions
- 50 Stable Isotopic Materials
- 51 Light Stable Isotopic Materials





## Elemental Composition in High Purity Metals

For more information, see Table 104.1 High Purity Metals on our website [www.nist.gov/srm](http://www.nist.gov/srm)



# HIGH PURITY MATERIALS

| SRM      | Description                   | Unit Size                      |
|----------|-------------------------------|--------------------------------|
| 685R     | High Purity Gold              | rod: 5.9 mm diameter × 25 mm   |
| 685W     | High Purity Gold              | wire: 1.4 mm diameter × 102 mm |
| 680a(L1) | High Purity Platinum          | wire: 0.51 mm diameter × 10 cm |
| 680a(L2) | High Purity Platinum          | wire: 0.51 mm diameter × 1 m   |
| 682      | High Purity Zinc              | semicirc: 57 mm                |
| 885      | Refined Copper                | pin: 200 g                     |
| 726      | Selenium, Intermediate Purity | shot: 450 g                    |
| 683      | Zinc Metal                    | semicirc: 57 mm                |
| 728      | Zinc, Intermediate Purity     | shot: 450 g                    |

### Fine Gold Standards

These RMs are a series of fine gold and gold bullion products developed and certified by the Royal Canadian Mint (RCM), Ottawa, Canada and distributed by NIST. The fine gold RMs are primarily intended for use as calibration standards for the determination of trace elements by solid sample spectrometric methods; the gold bullion RMs are primarily intended for use as quality control check standards for fire assay. There are five sets of RMs in the gold bullion series (RMs 8068-8082) available in three forms: disc (25 mm diameter  $\times$  20 mm); wire (2 mm diameter); and foil (35 mm  $\times$  40 mm  $\times$  1 mm). There are six sets of RMs in the fine gold series (RMs 8050-8067) available in three forms: block (25 mm  $\times$  25 mm  $\times$  2.5 mm); wire (2 mm diameter); and turnings (25 g).

### Stoichiometric Standards

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/RM | Description                     | Certified Use   | Stoichiometric Purity (%)     | Unit Size (g) |
|--------|---------------------------------|---|-------------------------------|---------------|
| 951    | Boric Acid                      | Acidimetric and Boron Isotopic Value                                      | 100.00                        | 100           |
| 84k    | Potassium Hydrogen Phthalate    | Acidimetric Standard  | 99.9911                       | 60            |
| 350a   | Benzoic Acid                    | Acidimetric Standard  | 99.9958                       | 30            |
| 351    | Sodium Carbonate                | Acidimetric Standard  | 99.9796                       | 50            |
| 723d   | Tris(hydroxymethyl)aminomethane | Acidimetric Standard  | 99.924                        | 50            |
| 987    | Strontium Carbonate             | Assay and Isotopic Values   | 99.98                         | 1             |
| 999b   | Potassium Chloride              | Assay Values for:<br>1. Potassium Chloride<br>2. Potassium<br>3. Chloride | 99.9817<br>52.4354<br>47.5463 | 60            |
| 136e   | Potassium Dichromate            | Oxidimetric Standard  | 99.984                        | 60            |
| 17e    | Sucrose                         | Polarimetric Standard   | 99.950                        | 60            |
| 917b   | D-Glucose (Dextrose)            | Polarimetric Standard   | 99.7                          | 50            |
| 8040   | Sodium Oxalate                  | Reductometric Standard  | 99.972                        | 60            |
| 83d    | Arsenic Trioxide                | Reductometric Standard  | 99.9926                       | 60            |

## Microchemistry

Unit Size: 2 g



| SRM  | Description          | Certified Component |
|------|----------------------|---------------------|
| 141d | Acetanilide          | C, H, N, O          |
| 142  | Anisic Acid          | CH <sub>3</sub> O-  |
| 143d | Cystine              | C, H, N, S, O       |
| 148  | Nicotinic Acid       | C, H, N             |
| 2141 | Urea                 | N                   |
| 2142 | o-Bromobenzoic Acid  | Br                  |
| 2143 | p-Fluorobenzoic Acid | F                   |
| 2144 | m-Chlorobenzoic Acid | Cl                  |

HIGH PURITY MATERIALS

## Spectrometric Single Element Solutions

Unit Size: 50 mL

These SRMs are intended as standard solutions for use in calibrating instruments used in atomic spectrometry, including atomic absorption spectrometry, inductively coupled plasma optical spectrometry, and inductively coupled plasma mass spectrometry.

| SRM   | Element    | Nominal Acid Concentration     |
|-------|------------|--------------------------------|
| 3101a | Aluminum   | HNO <sub>3</sub> 10 %          |
| 3102a | Antimony   | HNO <sub>3</sub> 10 % + HF 2 % |
| 3103a | Arsenic    | HNO <sub>3</sub> 15 %          |
| 3104a | Barium     | HNO <sub>3</sub> 1 %           |
| 3105a | Beryllium  | HNO <sub>3</sub> 10 %          |
| 3106  | Bismuth    | HNO <sub>3</sub> 10 %          |
| 3107  | Boron      | H <sub>2</sub> O               |
| 3108  | Cadmium    | HNO <sub>3</sub> 10 %          |
| 3109a | Calcium    | HNO <sub>3</sub> 10 %          |
| 3110  | Cerium     | HNO <sub>3</sub> 10 %          |
| 3111a | Cesium     | HNO <sub>3</sub> 1 %           |
| 3112a | Chromium   | HNO <sub>3</sub> 10 %          |
| 3113  | Cobalt     | HNO <sub>3</sub> 10 %          |
| 3114  | Copper     | HNO <sub>3</sub> 10 %          |
| 3115a | Dysprosium | HNO <sub>3</sub> 10 %          |
| 3116a | Erbium     | HNO <sub>3</sub> 10 %          |
| 3117a | Europium   | HNO <sub>3</sub> 16 %          |
| 3118a | Gadolinium | HNO <sub>3</sub> 10 %          |
| 3119a | Gallium    | HNO <sub>3</sub> 10 %          |
| 3120a | Germanium  | HNO <sub>3</sub> 10 % + HF 2 % |
| 3121  | Gold       | HNO <sub>3</sub> 5 % + HF 2 %  |
| 3122  | Hafnium    | HNO <sub>3</sub> 10% + HF 2%   |
| 3123a | Holmium    | HNO <sub>3</sub> 16 %          |
| 3124a | Indium     | HNO <sub>3</sub> 10 %          |
| 3126a | Iron       | HNO <sub>3</sub> 10 %          |
| 3127a | Lanthanum  | HNO <sub>3</sub> 10 %          |
| 3128  | Lead       | HNO <sub>3</sub> 10 %          |
| 3129a | Lithium    | HNO <sub>3</sub> 1 %           |
| 3130a | Lutetium   | HNO <sub>3</sub> 10 %          |
| 3131a | Magnesium  | HNO <sub>3</sub> 10 %          |
| 3132  | Manganese  | HNO <sub>3</sub> 10 %          |

(continued)



# HIGH PURITY MATERIALS

## Spectrometric Single Element Solutions (continued)

| SRM   | Element      | Nominal Acid Concentration           |
|-------|--------------|--------------------------------------|
| 3133  | Mercury      | HNO <sub>3</sub> 10 %                |
| 3134  | Molybdenum   | HCl 10 %                             |
| 3135a | Neodymium    | HNO <sub>3</sub> 10 %                |
| 3136  | Nickel       | HNO <sub>3</sub> 10 %                |
| 3137  | Niobium      | HNO <sub>3</sub> 10 % + HF 2 %       |
| 3138  | Palladium    | HCl 10 %                             |
| 3139a | Phosphorus   | HNO <sub>3</sub> 0.8 %               |
| 3140  | Platinum     | HCl 10 %                             |
| 3141a | Potassium    | HNO <sub>3</sub> 1 %                 |
| 3142a | Praseodymium | HNO <sub>3</sub> 10 %                |
| 3143  | Rhenium      | HNO <sub>3</sub> 10 %                |
| 3144  | Rhodium      | HCl 10 %                             |
| 3145a | Rubidium     | HNO <sub>3</sub> 1 %                 |
| 3147a | Samarium     | HNO <sub>3</sub> 10 %                |
| 3148a | Scandium     | HNO <sub>3</sub> 10 %                |
| 3149  | Selenium     | HNO <sub>3</sub> 10 %                |
| 3150  | Silicon      | H <sub>2</sub> O                     |
| 3151  | Silver       | HNO <sub>3</sub> 10 %                |
| 3152a | Sodium       | HNO <sub>3</sub> 1 %                 |
| 3153a | Strontium    | HNO <sub>3</sub> 10 %                |
| 3154  | Sulfur       | H <sub>2</sub> SO <sub>4</sub> 0.1 % |
| 3155  | Tantalum     | HNO <sub>3</sub> 10 % + HF 2 %       |
| 3156  | Tellurium    | HCl 20 %                             |
| 3157a | Terbium      | HNO <sub>3</sub> 16 %                |
| 3158  | Thallium     | HNO <sub>3</sub> 10 %                |
| 3159  | Thorium      | HNO <sub>3</sub> 10 %                |
| 3160a | Thulium      | HNO <sub>3</sub> 10 %                |
| 3161a | Tin          | HNO <sub>3</sub> 5 % + HF 2 %        |
| 3162a | Titanium     | HNO <sub>3</sub> 10 % + HF 2 %       |
| 3163  | Tungsten     | HNO <sub>3</sub> 7 % + HF 4 %        |
| 3164  | Uranium      | HNO <sub>3</sub> 10 %                |
| 3165  | Vanadium     | HNO <sub>3</sub> 10 %                |
| 3166a | Ytterbium    | HNO <sub>3</sub> 16 %                |
| 3167a | Yttrium      | HNO <sub>3</sub> 10 %                |
| 3168a | Zinc         | HNO <sub>3</sub> 10 %                |
| 3169  | Zirconium    | HNO <sub>3</sub> 10 % + HF 2 %       |

## Anion Chromatography Solutions

Unit Size: 50 mL

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

| SRM  | Description | Nominal Concentration (mg/kg) |
|------|-------------|-------------------------------|
| 3181 | Sulfate     | 1000                          |
| 3182 | Chloride    | 1000                          |
| 3183 | Fluoride    | 1000                          |
| 3184 | Bromide     | 1000                          |
| 3185 | Nitrate     | 1000                          |
| 3186 | Phosphate   | 1000                          |

## Stable Isotopic Materials

| SRM  | Description   | Chemical Form       | Unit Size (g)         |
|------|---|---------------------|-----------------------|
| 951  | Boron Isotope Standard  | Boric Acid          | 100                   |
| 952  | Enriched $^{10}\text{B}$ Isotope Standard                           | Boric Acid          | 0.25                  |
| 975a | Chlorine Isotope Standard   | Sodium Chloride     | 0.25                  |
| 976  | Copper Isotope Standard   | Metal               | disk: 0.4             |
| 977  | Bromine Isotope Standard  | Sodium Bromide      | 0.25                  |
| 978a | Silver Isotope Standard   | Silver Nitrate      | 0.25                  |
| 979  | Chromium Isotope Standard   | Chromium Nitrate    | 0.25                  |
| 980  | Magnesium Isotope Standard  | Metal               | 0.25                  |
| 981  | Lead Isotope Standard, Natural                                      | Metal               | wire: 1.0             |
| 982  | Lead Isotope Standard, $^{208}\text{Pb}/^{209}\text{Pb}$ Equal Atom | Metal               | wire: 1.0             |
| 983  | Lead Isotope Standard, Radiogenic                                   | Metal               | wire: 1.0             |
| 984  | Rubidium Isotope Standard   | Rubidium Chloride   | 0.25                  |
| 985  | Potassium Isotope Standard  | Potassium Chloride  | 1.0                   |
| 986  | Nickel Isotope Standard   | Metal               | 0.5                   |
| 987  | Strontium Isotope Standard  | Strontium Carbonate | 1.0                   |
| 989  | Rhenium Assay and Isotopic  | Rhenium             | pkg. 50               |
| 990  | Si Assay Isotopic   | Silicon             | —                     |
| 991  | Nitrate Spike Isotope Standard, $^{209}\text{Pb}$                   | Nitric Acid         | 15                    |
| 994  | Gallium Isotope Standard  | Metal               | disk: 0.25            |
| 997  | Thallium Isotope Standard   | Metal               | rod: 0.25             |
| 3230 | Iodine-129, Isotopic (low levels)                                   | Iodine              | 5 × 5 mL (plus blank) |
| 3231 | Iodine-129, Isotopic (high levels)                                  | Iodine              | 5 × 5 mL (plus blank) |



## Light Stable Isotopic Materials

These RMs 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*.

### Isotopic Ratio Legend:

- |                                      |  |
|--------------------------------------|--|
| 1. D / H                             | 5. $^{28}\text{Si}$ / $^{29}\text{Si}$ |
| 2. $^{18}\text{O}$ / $^{16}\text{O}$ | 6. $^{15}\text{N}$ / $^{14}\text{N}$   |
| 3. $^{13}\text{C}$ / $^{12}\text{C}$ | 7. $^{34}\text{S}$ / $^{32}\text{S}$   |
| 4. $^6\text{Li}$ / $^7\text{Li}$     |  |

| RM   | Description                                      | Isotopic Ratios | Unit Size                              |
|------|--|-----------------|--|
| 8535 | VSMOW-Water                                      | 1,2             | 20 mL                                  |
| 8536 | GISP-Water                                       | 1,2             | 20 mL                                  |
| 8537 | SLAP-Water                                       | 1,2             | 20 mL                                  |
| 8538 | NBS30-Biotite                                    | 1,2,3           | 2 g                                    |
| 8539 | NBS22-Oil  | 1,2,3           | 1 mL                                   |
| 8540 | PEFI-Polyethylene                                | 1,2,3           | ~2 mg                                  |
| 8541 | USGS24-Graphite                                  | 1,2,3           | 0.8 g                                  |
| 8542 | Sucrose ANU-Sucrose                              | 1,2,3           | 1 g                                    |
| 8543 | NBS18-Carbonatite                                | 2,3             | 0.4 g                                  |
| 8544 | NBS18-Limestone                                  | 2,3             | 0.4 g                                  |
| 8545 | LSVEC-Lithium Carbonate                          | 3,4             | 0.4 g                                  |
| 8546 | NBS28-Silica Sand (Optical)                      | 2,5             | 0.4 g                                  |
| 8547 | IAEA-N1-Ammonium Sulfate                         | 6               | 0.4 g                                  |
| 8548 | IAEA-N2-Ammonium Sulfate                         | 6               | 0.4 g                                  |
| 8549 | IAEA-N3-Potassium Nitrate                        | 6               | 0.4 g                                  |
| 8550 | USGS25-Ammonium Sulfate                          | 6               | 0.4 g                                  |
| 8551 | USGS26-Ammonium Sulfate                          | 6               | 0.4 g                                  |
| 8552 | NSVEC-Gaseous Nitrogen                           | 6               | 300 $\mu\text{mol}$                    |
| 8553 | Soufre de Lacq - Elemental Sulfur                | 2,7             | 0.5 g                                  |
| 8554 | IAEA-S1-Silver Sulfide                           | 2,7             | 0.5 g                                  |
| 8555 | IAEA-S2-Silver Sulfide                           | 2,7             | 0.5 g                                  |
| 8556 | NBS123-Sphalerite                                | 2,7             | 0.5 g                                  |
| 8557 | NBS127-Barium Sulfate                            | 2,7             | 0.5 g                                  |
| 8558 | USGS32-Potassium Nitrate                         | 6               | 0.5 g                                  |
| 8559 | Natural Gas Isotopic                             | —               | 1 cylinder (0.1 mole)                  |
| 8560 | Natural Gas Isotopic                             | —               | 1 cylinder (0.1 mole)                  |
| 8561 | Natural Gas Isotopic                             | —               | 1 cylinder (0.1 mole)                  |
| 8562 | CO <sub>2</sub> -Heavy, Paleomarine Origin       | 2,3             | 2 tubes: 9 mm diameter $\times$ 300 mm |
| 8563 | CO <sub>2</sub> -Light, Petrochemical Origin     | 2,3             | 2 tubes: 9 mm diameter $\times$ 300 mm |
| 8564 | CO <sub>2</sub> -Biogenic, Modern Biomass Origin | 2,3             | 2 tubes: 9 mm diameter $\times$ 300 mm |

# INDUSTRIAL MATERIALS

53 Ferrous Metals

60 Nonferrous Metals

68 Ceramics and Glasses

69 Glass

72 Cements

73 Lubricants



## FERROUS METALS

## Steels

These SRMs consist of selected steel alloys that provide a wide range of analytical values for relevant elements. Please visit our website to view the relevant certificate or report of investigation for all available certified and non-certified values.

## Low Alloy Steels (chip)

Unit Size: 150 g (unless otherwise noted)

| SRM  | Description                          |
|------|--------------------------------------|
| 72g  | AISI 4130                            |
| 293  | AISI 8620 (Cr - Ni - Mo)             |
| 139b | AISI 8640 (Cr - Ni - Mo)             |
| 291  | ASTM A213 (Cr - Mo)                  |
| 163  | Chromium Steel (100 g)               |
| 36b  | Chromium-Molybdenum Steel            |
| 155  | Chromium-Tungsten Steel              |
| 129c | SAE 112 High Sulfur                  |
| 2171 | HSLA 100 (6Ni - Cr - Cr - Cu - Mo)   |
| 106b | Nitralloy™ G (Cr - Mo - Al)          |
| 32e  | SAE 3140 (Ni - Cr)                   |
| 100b | SAE 340 (Mn)                         |
| 33e  | SAE 4820 (Ni)                        |
| 30f  | SAE 6150 (Cr - V)                    |
| 16f  | Basic Open Hearth Steel (1 % Carbon) |

## Silicon Steels

|      |                                     |
|------|-------------------------------------|
| 179  | High Silicon Steel                  |
| 125b | High Silicon Steel, Calcium-Bearing |
| 131g | Low Carbon Silicon Steel            |



### Low Alloy Steels (disk and rod)

For more information, see Table 101.8 Low Alloy Steels on our website [www.nist.gov/srm](http://www.nist.gov/srm).

Nominal Sizes for Solid Steel SRMs:

600 Series: 3.2 mm diameter × 51 mm

1100 and 1200 Series: 31 mm diameter × 19 mm

1700 Series: 34 mm diameter × 19 mm

A "C" preceding the SRM number indicates a chill cast sample; 31 mm diameter × 19 mm.

| SRM   | Description   |
|-------|---|
| 1270  | 2-1/4 Chromium - 1 Molybdenum Low Alloy Steel, A 336 (F-22) |
| C1285 | A242, Modified  |
| C1221 | AISI 1211, Modified, Resulfurized/Rephosphorized            |
| 1269  | AISI 1526, Modified (Line Pipe Steel)                       |
| 1222  | Cr-Ni-Mo (AISI 8640)  |
| 1224  | Carbon (AISI 1078)  |
| 1225  | Low Alloy (AISI 4130)                                       |
| 661   | AISI 4340   |
| 1262b | AISI 94B17 (Modified)                                       |
| 1254  | Calcium in Low Alloy Silicon Steel                          |
| 663   | Chromium-Vanadium Steel, Modified                           |
| 1263a | Chromium-Vanadium Steel, Modified                           |
| 1265a | Electrolytic Iron   |
| 1264a | High Carbon Steel, Modified                                 |
| 1135  | High Silicon Steel  |
| 1134  | High Silicon Steel  |
| 1768  | High Purity Iron  |
| 1226  | HY 130  |
| 1286  | HY 80   |
| 1228  | Basic Open Hearth Steel (0.1 % Carbon)                      |
| 1227  | Basic Open Hearth Steel (1 % Carbon)                        |
| 1761  | Low Alloy Steel   |
| 1762  | Low Alloy Steel   |
| 1763  | Low Alloy Steel   |
| 1764  | Low Alloy Steel   |
| 1765  | Low Alloy Steel   |
| 1766  | Low Alloy Steel   |
| 1767  | Low Alloy Steel   |
| 1768  | High Purity Iron  |
| 1218  | Low Carbon & Sulfur Silicon Steel                           |
| 1271  | Ni-Cr-Cu-Mo (HSLA100)                                       |



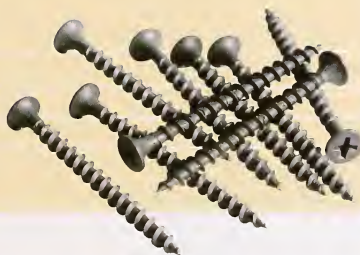
## Plain Carbon Steels (chip)

Unit Size: 150 g (unless otherwise noted)

| SRM | Description                        |
|-----|------------------------------------|
| 178 | 0.4C Basic Oxygen Furnace Steel    |
| 13g | 0.6 % Carbon Steel                 |
| 20g | AISI 1045 Steel                    |
| 14g | AISI 1078 Carbon Steel             |
| 368 | AISI 1211 Steel                    |
| 19h | Basic Electric Steel, 0.2 % Carbon |

### Basic Open-Hearth Steel

|      |                            |
|------|----------------------------|
| 15h  | 0.1 % Carbon               |
| 12h  | 0.4 % Carbon               |
| 152a | 0.5 % Carbon (Tin-Bearing) |
| 337a | 1 % Carbon (300 g)         |



## Stainless Steels (disk)

Unit Size: 32 mm diameter × 19 mm

For more information, see Table 101.10 Stainless Steels (disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM    | Description                     |
|--------|---------------------------------|
| 1219   | AISI 431 (16Cr - 2Ni)           |
| 1172   | AISI 348 (17Cr - 11Ni - 0.6Nb)  |
| 1223   | Chromium Steel                  |
| 1297   | SAE 201                         |
| 1295   | SAE 405                         |
| C1296  | SAE 460                         |
| C1153a | (17Cr - 9Ni)                    |
| C1152a | (18Cr - 11Ni)                   |
| 1155   | AISI 316 (18Cr - 12Ni - 2Mo)    |
| C1154a | Stainless Steel, (19Cr - 13Ni)  |
| C1151a | Stainless Steel, (23Cr - 7Ni)   |
| 1171   | AISI 321 (17 Cr - 11Ni - 0.3Ti) |
| C1287  | High Alloy (AISI 310 mod.)      |
| C1288  | High Alloy (A-743)              |

## Stainless Steels (chip)

Unit Size: 150 g (unless otherwise noted)

For more information, see Table 101.6 Stainless Steels (chip) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description                                  |
|------|--|
| 339  | SAE 303Se (17Cr - 9Ni - 0.2Se)               |
| 101g | AISI 304 L (18Cr - 10Ni)                     |
| 343a | AISI 431 (16Cr - 2Ni)                        |
| 367  | AISI 446 Stainless Steel                     |
| 123c | AISI 348 (17Cr - 11Ni - 0.6Nb)               |
| 121d | AISI 321 (17Cr - 11Ni - 0.3Ti)               |
| 160b | AISI 316 (18Cr - 12Ni - 2Mo)                 |
| 166c | AISI 316L Low Carbon Stainless Steel (100 g) |
| 893  | SAE 405 (Cr)                                 |
| 895  | SAE 201 (Cr-Mn)                              |
| 73c  | SAE 420 (13 % Cr)                            |
| 133b | CrMO   |



## Special Low Alloy Steels (chip and pin)

Unit Size: 150 g (unless otherwise noted)

For more information, see Table 101.3 Special Low Alloy Steels (chip and pin) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description                       |
|------|-----------------------------------|
| 2159 | Low Alloy Steel (pin - 200 g)     |
| 2160 | Low Alloy Steel (pin - 200 g)     |
| 2165 | Low Alloy Steel                   |
| 2166 | Low Alloy Steel                   |
| 2167 | Low Alloy Steel                   |
| 361  | AISI 4340 Steel                   |
| 362  | AISI 94B17, Modified              |
| 363  | Chromium-Vanadium Steel, Modified |
| 364  | High Carbon Steel, Modified       |
| 2168 | High Purity Iron                  |





## Specialty Steels (disk)

For more information, see Table 101.11 Specialty Steels (disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

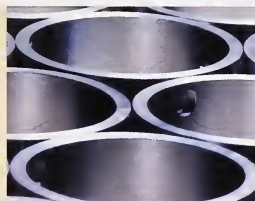
| SRM  | Description                    | Unit Size              |
|------|--------------------------------|------------------------|
| 1158 | High Nickel Steel, 36 % Nickel | 32 mm diameter × 19 mm |
| 1772 | S-7 Tool Steel                 | 34 mm diameter × 19 mm |
| 1157 | AISI M2, Tool Steel            | 32 mm diameter × 19 mm |
| 1233 | Valve Steel                    | 35 mm diameter × 19 mm |

## Tool Steels (chip)

Unit Size: 150 g

For more information, see Table 101.7 Tool Steels (chip form) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

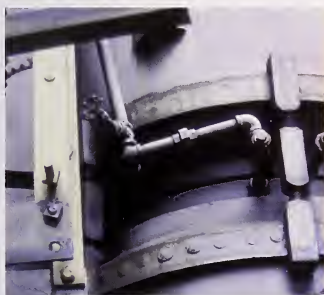
| SRM  | Description                                       |
|------|---|
| 134a | Molybdenum - Tungsten - Chromium - Vanadium Steel |
| 2172 | S-7 Tool Steel                                    |
| 132b | AISI M2, Tool Steel                               |
| 50c  | Tungsten - Chromium - Vanadium Steel              |



## High Alloy Steels (chip)

Unit Size: 150 g (unless otherwise noted)

For more information, see Table 101.4 High Alloy Steels on our website [www.nist.gov/srm](http://www.nist.gov/srm).



| SRM  | Description                                   |
|------|---|
| 345a | Cu Precipitation Hardening Steel (15Cr - 4Ni) |
| 344  | Mo Precipitation Hardening Steel (15Cr - 7Ni) |
| 126c | High Nickel Steel (36 % Ni)                   |
| 868  | High Temperature Alloy (Fe-Ni-Co) (100 g)     |
| 348a | High Temperature Alloy A286 (Ni-Cr)           |
| 862  | High Temperature Alloy L605 (100 g)           |
| 346a | Valve Steel                                   |

### Steelmaking Alloys (fine powder)

Unit Size: 150 g

For more information, see Table 101.12 Steelmaking Alloys on our website [www.nist.gov/srm](http://www.nist.gov/srm).



| SRM | Description                                   |
|-----|---|
| 57a | Silicon Metal                                 |
| 58a | Ferrosilicon (73 % Silicon-Regular Grade)     |
| 59a | Ferrosilicon                                  |
| 195 | Ferrosilicon (75 % Silicon High Purity Grade) |
| 196 | Low Carbon Ferrochromium                      |
| 64c | High Carbon Ferrochromium                     |
| 68c | High Carbon Ferromanganese                    |
| 90  | Ferrophosphorus                               |
| 347 | Magnesium Ferrosilicon                        |
| 689 | Silicon Ferrochromium                         |

### Cast Irons (chip)

Unit Size: 150 g

For more information, see Table 101.13 Cast Irons (chip) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Title  |
|------|--|
| 4L   | Cast Iron  |
| 5m   | Cast Iron  |
| 6g   | Cast Iron  |
| 122i | Cast Iron  |
| 7g   | High Phosphorus Cast Iron                        |
| 115a | Copper-Nickel-Chromium Cast Iron                 |
| 341  | Ductile Cast Iron                                |
| 334  | Gray Cast Iron (Carbon and Sulfur)               |
| 890  | High-Alloy White Cast Iron, HC 250+V             |
| 891  | High-Alloy White Cast Iron, Nickel-Hard, Type I  |
| 892  | High-Alloy White Cast Iron, Nickel-Hard, Type IV |
| 82b  | Nickel Chromium Cast Iron                        |
| 107c | Nickel-Chromium-Molybdenum Cast Iron             |
| 342a | Nodular Cast Iron                                |
| 338  | White Cast Iron, Carbon and Sulfur               |





## Cast Steels, White Cast Irons, and Ductile Irons (disk)

Unit Size: 32 mm diameter × 19 mm

For more information, see Table 101.14 Cast Steels, White Cast Irons, and Ductile Irons on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM    | Description                                  |
|--------|--|
| 1138a  | Cast Steel (No. 1)                           |
| 1139a  | Cast Steel (No. 2)                           |
| C1173  | Cast Steel (No. 3)                           |
| C2423  | Ductile Iron A                               |
| C2423a | Ductile Iron B                               |
| C2424  | Ductile Iron C                               |
| C2424a | Ductile Iron D                               |
| C1291  | High Alloy White Cast Iron, Ni-Hard, Type I  |
| C1292  | High Alloy White Cast Iron, Ni-Hard, Type IV |
| C1290  | High Alloy White Cast Iron, HC-250+V         |
| 1173   | Nickel-Chromium-Molybdenum-Vanadium Steel    |
| C1137a | White Cast Iron                              |
| C1145a | White Cast Iron                              |



## High Temperature Alloys (chip and disk)

For more information, see Table 101.9 High Temperature Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM   | Description                           | Unit Size                    |
|-------|---------------------------------------|------------------------------|
| 866   | Incoloy™ 800                          | 100 g                        |
| 867   | Incoloy™ 825                          | 100 g                        |
| 1230  | High Temperature Alloy A286           | disk: 32 mm diameter × 19 mm |
| 1246  | Incoloy™ 800                          | disk: 35 mm diameter × 19 mm |
| 1247  | Incoloy™ 825                          | disk: 35 mm diameter × 19 mm |
| 1250  | High Temperature Alloy (Fe - Ni - Co) | disk: 32 mm diameter × 19 mm |
| C2400 | High Alloy Steel, ACl 17/4 PH         | disk: 32 mm diameter × 19 mm |
| C2401 | High Alloy Steel ACl-CD-4M Cu         | disk: 32 mm diameter × 19 mm |

## Gases in Metals: Iron and Steel (rod)

These SRMs are certified for oxygen content. Materials certified for nitrogen are noted.

| SRM   | Description                            | Rod Size (mm)   |
|-------|--|-----------------|
| 1089* | Gasometric Standard, set includes:     |                 |
|       | SRM 1095 AISI 4340 Steel               | 6.4 × 102       |
|       | SRM 1096 AISI 94B17 Steel, Modified**  | 6.4 × 102       |
|       | SRM 1097 Cr-V Steel, Modified          | 6.4 × 102       |
|       | SRM 1098 High Carbon Steel**           | 6.4 × 102       |
|       | SRM 1099 Electrolytic Iron             | 6.4 × 102       |
| 1754  | AISI 4320 Oxygen in Low Alloy Steel,** | 9.5 × 9.5 × 102 |
| 1755  | Nitrogen in Low Alloy Steel            | 1.38 × 19       |
| 1090  | Oxygen in Ingot Iron                   | 6.35 × 102      |
| 1094  | Oxygen in Maraging Steel               | 0.6 × 82        |
| 1091a | AISI 431 Oxygen in Stainless Steel     | 7.9 × 102       |
| 1093  | Oxygen in Valve Steel                  | 0.6 × 82        |

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

\*\* In addition to being certified for oxygen, these SRMs are also certified for nitrogen.

## NONFERROUS METALS

### Aluminum Base Alloys (chip and disk)

SRMs 1710 through 1715 are specially prepared to include low levels of cadmium and lead encountered in the analysis of recycled aluminum.

For more information, see Table 102.1 Aluminum Base Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM    | Description                               | Unit Size                           |
|--------|---|-------------------------------------|
| 87a    | Silicon - Aluminum Alloy                  | 75 g                                |
| 853a   | Aluminum Alloy 3004                       | 40 g                                |
| 854a   | Aluminum Alloy 5182                       | 40 g                                |
| 855a   | Aluminum Casting Alloy 356                | 30 g                                |
| 856a   | Aluminum Casting Alloy 380, Fine Millings | 30 g                                |
| 858    | Alloy 6011, Modified                      | 35 g                                |
| 1241c  | Aluminum Alloy 5182                       | disk: 63 mm diameter × 1.9 cm thick |
| 1255b  | Aluminum Alloy 356                        | disk: 63 mm diameter × 1.9 cm thick |
| 1256b  | Aluminum Alloy 380                        | disk: 63 mm diameter × 1.9 cm thick |
| 1258   | Alloy 6011, Modified                      | disk: 35 mm diameter × 19 mm        |
| 1258-I | Alloy 6011, Modified                      | disk: 35 mm diameter × 19 mm        |
| 859    | Alloy 7075                                | 35 g                                |
| 1240C  | Aluminum Alloy 3004                       | disk: 63 mm diameter × 19 mm        |
| 1259   | Alloy 7075                                | disk: 35 mm diameter × 19 mm        |

(continued)



## Aluminum Base Alloys (chip and disk) (continued)

| SRM  | Description       | Unit Size  |
|------|-------------------|--|
| 1710 | Alloy 3004        | disk: 63 mm diameter × 19 mm                                 |
| 1711 | Alloy 3004        | disk: 63 mm diameter × 19 mm                                 |
| 1712 | Alloy 3004        | disk: 63 mm diameter × 19 mm                                 |
| 1713 | Alloy 5182        | disk: 63 mm diameter × 19 mm                                 |
| 1714 | Alloy 5182        | disk: 63 mm diameter × 19 mm                                 |
| 1715 | Alloy 5182        | disk: 63 mm diameter × 19 mm                                 |
| 2426 | 55% Aluminum Zinc | chip: 31 mm diameter 2 × 10 <sup>4</sup> kg - 31 mm diameter |

## Cobalt Base Alloys (chip and disk)

For more information, see Table 102.2 Cobalt Base Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description                 | Unit Size                    |
|------|-----------------------------|------------------------------|
| 862  | High Temperature Alloy L605 | chip: 100 g                  |
| 1242 | High Temperature Alloy L605 | disk: 35 mm diameter × 19 mm |
| 1775 | Refractory Alloy MP-35-N    | disk: 35 mm diameter × 19 mm |
| 2175 | Refractory Alloy MP-35-N    | chip: 50 g                   |

## Copper “Benchmark” (chip and rod)

Unit Size: Chip: 50 g

Rod: 6.4 mm × 103 mm

For more information, see Table 102.5 Copper Benchmark (chip and rod) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM        |                | Description                       |
|------------|----------------|-----------------------------------|
| Chip       | Rod/Chill Cast |                                   |
|            | 494            | Unalloyed Copper - Cu I           |
| 395        | 495            | Unalloyed Copper - Cu II          |
| 396        | 496            | Unalloyed Copper - Cu III         |
|            | 457            | Unalloyed Copper - Cu IV          |
| 398        |                | Unalloyed Copper - Cu V           |
|            | 498            | Unalloyed Copper - Cu V           |
| 399        | 499            | Unalloyed Copper - Cu VI          |
| 400        | 500            | Unalloyed Copper - Cu VII         |
|            | C1251a         | Phosphorus Deoxidized Copper VIII |
|            | C1252a         | Phosphorus Deoxidized Copper IX   |
|            | C1253a         | Phosphorus Deoxidized Copper X    |
| 454 (35 g) |                | Unalloyed Copper - Cu XI          |



### Copper Base Alloys (chip and rod)

For more information, see Table 102.3 Copper Base Alloys (chip and rod) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM                     | Description               | Unit Size (g)                  |
|-------------------------|---------------------------|--------------------------------|
| 158a                    | Silicon, Bronze           | 150                            |
| <b>Beryllium-Copper</b> |                           |                                |
| 458                     | C-17510                   | 50                             |
| 459                     | C-17200                   | 50                             |
| 460                     | C-17300                   | 50                             |
| <b>Phosphor-Bronze</b>  |                           |                                |
| 871                     | CDA 521                   | 100                            |
| 872                     | CDA 544                   | 100                            |
| <b>Cupro-Nickel</b>     |                           |                                |
| 874                     | 10 % CDA 706, High-Purity | 100                            |
| 875                     | 10 % CDA 706, Doped       | 100                            |
| <b>Nickel-Silver</b>    |                           |                                |
| 879                     | CDA 762                   | 100                            |
| 880                     | CDA 770                   | 100                            |
| 1034                    | Unalloyed Copper          | rod: 6.35 mm diameter × 103 mm |
| 1035                    | Leaded-Tin Bronze Alloy   | 50                             |





## Copper Base Alloys (block and disk)

For more information, see Table 102.4 Copper Base Alloys (block and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

The 1100 series SRMs are wrought disks 32 mm diameter  $\times$  19 mm. The C1100 series SRMs are chill cast blocks 32 mm square  $\times$  19 mm. Both forms have nearly identical elemental compositions.

| SRM   |       | Description          |
|-------|-------|----------------------|
| Disk  | Block |                      |
| 1104  |       | Free-Cutting Brass   |
| 1107  |       | Naval Brass B        |
| 1108  |       | Naval Brass C        |
| 1110  |       | Red Brass B          |
| 1111  |       | Red Brass C          |
| 1112  | C1112 | Gilding Metal A      |
| 1113  | C1113 | Gilding Metal B      |
| 1114  | C1114 | Gilding Metal C      |
| 1115  | C1115 | Commercial Bronze A  |
| 1116  | C1116 | Commercial Bronze B  |
| 1117  | C1117 | Commercial Bronze C  |
|       | C1122 | Beryllium-Copper     |
| 1276a |       | CDA 715 Cupro-Nickel |

## Lead Base Alloys (disk and powder forms)

| SRM    |      | Description                                    | Unit Size (g) |                                 |
|--------|------|--|---------------|---------------------------------|
| Powder | Disk |  | Powder        | Disk                            |
| 1129   |      | Solder 63Sn - 37Pb                             | 200           |                                 |
| 127b   | 1131 | Solder 40Sn - 60Pb                             | 150           | 32 mm diameter $\times$ 19 mm   |
| 53e    | 1132 | Lead Base Bearing Metal<br>(84Pb - 10Sb - 6Sn) | 150           | 32 mm diameter $\times$ 19 mm   |
|        | 1727 | Anode Tin (block form)                         |               | (30 $\times$ 30 $\times$ 30 mm) |



### Lead Base Materials (disk)

Unit Size: 50 mm diameter × 16 mm

| SRM   | Description      |
|-------|------------------|
| C2415 | Battery Lead     |
| C2416 | Bullet Lead      |
| C2417 | Lead Base Alloy  |
| C2418 | High Purity Lead |



### Solder Thickness (plate form)

| SRM  | Description                     | Unit Size (g) |      |     |
|------|---------------------------------|---------------|------|-----|
|      |                                 | Powder        | Disk |     |
| 2321 | Tin-Lead Sn: 60<br>Alloy Pb: 40 | 6.8           | 295  | 7.5 |

### Tin Base Alloys (chip)

| SRM  | Description            | Unit Size       |
|------|------------------------|-----------------|
| 54d  | Tin Base Bearing Metal | 170 g           |
| 1727 | Anode Tin              | 30 × 30 × 30 mm |



## Nickel Base Alloys (chip and disk)

For more information, see Table 102.12 Nickel Base Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

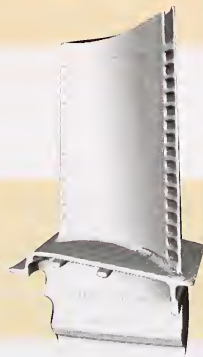
| SRM   | Description                             | Unit Size                    |
|-------|---|------------------------------|
| 349a  | Waspaloy™                               | 150 g                        |
| 861   | Nickel-Based Superalloy                 | 50 g                         |
| 864   | Inconel™ 600                            | 100 g                        |
| 865   | Inconel™ 625                            | 100 g                        |
| 882   | Nickel-Copper Alloy (65Ni - 31Cu - 3Al) | 100 g                        |
| 1159  | Electronic and Magnetic Alloy Ni-Fe     | disk: 31 mm diameter × 19 mm |
| 1160  | Electronic and Magnetic Alloy Ni-Mo     | disk: 31 mm diameter × 19 mm |
| 1243  | Waspaloy™                               | disk: 34 mm diameter × 19 mm |
| 1244  | Inconel™ 600                            | disk: 35 mm diameter × 19 mm |
| 1245a | Inconel™ 625                            | disk: 35 mm diameter × 19 mm |
| C1248 | Nickel-Copper Alloy (66Ni - 30Cu)       | disk: 32 mm diameter × 19 mm |
| 1249  | Inconel™ 718                            | disk: 41 mm diameter × 19 mm |
| C2402 | Hastelloy™ C                            | disk: 32 mm diameter × 19 mm |
| 1775  | Refractory Alloy MP 35N                 | disk                         |
| 2175  | Refractory Alloy MP 35N                 | chip 50 g                    |

## Nickel Oxides (powder)

Unit Size: 25 g

For more information, see Table 102.14 Nickel Oxides on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM | Description        |
|-----|--------------------|
| 671 | Nickel Oxide No. 1 |
| 672 | Nickel Oxide No. 2 |
| 673 | Nickel Oxide No. 3 |



## Trace Elements in Nickel Base Superalloys (chip)

Unit Size: 35 g

For more information, see Table 102.13 Trace Elements in Nickel Base Superalloys (chip) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM | Description    | Unit Size (g) | Trace Composition (in mg/kg) |      |      |       |
|-----|----------------|---------------|------------------------------|------|------|-------|
|     |                |               | Pb                           | Se   | Te   | Tl    |
| 897 | "Tracealloy" A | 35            | 11.7                         | 9.1  | 1.05 | 0.51  |
| 898 | "Tracealloy" B | 35            | 2.5                          | 2.00 | 0.54 | 2.75  |
| 899 | "Tracealloy" C | 35            | 3.9                          | 9.5  | 5.9  | 0.252 |

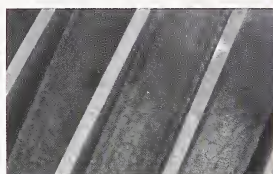
### Titanium Base Alloys (chip and disk)

For more information, see Table 102.16 Titanium Base Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description           | Unit Size (g)                |
|------|-----------------------|------------------------------|
| 641  | 8 Mn (A)              | disk: 32 mm diameter × 19 mm |
| 642  | 8 Mn (B)              | disk: 32 mm diameter × 19 mm |
| 643  | 8 Mn (C)              | disk: 32 mm diameter × 19 mm |
| 647  | 6Al - 2Mo - 2Sn - 4Zr | 50                           |
| 648  | 5Al - 2Sn - 2Cr - 4Mo | 50                           |
| 649  | 15V - 3Al - 2Cr - 3Sn | 50                           |
| 650  | Unalloyed Titanium A  | 30                           |
| 651  | Unalloyed Titanium B  | 30                           |
| 654b | 6Al - 4V              | disk: 31 mm diameter × 19 mm |
| 1128 | 15V - 3Al - 3Cr - 3Sn | disk: 35 mm diameter × 19 mm |
| 2061 | TiAl (NbW) Alloy      | cube                         |
| 2062 | TiAl (NbW) Alloy      | disk                         |
| 2431 | 6Al - 2Sn - 4Zr - 6Mo | 50                           |
| 2432 | 10V - 2Fe - 3Al       | 50                           |
| 2433 | 8Al - 1Mo - 1V        | 50                           |
| 173c | 6Al - 4V              | 50                           |



### Hydrogen in Titanium (platelet)



| SRM  | Description                | Unit Size |
|------|----------------------------|-----------|
| 2452 | Hydrogen in Titanium Alloy | 10 g      |
| 2453 | Hydrogen in Titanium Alloy | 10 g      |
| 2454 | Hydrogen in Titanium Alloy | 10 g      |

### Zirconium Base Alloys (chip)

| SRM  | Description | Unit Size |
|------|-------------|-----------|
| 360b | Zircaloy-4  | 100 g     |



## Zinc Base Alloys (chip and disk)

For more information, see Table 102.17 Zinc Base Alloys (chip and disk) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description                                | Unit Size                        |
|------|--|----------------------------------|
| 94c  | Die Casting Alloy                          | chip: 150 g                      |
| 625  | ASTM AG 40A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 626  | ASTM AG 40A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 627  | ASTM AG 40A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 628  | ASTM AC 41A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 629  | ASTM AC 41A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 630  | ASTM AC 41A Die Casting Alloy              | disk: 44 mm diameter × 19 mm     |
| 631  | Zinc spelter, Modified                     | disk: 45 mm diameter × 19 mm     |
| 1736 | Zinc-Aluminum (.31 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1737 | Zinc-Aluminum (.63 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1738 | Zinc-Aluminum (.10 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1739 | Zinc-Aluminum (.21 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1740 | Zinc-Aluminum (.42 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1741 | Zinc-Aluminum (.52 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 1742 | Zinc-Aluminum (.79 % Al) Die Casting Alloy | disk: 50.8 mm diameter × 12.7 mm |
| 2139 | Zinc-Aluminum (.80 % Al) Die Casting Alloy | chip: 100 g                      |
| 2426 | Zinc-Aluminum                              | chip: 5 g                        |

## Microindentation Hardness (block form)

| SRM   | Description                         | Hardness<br>Nominal (kgf/mm <sup>2</sup> ) |
|-------|-------------------------------------|--|
| 1893  | Bright Copper (Knoop)               | 125  |
| 1894a | Bright Copper (Vickers)             | 125  |
| 1895  | Bright Nickel (Knoop)               | 600  |
| 1896b | Bright Nickel (Vickers)             | 600  |
| 1905  | Bright Nickel (Knoop)               | 600  |
| 1906  | Bright Nickel (Knoop)               | 600  |
| 1907  | Bright Nickel (Knoop)               | 600  |
| 1908  | Bright Nickel (Vickers)             | 600  |
| 1909  | Bright Nickel (Vickers)             | 600  |
| 2798a | Bright Nickel (Vickers)             | 600  |
| 2830  | Ceramic, Silicon Nitride (Knoop)    | 1500                                       |
| 2831  | Ceramic, Tungsten Carbide (Vickers) | 1530                                       |



## CERAMICS AND GLASSES

### Carbides (powder)

| SRM  | Description      | Unit Size (g) |
|------|------------------|---------------|
| 112b | Silicon Carbide  | 80            |
| 276b | Tungsten Carbide | 75            |



### Cemented Tungsten Carbides (powder)

Unit Size: 100 g

| SRM | Description                              |
|-----|--|
| 887 | Cemented Carbide (83W - 10Co)            |
| 888 | Cemented Carbide (64W - 25Co - 5Ta)      |
| 889 | Cemented Carbide (75W - 9Co - 5Ta - 4Ti) |

### Trace Elements (powder and wafer)

These SRMs are for calibrating instruments and evaluating analytical techniques used to determine trace elements in inorganic matrices. SRMs 610 through 617 come in units of 6 wafers with wafer thicknesses of 3 mm for even numbered SRMs and 1 mm for odd numbered SRMs.

These SRMs also have values listed for Sr isotope ratios.

| SRM                            | Description                                | Certified Elements |
|--------------------------------|--|--------------------|
| 607                            | Trace Elements in Potassium Feldspar (5 g) |                    |
| <b>Trace Elements in Glass</b> |  |                    |
| 610/611                        |  | 33 elements        |
| 612/613                        |  | 33 elements        |
| 614/615                        |  | 33 elements        |
| 616/617                        |  | 33 elements        |



## Glasses (powder and solid)

For more information, see Table 112.3 Glasses (powder and solid) on our website [www.nist.gov/srm](http://www.nist.gov/srm).

| SRM  | Description                | Unit Size (g)                      |
|------|----------------------------|------------------------------------|
| 81a  | Glass Sand                 | 75                                 |
| 89   | Lead-Barium                | 45                                 |
| 92   | Low-Boron Soda-Lime Powder | 45                                 |
| 93a  | High-Boron Boro-silicate   | wafer: 32 mm diameter × 6 mm       |
| 165a | Glass Sand (low Iron)      | 75                                 |
| 620  | Soda-Lime, Flat            | 3 platelets: 35 mm × 35 mm × 3 mm  |
| 621  | Soda-Lime, Container       | 3 disks: 38 mm diameter × 5 mm     |
| 1411 | Soft Borosilicate          | 10 platelets: 32 mm × 32 mm × 3 mm |
| 1412 | Multicomponent             | 8 platelets: 32 mm × 32 mm × 3 mm  |
| 1413 | Glass Sand (high alumina)  | 75                                 |
| 1830 | Soda-Lime, Float           | 3 platelets: 32 mm × 32 mm × 6 mm  |
| 1831 | Soda-Lime, Sheet           | 3 platelets: 37 mm × 37 mm × 3 mm  |
| 1834 | Fused Ore Glass            | disk: 30 mm diameter × 3 mm        |

## GLASS

### Chemical Resistance [Durability] of Glass (solid form)

| SRM | Description      | Unit Size |
|-----|------------------|-----------|
| 622 | Soda-Lime Silica | 2.2 kg    |
| 623 | Borosilicate     | 2.2 kg    |



### Electrical Properties of Glass (bar form)

| SRM | Description                          | Unit Size (cm) |
|-----|--------------------------------------|----------------|
| 624 | Lead-Silica, for DC Resistivity      | 5 × 5 × 0.5    |
| 774 | Lead-Silica, for Dielectric Constant | 5 × 5 × 2.5    |

### Viscosity of Glass (bar form)

| SRM  | Description      | Unit Size      |
|------|------------------|----------------|
| 710a | Soda-Lime-Silica | 10 × 10 × 4 cm |
| 717a | Borosilicate     | 450 g          |

### Glass Liquidus Temperature (solid form)

| SRM  | Description      | Unit Size                          |
|------|------------------|------------------------------------|
| 773  | Soda-Lime-Silica | 2.5 cm × 2.5 cm × 0.6 cm           |
| 1416 | Aluminosilicate  | 22 lengths of 12.7 cm tube (250 g) |





## Viscosity Fixpoints (solid forms)



| SRM  | Description                     | Unit Size                 |
|------|---------------------------------|---------------------------|
| 709  | Extra Dense Lead Silica         | 4 cm × 4 cm × 5 cm        |
| 710a | Soda-Lime-Silica                | 10 cm × 10 cm × 4 cm      |
| 713  | Dense Barium Crown 620/603      | 3.6 cm × 1.7 cm           |
| 714  | Alkaline Earth Alumina Silicate | .6 cm × 15.2 cm           |
| 716  | Neutral                         | 1.2 cm × 15.2 cm          |
| 717a | Borosilicate                    | 4.2 cm × 4.2 cm × 12.5 cm |

## Relative Stress Optical Coefficient (bar form)

| SRM | Description             | Unit Size          |
|-----|-------------------------|--------------------|
| 709 | Extra Dense Lead Silica | 4 cm × 4 cm × 5 cm |

## Density (solid form)

| SRM   | Description       | Unit Size                       |
|-------|-------------------|---------------------------------|
| 1826b | Soda-Lime Glass   | slab - 0.8 cm × 2.0 cm × 4.0 cm |
| 1827a | Lead Silica Glass | slab - 2.5 cm × 2.5 cm × 1.2 cm |

## CEMENTS

### Portland Cements (powder)

| SRM                             | Unit Size |
|---------------------------------|-----------|
| <i>Calcium Aluminate Cement</i> |           |
| 1882a                           | 4 × 5 g   |
| 1883a                           | 4 × 5 g   |
| <i>Portland Cement</i>          |           |
| 1880a                           | 4 × 5 g   |
| 1881a                           | 4 × 5 g   |
| 1884a                           | 4 × 5 g   |
| 1885a                           | 4 × 5 g   |
| 1886a                           | 4 × 5 g   |
| 1887a                           | 4 × 5 g   |
| 1888a                           | 4 × 5 g   |
| 1889a                           | 4 × 5 g   |
| <i>Silica Fume</i>              |           |
| 2696                            | 1 × 70 g  |

### Portland Cement Clinkers (solid)

| SRM  | Unit Size |
|--|-----------|
| <i>Portland Cement Clinkers (5 phases certified)</i> |           |
| 2686   | 3 × 10 g  |
| 2687   | 3 × 10 g  |
| 2688   | 3 × 10 g  |



## LUBRICANTS

### Lubricating Oil Ingredients

These SRMs are for determining the concentrations of a single element in lubricating base oil. SRMs 1818a and 1819a consist of five bottles, approximately 20 g of liquid each; SRM 1836 consists of four sets of four ampoules, each ampoule containing approximately 4 g of liquid.

| SRM   | Description                      | Elemental Composition (mg/kg) |       |       |       |       |
|-------|----------------------------------|-------------------------------|-------|-------|-------|-------|
|       |                                  | I                             | II    | III   | IV    | V     |
| 1818a | Total Chlorine                   | 31.6                          | 60.0  | 78.2  | 154.4 | 234.0 |
| 1836  | Total Nitrogen                   | 9.0                           | 50.9  | 113.3 | 166.2 |       |
| 1819a | Total Sulfur                     | 423.5                         | 741.1 | 4022  | 4689  | 6135  |
| 1848  | Lubricating Oil Additive Package | 100 mL                        |       |       |       |       |

### Wear-Metals in Oil

| SRM   | Description            | Unit Size |
|-------|------------------------|-----------|
| 1084a | Wear-Metals            | 5 × 1.6 g |
| 1085b | Wear-Metals            | 5 × 1.2 g |
| 1083  | Wear-Metals (Base Oil) | 150 mL    |

### Carbon Modified Silica

Unit Size: 3 × 1 g

This SRM is chemically modified microparticulate silica intended for the calibration of instruments used to measure total carbon.

| SRM  | Description            | Bottle | Mass Fraction (%) |
|------|------------------------|--------|-------------------|
| 1216 | Carbon Modified Silica | I      | 0.70              |
|      |                        | II     | 9.06              |
|      |                        | III    | 17.04             |

### Used Auto Catalysts

Unit Size: 70 g

| SRM  | Description       | Elemental Composition |
|------|-------------------|-----------------------|
| 2557 | Recycled Monolith | Pt, Pd, Rh, Pb        |
| 2556 | Recycled Pellet   |                       |



# PHYSICAL PROPERTIES

- 75 Ion Activity
- 78 Polymeric Properties
- 80 Thermodynamic Properties
- 84 Optical Properties
- 87 Electrical Properties
- 88 Optoelectronics
- 88 Metrology
- 91 Ceramics and Glasses
- 93 X-ray Spectrometry



## ION ACTIVITY

### pH Calibration

| SRM   | Description                            | pH(S) Values<br>(at 25 °C) | Unit Size (g) |
|-------|--|----------------------------|---------------|
| 2193a | Calcium Carbonate                      | —                          | —             |
| 723d  | Tris(Hydroxymethyl) aminomethane       | —                          | —             |
| 185h  | Potassium Hydrogen Phthalate           | 4.006                      | 60            |
| 188   | Potassium Hydrogen Tartrate            | 3.557                      | 60            |
| 189b  | Potassium Tetroxalate                  | 1.719                      | 65            |
| 187e  | Sodium Tetraborate Decahydrate (Borax) | 9.182                      | 30            |

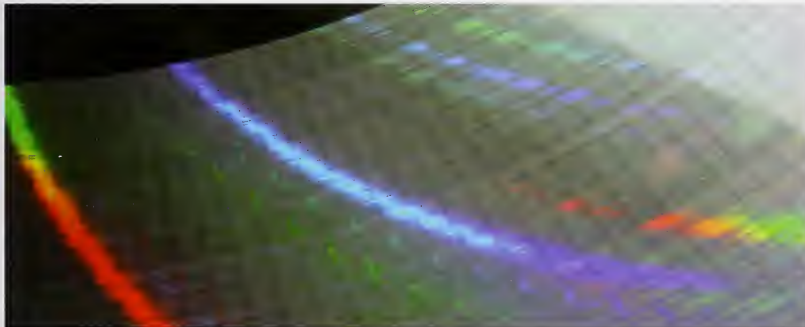
#### Admixtures

Unit Size: 30 g (unless otherwise noted)

|      |                           |         |     |
|------|---------------------------|---------|-----|
| 186g | pH Standards              |         | Set |
| 191c | Sodium Bicarbonate (25 g) | 10.015* |     |
| 192c | Sodium Carbonate          |         |     |

\*This pH results only when the two SRMs listed are used as an admixture in solution.

\*\* Physiological buffer preparation.



# PHYSICAL PROPERTIES

## Biological Buffer Systems

Unit Size: 60 g

| SRM  | Description     | pH(S) Values (at 37 °C) |            |
|------|-----------------|-------------------------|------------|
|      |                 | 0.05 molal              | 0.08 molal |
| 2181 | HEPES Free Acid | 7.364*                  | 7.373*     |
| 2182 | NaHEPESate      |                         |            |
| 2183 | MOPSO Free Acid | 6.699*                  | 6.694*     |
| 2184 | NaMOPSOate      |                         |            |



\*This pH results only when the two SRMs listed are used as an admixture in solution.

## pD Calibration

| SRM    | Description                    | pD(S) Values<br>(at 25 °C) | Unit Size (g) |
|--------|--------------------------------|----------------------------|---------------|
| 2185   | Potassium Hydrogen Phthalate   | 4.518                      | 60            |
| 2186i  | Potassium Dihydrogen Phosphate | 7.428*                     | 30            |
| 2186ii | Disodium Hydrogen Phosphate    |                            | 30            |
| 2191a  | Sodium Bicarbonate             | 10.732*                    | 30            |
| 2192a  | Sodium Carbonate               |                            | 30            |

\*This pD results only when the two SRMs listed are used as an admixture in solution.

## Ion-Selective Electrode Calibration

| SRM  | Description        | Certified Property | Unit Size (g) |
|------|--------------------|--------------------|---------------|
| 2201 | Sodium Chloride    | pNa, pCl           | 125           |
| 2202 | Potassium Chloride | pK, pCl            | 160           |
| 2203 | Potassium Fluoride | pF                 | 125           |

## Electrolytic Conductivity

| SRM                                      | Description            | Nominal Conductivity<br>( $\mu\text{S}/\text{cm}$ ) |
|--|------------------------|---|
| 3190                                     | HCl in Deionized Water | —   |
| <i>KCl in Deionized Water</i>            |                        |   |
| 3191                                     |                        | 100   |
| 3192                                     |                        | 500   |
| 3193                                     |                        | 1000  |
| 3194                                     |                        | 10 000  |
| <i>KCl in n-Propanol/Deionized Water</i> |                        |   |
| 3198                                     |                        | 5   |
| 3199                                     |                        | 15  |



## Positive Electrophoretic Mobility

| SRM  | Description                        | Certified Property  | Unit Size |
|------|------------------------------------|---|-----------|
| 1980 | Goethite ( $\alpha\text{-FeOOH}$ ) | $+\mu\text{E}$ , $2.53 \mu\text{m} \cdot \text{cm}/\text{V} \cdot \text{s}$ | 40 mL     |

## POLYMERIC PROPERTIES

### Molar Mass/Molecular Weight ( $M_w$ )

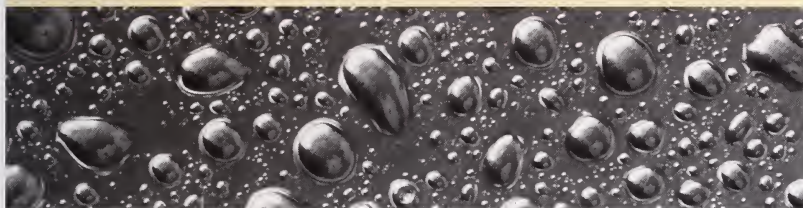
| SRM  | $M_w$ (g/mol)   | Unit Size (g) |
|--|---|---------------|
| <b>Poly(ethylene oxide)</b>                                      |   |               |
| 1924   | $M_w \approx 120\,900$ ( $M_w/M_n \approx 1.04$ )                     | 0.2           |
| 1923   | $M_w \approx 26\,900$ ( $M_w/M_n \approx 1.06$ )                      | 0.2           |
| <b>Poly(methylmethacrylate)</b>                                  |   |               |
| 1489*  | $M_n \approx 115\,000$ ( $M_w/M_n \leq 1.1$ )                         | 1.1           |
| 1488*  | $M_n \approx 29\,300$ ( $M_w/M_n \leq 1.1$ )                          | 2             |
| 1487*  | $M_w \approx 6300$  | 2             |
| <b>Polyethylene/Polystyrene</b>                                  |   |               |
| 2887*  | $M_w \approx 196\,400$  | 0.3           |
| 2885*  | $M_w \approx 6280$  | 0.3           |
| 2886*  | $M_w \approx 87\,000$   | 0.3           |
| 2888   | $M_w \approx 7190$  | 0.3           |
| <b>Polyethylene, linear</b>                                      |   |               |
| 1475a*   | $M_w \approx 52\,000$ ( $M_w/M_n \approx 2.90$ ) (see also melt flow) | 50            |
| 1484a*   | $M_w \approx 119\,600$ ( $M_w/M_n \approx 1.19$ )                     | 0.3           |
| 1482a*   | $M_w \approx 13\,600$ ( $M_w/M_n \approx 1.19$ )                      | 0.4           |
| 1483a*   | $M_w \approx 32\,100$ ( $M_w/M_n \approx 1.11$ )                      | 1             |
| <b>Polystyrene, linear, broad molecular weight distribution</b>  |   |               |
| 706a   | $M_w \approx 285\,000$  | 18            |
| <b>Polystyrene, linear, narrow molecular weight distribution</b> |   |               |
| 1478*  | $M_w \approx 37\,400$ ( $M_w/M_n \approx 1.04$ )                      | 2             |
| 705a*  | $M_w \approx 179\,300$ ( $M_w/M_n \approx 1.07$ )                     | 5             |
| 1479   | $M_w \approx 1\,050\,000$   | 2             |
| <b>Polyurethane</b>  |   |               |
| 1480   | $M_w \approx 47\,300$   | 1             |

\* Also certified for viscosity



## Melt Flow Rate

| SRM   | Description                              | Melt Flow Rate<br>(g/10 min) | Unit Size (g) |
|-------|--|------------------------------|---------------|
| 1473b | Polyethylene Resin, Low Density          | 1.13                         | 50            |
| 1474a | Polyethylene Resin                       | 5.03                         | 60            |
| 1475a | Polyethylene, Linear                     | 2.02                         | 50            |
| 1476a | Branded Polyethylene Resin               | 1.23                         | 12            |
| 1496  | Polyethylene Gas Pipe Resin, Unpigmented | 0.26                         | 908           |
| 1497  | Polyethylene Gas Pipe Resin, Pigmented   | 0.186                        | 9080          |



## Viscosity

| SRM  | Description   | Unit Size (mL) |
|------|---|----------------|
| 2490 | Non-Newtonian Polymer Solution for Rheology (Polyisobutylene Dissolved in 2,6,10,14-Tetramethylpentadecane) | 100            |
| 2491 | Non-Newtonian Polymer Melt for Rheology   | 100            |

## Biomaterials

| RM   | Description  | Unit Size   |
|------|--|---|
| 8456 | Ultra High Molecular Weight Polyethylene<br><i>Properties:</i><br>- Young's Modulus<br>- Yield Strength<br>- Ultimate Strength<br>- Elongation | bar: 7.62 cm diameter × 152.4 cm<br>(3 in diameter × 60 in) |
| 8457 | Ultra High Molecular Weight Polyethylene<br><i>Properties:</i><br>- Young's Modulus<br>- Yield Strength<br>- Ultimate Strength<br>- Elongation | 10 (0.5 cm) cubes   |

## THERMODYNAMIC PROPERTIES

### Calorimetry - Combustion

| SRM   | Description  | Heat of Combustion (MJ/kg)* | Unit Size (g) |
|-------|--|-----------------------------|---------------|
| 39j   | Benzoic Acid   | 26.434                      | 30            |
| 2692b | Coal, Bituminous: % S = 1.170  | (32.81)**                   | 50            |
| 2685b | Coal, Bituminous: % S = 4.730  | (26.94)**                   | 50            |
| 2682b | Coal, Sub-Bituminous: % S = 0.4917                                   | (25.66)**                   | 50            |
| 2151  | Nicotinic Acid   | 22.184                      | 25            |
| 2684b | Coal, Bituminous, Sulfur and Mercury:<br>% S = 3.08; Hg = 97.4 µg/kg | 28.56**                     | 50            |
| 1657  | Synthetic Refuse-Derived Fuel  | 13.87**                     | 100           |
| 2683b | Sulfur and Mercury in Coal: % S = 1.955,<br>Hg = 90.0 µg/kg          | 30.62                       | 50            |
| 1656  | Thianthrene  | 33.480                      | 30            |
| 2152  | Urea   | 10.536                      | 25            |



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

\*\* Gross calorific value or HHV (Higher Heating Value).

### Calorimetry - Solution

| SRM  | Description  | Heat of Solution      | Unit Size |
|------|--|-----------------------|-----------|
| 1655 | Potassium Chloride<br>(Water Solution Calorimetry) | Absorbed (235.86 J/g) | 30 g      |

### Enthalpy and Heat Capacity

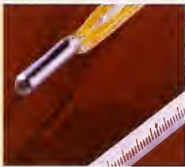
| SRM   | Description                                      | Unit Size              | Temperature Range (K) |
|-------|--|------------------------|-----------------------|
| RM 5  | Copper   | 1.9 cm diameter 12 cm  | 25 to 300             |
| 781D2 | Molybdenum                                       | 0.64 cm diameter 10 cm | 273.15 to 2800        |
| 705a  | Polystyrene<br>(Molecular Weight: 170 900 g/mol) | 5 g                    | 10 to 350             |
| 720   | Synthetic Sapphire                               | 15 g                   | 10 to 2250            |

## Differential Scanning Calorimetry

| SRM  | Description                  | Melting Temperature (K)                       | Enthalpy of Fusion (J/g) | Unit Size               |
|------|------------------------------|---|--------------------------|-------------------------|
| 2222 | Biphenyl (99.984 %)          | 342.41  | 120.41                   | 1 g                     |
| 2232 | Indium (99.9999 %)           | 156.5985 °C                                   | 28.51                    | 1 g                     |
| 2234 | Gallium for Thermal Analysis | —   | —                        | —                       |
| 2235 | Bismuth for Thermal Analysis | —   | —                        | —                       |
| 2225 | Mercury                      | 234.30  | 11.469                   | 2.5 g                   |
| 2220 | Tin (99.9995 %)              | 505.10  | 60.2                     | (2.5 × 2.5 × 0.0127) cm |
| 1514 | Thermal Analysis Purity Set  | 4 levels of p-ABA<br>(0.0 mol % to 5.0 mol %) | —                        | 4 × 0.5 g               |

## Differential Thermal Analysis

| RM     | Description          | Temperature Range (°C) | Unit Size |
|--------|----------------------|------------------------|-----------|
| GM 754 | ICTA Polystyrene DTA | 97.8 to 107.5          | 10 g      |
| 8759   | ICTA Set DTA         | 295 to 675             | 5 × 10 g  |
| 8760   | ICTA Set DTA         | 570 to 940             | 5 × 10 g  |



## Defining Fixed Points, International Temperature Scale of 1990, ITS-90

| SRM                             | Description                       | Temperature (°C) | Unit Size (g)    |
|---------------------------------|-----------------------------------|------------------|------------------|
| <b>Pure Metals</b>              |                                   |                  |                  |
| 743                             | Mercury (Triple Point)            | -38.8344         | ampoule: 680     |
| 1745                            | Indium (Freezing Point)           | 156.5985         | ingot: 20 × 10 g |
| 741a                            | Tin (Freezing Point)              | 231.928          | shot: 200        |
| 740a                            | Zinc (Freezing Point)             | 419.527          | shot: 200        |
| 1744                            | Aluminum (Freezing Point)         | 660.323          | ingot: 200       |
| 1746                            | Silver (Freezing Point)           | 961.780          | shot: 300        |
| 1751                            | Gallium Melting Point             | —                | 200              |
| <b>Devices (semi-open cell)</b> |                                   |                  |                  |
| 1747                            | Tin (Freezing Point), 99.9999+ %  | 231.928          | 1071             |
| 1748                            | Zinc (Freezing Point), 99.9999+ % | 419.527          | 1031             |

## Reference Points

| SRM | Description                      | Temperature (°C) | Unit Size (g) |
|-----|----------------------------------|------------------|---------------|
| 742 | Alumina, 99.9+ % (Melting Point) | 2052             | powder: 10    |
| 45d | Copper (Freezing Point)          | 1084.6           | bar: 450      |
| 49e | Lead (Freezing Point)            | 327.453          | bar: 600      |



## Freezing Point, Melting Point, and Triple Point Cells (sealed cell)

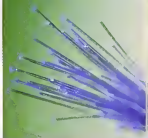
| SRM  | Description   | Temperature (°C) | Unit Size (g) |
|------|---|------------------|---------------|
| 1968 | Gallium (Melting Point), 99.9999+ %                               | 29.7646          | 25            |
| 1972 | 1,3-Dioxolan-2-one (Ethylene Carbonate) (Triple Point), 99.999+ % | 36.3143          | 60            |
| 1969 | Rubidium (Triple Point), 99.9+ %                                  | 39.30            | 154           |
| 1973 | n-Docosane (Triple Point), 99.999+ %                              | 43.879           | 60            |
| 1970 | Succinonitrile (Triple Point), 99.999+ %                          | 58.0642          | 60            |
| 1971 | Indium (Freezing Point), 99.9999+ %                               | 156.598          | 100           |

## Thermal Expansion of Metal and Glass

| SRM   | Description              | Temperature Range (K) | Unit Size (cm) |
|-------|--------------------------|-----------------------|----------------|
| 731L1 | Borosilicate Glass       | 80 to 680             | 0.64 × 5.1     |
| 731L2 | Borosilicate Glass       | 80 to 680             | 0.64 × 10.2    |
| 731L3 | Borosilicate Glass       | 80 to 680             | 0.64 × 15.2    |
| 736L1 | Copper                   | 20 to 800             | 0.64 × 5.1     |
| 738   | AISI 446 Stainless Steel | 293 to 780            | 0.64 × 5.1     |

## Thermal Resistance of Glass, Silica, and Polystyrene

| SRM   | Description                | Unit Size (cm) | Temperature Range (K) | Thermal Resistance at (m <sup>2</sup> · K · W <sup>-1</sup> ) |
|-------|----------------------------|----------------|-----------------------|---|
| 1449  | Fumed Silica Board         | 60 × 60 × 2.54 | 297.1                 | 1.2   |
| 1450c | Fibrous Glass Board        | 61 × 61 × 2.54 | 280 to 340            | 0.78  |
| 1452  | Fibrous Glass Blanket      | 60 × 60 × 2.54 | 297.1                 | 0.6   |
| 1453  | Expanded Polystyrene Board | 66 × 93 × 1.34 | 285 to 310            | 0.4   |
| 1459  | Fumed Silica Board         | 30 × 30 × 2.54 | 297.1                 | 1.2   |



## Vapor Pressure of Metals

| SRM | Description | Pressure Range (Pa)<br>(K, ITS-90) | Temperature Range | Unit Size                               |
|-----|-------------|------------------------------------|-------------------|---|
| 745 | Gold        | $10^{-3}$ to $10^2$                | 1300 to 2100      | wire: 0.14 cm diameter $\times$ 15.2 cm |
| 746 | Cadmium     | $10^{-6}$ to $10^1$                | 350 to 594        | rod: 0.64 cm diameter $\times$ 6.4 cm   |

## Thermal Conductivity of Graphite and Iron

| RM   | Description       | Unit Size          | Conductivity at 293 K<br>( $\text{W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ ) |
|------|-------------------|--------------------|---|
| 8420 | Electrolytic Iron | 0.64D $\times$ 5.0 | 77.9  |
| 8421 | Electrolytic Iron | 3.18D $\times$ 5.0 | 77.9  |
| 8424 | Graphite          | 0.64D $\times$ 5.0 | 90.9  |
| 8426 | Graphite          | 2.54D $\times$ 5.0 | 90.9  |

## Laboratory Thermometer (mercury in glass)

Unit Size: 1 each

| SRM | Description                     | Calibrated Points ( $^{\circ}\text{C}$ ) |
|-----|---------------------------------|--|
| 934 | Clinical Laboratory Thermometer | -0.20 to +0.20                           |

## Thermocouple Material, Platinum

Unit Size: 1 each

| SRM  | Description                                | Temperature Range                                  |
|------|--|--|
| 1749 | Gold vs. Platinum Thermocouple Thermometer | 0 $^{\circ}\text{C}$ to 1000 $^{\circ}\text{C}$    |
| 1967 | Platinum Wire, High Purity (99.999+ %)     | -197 $^{\circ}\text{C}$ to 1768 $^{\circ}\text{C}$ |
| 1750 | Standard Platinum Resistance Thermometer   | 14 K to 430 K                                      |

## OPTICAL PROPERTIES

### Molecular Transmittance and Absorbance



| SRM                                   | Description   | Wavelength Range        | Unit Size                                   |
|---------------------------------------|---|-------------------------|---|
| <b>Crystalline and Solution Forms</b> |   |                         |   |
| 935a                                  | Crystalline Potassium Dichromate, UV Absorbance           | 235 nm to 350 nm        | 15 g  |
| 1935                                  | Potassium Dichromate Solution, UV Absorbance              | 235 nm to 350 nm        | 10 ampoules:<br>5 samples, plus 5 blanks    |
| 2032                                  | Potassium Iodide, Stray Light                             | 240 nm to 275 nm        | 25 g  |
| 931g                                  | Liquid Filters, Absorbance                                | 302 nm to 678 nm        | 12 ampoules:<br>3 × 3 levels, plus 3 blanks |
| <b>Glass Filters, Transmittance</b>   |   |                         |   |
| 930e                                  | 10 %, 20 %, 30 % Transmittance                            | 440 nm to 635 nm        | 3 filters, plus 1 blank                     |
| 1930                                  | 1 %, 3 %, 50 % Transmittance                              | 440 nm to 635 nm        | 3 filters, plus 1 blank                     |
| 2031a                                 | Metal-on-Quartz Filters<br>10 %, 30 %, 90 % Transmittance | 250 nm to 635 nm        | 3 filters, plus 1 blank                     |
| 2053                                  | 20 nm Ni-Cr Film on Silica                                | 2 $\mu$ m to 25 $\mu$ m | 25 mm diameter × 250 $\mu$ m                |
| 2054                                  | 90 nm Ni-Cr Film on Silica                                | 2 $\mu$ m to 25 $\mu$ m | 25 mm diameter × 250 $\mu$ m                |
| 2055                                  | 77 nm Cu-Ni Film on Silica                                | 2 $\mu$ m to 25 $\mu$ m | 25 mm diameter × 250 $\mu$ m                |
| 2056                                  | 97 nm Cu-Ni Film on Silica                                | 2 $\mu$ m to 20 $\mu$ m | 25 mm diameter × 250 $\mu$ m                |
| 2930                                  | Ultimate Range Visible Absorbance Filters                 | —                       | 3 filters & 1 blank                         |

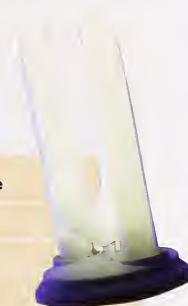


## Transmittance Wavelength Standards

| SRM   | Description                                       | Wavelength Range                  | Unit Size               |
|-------|---|-----------------------------------|-------------------------|
| 2035  | Near-IR Transmission                              | 971 nm to 1949 nm                 | 25 mm diameter × 1.5 mm |
| 2036  | Near-IR Wavelength/Wavenumber Reflection Standard | 975 nm to 1946 nm                 | —                       |
| 2037  | Red Diesel Dye                                    | —                                 | 100 mg                  |
| 2065  | Transmission Wavelength/Vacuum Wavenumber         | ultraviolet-visible–near-infrared | 25 mm diameter × 1.5 mm |
| 1921a | Infrared Transmission                             | 3.2 μm to 18.5 μm                 | 1 polystyrene film      |

## Fluorescence

| SRM/RM | Description  | Wavelength Range   | Unit Size                           |
|--------|--|--------------------|-------------------------------------|
| 936a   | Quinine Sulfate Dihydrate                                  | 375 nm to 675 nm   | 1 g                                 |
| 1932   | Fluorescein  | 488 nm to 191 nm   | 3 × 2 mL                            |
| 2242   | Relative Intensity Correction Standard, Raman Spectroscopy | —                  | 1 artifact                          |
| 2241   | Relative Intensity Correction Standard, Raman Spectroscopy | 785 nm             | 1 glass slide (10.7 × 30.4 × 2.0mm) |
| 2243   | Relative Intensity Correction Standard, Raman Spectroscopy | 488 nm to 514.5 nm | 1 glass slide                       |



## Specular Spectral Reflectance

| SRM  | Description                                   | Wavelength Range (nm) |
|------|---|-----------------------|
| 2003 | First Surface, Aluminum on Glass              | 250 to 2500           |
| 2011 | First Surface, Gold on Nickel-Plated Aluminum | 600 to 2500           |
| 2017 | Multi-Angle White Reflectance Standard        | 400 to 700            |
| 2023 | Second Surface, Aluminum on Fused Quartz      | 250 to 2500           |
| 2026 | First Surface, Black Glass                    | 250 to 2500           |
| 2040 | PTFE Diffuser for Spectral Reflectance Factor | 380 to 780            |

### Optical Rotation

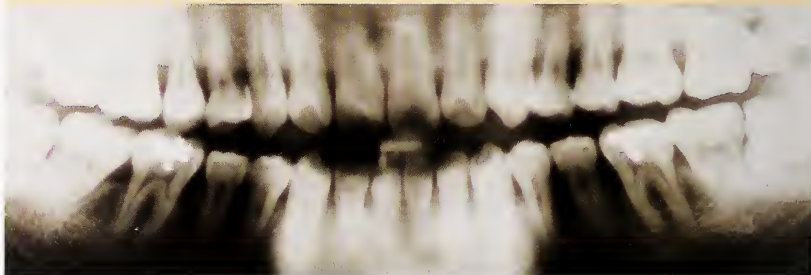
| SRM  | Description          | Wavelength Range | Unit Size |
|------|----------------------|------------------|-----------|
| 917b | D-Glucose (Dextrose) | 546 nm to 589 nm | 50 g      |
| 17e  | Sucrose              | 546 nm to 633 nm | 60 g      |

### Liquid Refractive Index

| SRM  | Description | Wavelength Range | Unit Size |
|------|-------------|------------------|-----------|
| 1922 | Mineral Oil | 468 nm to 589 nm | 30 mL     |

### X-ray and Photographic Imaging

| SRM   | Description                     | Unit Size        |
|-------|---------------------------------|------------------|
| 1010a | Microcopy Resolution Test Chart | 5 charts         |
| 1008  | Photographic Step Tablet        | 25.4 cm × 3.5 cm |
| 1001  | X-ray Film Step Tablet          | 25.4 cm × 3.5 cm |





## ELECTRICAL PROPERTIES

### Electrical Resistivity and Conductivity of Electrolytic Iron and Graphite

Unit Size: rod: 0.64 cm diameter × 5.0 cm

| RM                                       | Resistivity Range<br>( $\mu\Omega \cdot m$ ) | Unit Size                 |
|--|--|---------------------------|
| <i>Electrolytic Iron (2 K to 1000 K)</i> |  |                           |
| 8420                                     | 0.004 to 0.909                               | 0.64 cm diameter × 5.0 cm |
| <i>Graphite (5 K to 2500 K)</i>          |  |                           |
| 8424                                     | 28.78 to 12.59                               | 0.64 cm diameter × 5.0 cm |



### Electrical Resistivity and Conductivity of Silicon

| SRM  | Resistivity ( $\Omega \cdot cm$ ) | Type |              |
|------|-----------------------------------|------|--------------|
| 2541 | Silicon Resistivity               | 0.01 | 100D × 0.625 |
| 2542 | Silicon Resistivity               | 0.1  | 100D × 0.625 |
| 2543 | Silicon Resistivity               | 1    | 100D × 0.625 |
| 2544 | Silicon Resistivity               | 10   | 100D × 0.625 |
| 2545 | Silicon Resistivity               | 25   | 100D × 0.625 |
| 2546 | Silicon Resistivity               | 100  | 100D × 0.625 |
| 2547 | Silicon Resistivity               | 200  | 100D × 0.625 |

## OPTOELECTRONICS

| SRM   | Description   | Unit Size                          |
|---|---|------------------------------------|
| <b>Wavelength Calibration Standards</b>             |   |                                    |
| 2514  | Wavelength Calibration Reference for 1560 nm to 1595 nm - Carbon Monoxide ( $^{12}\text{C}^{16}\text{O}$ )            | Gas Absorption Cell                |
| 2515  | Wavelength Calibration Reference for 1595 nm to 1630 nm - Carbon Monoxide ( $^{13}\text{C}^{16}\text{O}$ )            | Gas Absorption Cell                |
| 2517a   | High Resolution Wavelength Calibration Reference for 1510 nm to 1540 nm - Acetylene ( $^{12}\text{C}_2\text{H}_2$ )   | Gas Absorption Cell                |
| 2519a   | Wavelength Reference Absorption Cell for 1530 nm to 1560 nm Hydrogen Cyanide ( $\text{H}^{13}\text{C}^{14}\text{N}$ ) | Gas Absorption Cell                |
| <b>Polarization Mode Dispersion Standards</b>       |   |                                    |
| 2518  | Polarization Mode Dispersion Standard   | 1 each                             |
| 2538  | Deterministic Polarization Mode Dispersion Standard   | 1 each                             |
| <b>Fiber and Fiber-Connector Geometry Standards</b> |   |                                    |
| 2513  | Mode Field Diameter Standard for Single-Mode Fiber  | 1 each                             |
| 2520  | Optical Fiber Diameter Standard   | 1 each                             |
| 2522  | Pin Gauge Standard for Optical Fiber Ferrules   | 1 wire-sizing bore                 |
| 2523  | Optical Fiber Ferrule Geometry Standard   | 1 ceramic connector ferrule        |
| 2553  | Optical Fiber Coating Diameter ( $n = 1.504$ )  | 1 each: 250 $\mu\text{m}$ diameter |
| 2554  | Optical Fiber Coating Diameter ( $n = 1.515$ )  | 1 each: 250 $\mu\text{m}$ diameter |
| 2555  | Optical Fiber Coating Diameter ( $n = 1.535$ )  | 1 each: 250 $\mu\text{m}$ diameter |

## METROLOGY

### Optical Microscope Linewidth Measurement (Photomask)



| SRM                                    | Linewidth ( $\mu\text{m}$ ) | Pitch ( $\mu\text{m}$ ) | Unit Size (cm)                 |
|--|-----------------------------|-------------------------|--------------------------------|
| <b>Linewidth Measurement Standards</b> |                             |                         |                                |
| 475                                    | 0.9 to 10.8                 | 2 to 36                 | $6.35 \times 6.35 \times 0.15$ |
| 476                                    | 0.9 to 10.8                 | 2 to 36                 | $6.35 \times 6.35 \times 0.15$ |

### Microscale Dimensional Measurement Standards

| SRM  | Description                             | Unit Size (cm)  |
|------|---|---|
| 2800 | Microscope Magnification Standard       | $25 \text{ mm} \times 75 \text{ mm} \times 2.3 \text{ mm}$    |
| 5001 | Two-Dimensional Grid Photomask Standard | $6.0 \text{ in} \times 6.0 \text{ in} \times 0.25 \text{ in}$ |



## Scanning Electron Microscope (SEM)

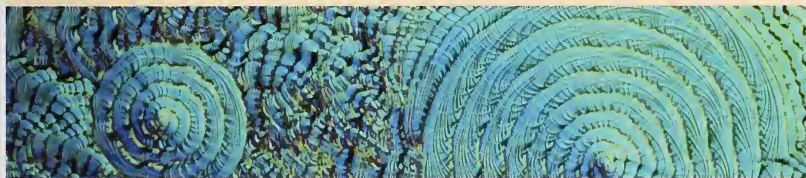
| SRM/RM | Description                       | Spacings     | Unit Size (mm)                  |
|--------|-----------------------------------|--------------|---------------------------------|
| 2069b  | SEM Performance Standard          | 2 mm to 4 mm | 12 mm diameter with 3 mm peg    |
| 8091   | SEM Sharpness Standard            |              | semiconductor chip: 2 mm × 2 mm |
| 2800   | Microscope Magnification Standard | 1 μm to 5 mm | 25 × 75 × 2.3                   |

## Thin Film for Transmission Electron Microscope

| SRM   | Description                           | Certified Element     | Unit Size    |
|-------|---------------------------------------|-----------------------|--------------|
| 2063a | Microanalysis Thin Film Mineral Glass | Ar, Ca, Fe, Mg, O, Si | 1 glass film |

## Depth Profiling

| SRM   | Description  | Value   | Unit Size (cm)  |
|-------|--|---|-----------------|
| 2133  | Phosphorus Implant in Silicon Depth Profile Standard | <sup>31</sup> P: 0.04927 μg/cm <sup>2</sup><br>(9.58 × 10 <sup>14</sup> atoms/cm <sup>2</sup> ) | crystal 1 × 1   |
| 2134  | Arsenic Implant in Silicon Profile Standard          | <sup>75</sup> As - 7 × 10 <sup>14</sup> atoms/cm <sup>2</sup>                                   | crystal: 1 × 1  |
| 2135c | Nickel-Chromium Thin-Film Depth Profile Standard     | Cr: 41.3 μg/cm <sup>2</sup><br>Ni: 49.4 μg/cm <sup>2</sup>                                      | 1 × 2.54 × 0.04 |
| 2137  | Boron Implant in Silicon Depth Profile Standard      | <sup>10</sup> B - 1.018 v 1015 atoms/cm <sup>2</sup>  | 1 × 1           |



SILICON CRYSTAL

## Solder Thickness for X-ray Fluorescence

Unit Size: plate: 15 mm × 15 mm

| SRM  | Description    | Composition      | Coating Mass/Area      | Coating Thickness |      |
|------|----------------|------------------|------------------------|-------------------|------|
|      |                |                  |                        | (μm)              | (μm) |
| 2321 | Tin-Lead Alloy | 60 % Sn, 40 % Pb | 6.8 mg/cm <sup>2</sup> | 295               | 7.5  |

## Coating Thickness

Unit Size: 45 mm × 45 mm

These SRMs are suitable for calibrating instruments based on magnetic induction and magnetic pull-off techniques used in the measurement of organic and non-magnetic inorganic coatings over steel.

| SRM                                  | Nominal Coating Thickness |                    |
|--------------------------------------|---------------------------|--------------------|
|                                      | ( $\mu\text{m}$ )         | (mils)             |
| <b>Chromium over Copper on Steel</b> |                           |                    |
| 1358a                                | 80, 255, 1000             | 3.1, 9.8, 39       |
| 1359b                                | 48, 140, 505, 800         | 2.0, 5.5, 20, 32   |
| 1361b                                | 6, 12, 25, 48             | 0.2, 0.5, 1.0, 2.0 |
| 1362b                                | 40, 80, 140, 205          | 1.6, 3.1, 5.5, 7.9 |
| 1363b                                | 255, 385, 505, 635        | 9.8, 16, 20, 26    |
| 1364b                                | 800, 1000, 1525, 1935     | 32, 39, 59, 79     |

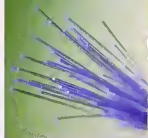


## Ellipsometry

Unit Size: 76 mm substrate diameter

Each unit is certified for the ellipsometric parameters delta ( $\Delta$ ) and psi ( $\psi$ ) at the vacuum wavelength  $\lambda = 633.0$  nm, and for the derived values of the thicknesses and indexes of refraction of the silicon dioxide and silicon layers.

| SRM                                  | Thickness (nm) |
|--------------------------------------|----------------|
| <b>Thin Film Thickness Standards</b> |                |
| 2534                                 | 25             |



## Superconducting Critical Current (wire form)

Unit Size: wire: 8.7 cm diameter  $\times$  2.2 m

| SRM  | Description           | Magnetic Field Range (T) | Critical Current Range (A) |
|------|-----------------------|--------------------------|----------------------------|
| 1457 | Niobium-Titanium Wire | 2.000 to 8.000           | 293.30 to 69.72            |

## CERAMICS AND GLASSES

### Chemical Resistance [Durability] of Glass



| SRM | Description      | mL of N/50 H <sub>2</sub> SO <sub>4</sub> | Unit Size (kg) |
|-----|------------------|---|----------------|
| 623 | Borosilicate     | 0.34                                      | 2.2            |
| 622 | Soda-Lime Silica | 7.67                                      | 2.2            |

### Electrical Properties of Glass

Unit Size: 5 cm  $\times$  5 cm  $\times$  2.5 cm

SRM 624 is suitable for use with ASTM C 657. SRM 774 is suitable for use with ASTM D 150.

| SRM | Description   | Unit Size (cm)            | Value  |
|-----|---|---------------------------|--|
| 624 | Lead Silica for DC Volume Resistivity                           | 5 $\times$ 5 $\times$ 2.5 | $\log_{10} \rho \geq 9.9 \Omega\text{-cm at } 300^\circ\text{C}$ |
| 774 | Lead Silica for Dielectric Constant and ac Loss Characteristics | 5 $\times$ 5 $\times$ 2.5 | $K \approx 7.47 \text{ at } 100 \text{ Hz}$                      |

## Viscosity of Glass

| SRM  | Description            | Unit Size (mm)        |
|------|------------------------|-----------------------|
| 717a | Borosilicate Glass     | block: 40 × 40 × 150  |
| 710a | Soda-Lime-Silica Glass | block: 100 × 100 × 40 |

## Viscosity Fixpoints of Glass

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

| SRM  | Description                      | Unit Size               |
|------|----------------------------------|-------------------------|
| 714  | Alkaline Earth Alumina Silicate  | 225 g                   |
| 717a | Borosilicate                     | 40 mm × 40 mm × 150 mm  |
| 713  | Dense Barium Crown 620/603 Glass | 225 g                   |
| 709  | Extra Dense Lead Silica          | 4 cm × 4 cm × 5 cm      |
| 716  | Neutral Glass                    | 250 g                   |
| 710a | Soda-Lime-Silica                 | 100 mm × 100 mm × 40 mm |



## Relative Stress Optical Coefficient

| SRM | Description             | Relative Stress Optical Coefficient (C)<br>at $\lambda = 546.1$ nm<br>(Value × $10^{-12}$ m <sup>2</sup> /N) | Unit Size               |
|-----|-------------------------|--|-------------------------|
| 709 | Extra Dense Lead Silica | C = - 1.359  | bar: 4 cm × 4 cm × 5 cm |

## Density

| SRM   | Description       | Density (kg/m <sup>3</sup> ) | Unit Size                   |
|-------|-------------------|------------------------------|-----------------------------|
| 1826b | Soda-Lime Glass   | 2548.668 at 20 °C            | slab: 8 mm × 20 mm × 40 mm  |
| 1827a | Lead Silica Glass | 3593.800 at 20 °C            | slab: 25 cm × 25 cm × 12 cm |
| 211d  | Toluene           | 871.476 at 15 °C             | 4 × 5 mL                    |
| 2214  | Isooctane         | 695.969 at 15 °C             | 4 × 5 mL                    |

## Glass Liquidus Temperature

| SRM  | Description      | Unit Size                          | Method                           | Temperature (°C) |
|------|------------------|------------------------------------|----------------------------------|------------------|
| 773  | Soda-Lime-Silica | 2.5 cm × 2.5 cm × 0.6 cm           | A (boat)<br>B (perforated plate) | 988<br>991       |
| 1416 | Aluminosilicate  | 22 lengths of 12.7 cm tube (250 g) |                                  | 1147             |

## X-RAY SPECTROMETRY

### X-ray Diffraction

| SRM   | Description  | XRD Application           | Unit Size (g)          |
|-------|--|---------------------------|------------------------|
| 676   | Alumina (Corundum Structure)   | Quantitative Analysis     | 20                     |
| 1976  | Alumina Plate, Sintered  | Instrument Response       | 45 mm × 45 mm × 1.6 mm |
| 2910  | Calcium Hydroxyapatite   | Quantitative Analysis     | 5                      |
| 660a  | Lanthanum Hexaboride Powder  | Line Position, Line Shape | 6                      |
| 675   | Mica   | Low 2θ (Large d-Spacing)  | 7.5                    |
| 1879a | Respirable Cristobalite  | Quantitative Analysis     | 5                      |
| 1878a | Respirable Quartz  | Quantitative Analysis     | 5                      |
| 656   | Silicon Nitride  | Quantitative Analysis     | 2 × 10 g               |
| 640c  | Silicon Powder 2~ /d-Spacing   | Line Position, Line Shape | 7.5                    |
| 674b  | X-ray Powder Diffraction Intensity Set (α-Al <sub>2</sub> O <sub>3</sub> , CeO <sub>2</sub> , Cr <sub>2</sub> O <sub>3</sub> , TiO <sub>2</sub> , ZnO) | Quantitative Analysis     | —                      |
| 1990  | Single Crystal Diffractometer Alignment Standard   | Quantitative Analysis     | 3 spheres              |

# RADIOACTIVITY

- 95 Alpha Particle Solution Standards
- 96 Beta Particle and Electron Capture Solution Standards
- 97 Gamma Point Source
- 97 Radiopharmaceutical Standards
- 98 Beryllium Isotopic Ratio Standard
- 98 Radiocarbon Dating Contemporary Standards
- 99 Environmental Natural Matrix Standards
- 99 Neutron Density Monitor Wire
- 99 Fission Track Glass





**TABLE 1: Alpha Particle Solution Standards**

| Radionuclide          | SRM Number | Approx. Bq g <sup>-1</sup> | Reference Time | Expanded Uncertainty | Solution Mass | Chemical Form (%)                               | Solution Composition (g) | Notes |
|-----------------------|------------|----------------------------|----------------|----------------------|---------------|---|--------------------------|-------|
| Americium-241*        | 4322B      | 40                         | Sep 1991       | 1.0                  | 5             | Am(NO <sub>3</sub> ) <sub>3</sub>               | 1 M HNO <sub>3</sub>     |       |
| Americium-243*        | 4332D      | 40                         | May 1995       | 0.8                  | 5             | Am(NO <sub>3</sub> ) <sub>3</sub>               | 1 M HNO <sub>3</sub>     |       |
| Curium-243*           | 4329       | 70                         | Jun 1984       | 1.4                  | 5             | Cm(NO <sub>3</sub> ) <sub>3</sub>               | 1 M HNO <sub>3</sub>     |       |
| Curium-244*           | 4320A      | 35                         | Feb 1996       | 0.7                  | 5             | Cm(NO <sub>3</sub> ) <sub>3</sub>               | 1 M HNO <sub>3</sub>     |       |
| Neptunium-237*        | 4341       | 100                        | Mar 1992       | 1.3                  | 5             | Np(NO <sub>3</sub> ) <sub>3</sub>               | 2 M HNO <sub>3</sub>     |       |
| Plutonium-238*        | 4323A      | 30                         | Feb 1994       | 0.7                  | 5             | Pu(NO <sub>3</sub> ) <sub>6</sub>               | 3 M HNO <sub>3</sub>     |       |
| Plutonium-239*        | 4330B      | 40                         | Dec 1995       | 0.7                  | 5             | Pu(NO <sub>3</sub> ) <sub>6</sub>               | 3 M HNO <sub>3</sub>     |       |
| Plutonium-240*        | 4338A      | 40                         | May 1996       | 0.8                  | 5             | Pu(NO <sub>3</sub> ) <sub>6</sub>               | 3 M HNO <sub>3</sub>     |       |
| Plutonium-242*        | 4334G      | 25                         | Jun 1994       | 0.8                  | 5             | Pu(NO <sub>3</sub> ) <sub>6</sub>               | 3 M HNO <sub>3</sub>     |       |
| Polonium-209**        | 4326       | 85                         | Mar 1994       | 0.4                  | 5             | PoCl <sub>4</sub>                               | 2 M HCl                  |       |
| Radium-226            | 4969       | 3                          | Sep 1998       | 1.8                  | 5             | RaCl <sub>2</sub>                               | 1.5 M HCl                |       |
| Radium-226            | 4965       | 30                         | Sep 1991       | 1.2                  | 5             | RaCl <sub>2</sub>                               | 1.4 M HCl                |       |
| Radium-226**          | 4966       | 270                        | Sep 1991       | 1.2                  | 5             | RaCl <sub>2</sub>                               | 1.4 M HCl                |       |
| Radium-226**          | 4967A      | 2,500                      | Sep 2003       | 0.9                  | 5             | RaCl <sub>2</sub>                               | 1 M HCl                  |       |
| Radon-222             | 4971       | 4 Total                    | #              | #                    | 0.2           | RaCl <sub>2</sub>                               | 1 M HCl                  | a     |
| Radon-222             | 4972       | 40 Total                   | #              | #                    | 0.2           | RaCl <sub>2</sub>                               | 1 M HCl                  | a     |
| Radon-222             | 4973       | 400 Total                  | #              | #                    | 0.2           | RaCl <sub>2</sub>                               | 1 M HCl                  | a     |
| Radon-222             | 4974       | 5000 Total                 | May 2005       | 1.3                  | 0.2           | RaCl <sub>2</sub>                               | 1 M HCl                  |       |
| Thorium-229           | 4328C      | 30                         | #              | #                    | 5             | Th(NO <sub>3</sub> ) <sub>4</sub>               | 1 M HNO <sub>3</sub>     |       |
| Thorium-230           | 4342A      | 50                         | #              | #                    | 5             | Th(NO <sub>3</sub> ) <sub>4</sub>               | 1 M HNO <sub>3</sub>     |       |
| Uranium-232           | 4324B      | 30                         | Jul 2002       | 0.8                  | 5             | UO <sub>2</sub> (NO <sub>3</sub> ) <sub>2</sub> | 2 M HNO <sub>3</sub>     |       |
| Uranium-238 (Natural) | 4321C      |                            | Jan 1992       |                      | 5             | UO <sub>2</sub> (NO <sub>3</sub> ) <sub>2</sub> | 1 M HNO <sub>3</sub>     |       |
| Uranium-238           |            | 250                        |                | 0.9                  |               |   |                          |       |
| Uranium-235           |            | 11                         |                | 1.0                  |               |   |                          |       |
| Uranium-234           |            | 240                        |                | 1.9                  |               |   |                          |       |

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\*\* **License Certification** is not required by NIST for this material but a state-issued license may be required for possession. Contact your state Office of Radiation Safety for further information.

# Material in preparation.

a) SRMs 4971, 4972, and 4973 are intended for the calibration of radon-222 measuring instruments. They consist of small heat-sealed polyethylene cylinders containing approximately 0.2 g of radium-226 solution. These SRMs are calibrated in terms of radium-226 activity and in terms of the emanation fraction of the radon-222 under specified conditions.

**TABLE 2: Beta Particle and Electron Capture Solution Standards**

| Radionuclide   | SRM Number | Approx. Bq g <sup>-1</sup> | Reference Time | Expanded Uncertainty | Solution Mass (%) | Chemical Form (g)                  | Solution Composition | Notes |
|----------------|------------|----------------------------|----------------|----------------------|-------------------|------------------------------------|----------------------|-------|
| Barium-133 *   | 4251C      | 500,000                    | Sep 1993       | 0.5                  | 5                 | BaCl <sub>2</sub>                  | 1 M HCl              |       |
| Carbon-14      | 4222C      | 50,000                     | Sep 1990       | 0.8                  | 5                 | n-Hexadecane                       | n-Hexadecane         |       |
| Cesium-137 *   | 4233E      | 300,000                    | Jan 2004       | 0.7                  | 5                 | CsCl                               | 1 M HCl              |       |
| Chlorine-36    | 4943       | 10,000                     | Dec 1984       | 0.8                  | 3                 | NaCl                               | H <sub>2</sub> O     |       |
| Cobalt-60 *    | 4915E      | 75,000                     | Jan 1995       | 0.6                  | 5                 | CoCl <sub>2</sub>                  | 1 M HCl              |       |
| Europium-152*  | 4370C      | 90,000                     | Feb 1987       | 1.1                  | 5                 | EuCl <sub>3</sub>                  | 1 M HCl              |       |
| Holmium-166m*  | 4274       | 20,000                     | #              | #                    | 5                 | HoCl <sub>3</sub>                  | 1 M HCl              |       |
| Hydrogen-3†    | 4361C      | 2                          | Sep 1998       | 1.1                  | 500               | H <sub>2</sub> O                   | H <sub>2</sub> O     |       |
| Hydrogen-3     | 4926E      | 5,000                      | Sep 1998       | 1.1                  | 20                | H <sub>2</sub> O                   | H <sub>2</sub> O     |       |
| Hydrogen-3     | 4927F      | 600,000                    | Sep 1998       | 1.1                  | 5                 | H <sub>2</sub> O                   | H <sub>2</sub> O     |       |
| Hydrogen-3     | 4947C      | 300,000                    | Mar 1987       | 1.2                  | 4                 | Toluene                            | Toluene              |       |
| Iodine-129*    | 4949C      | 3,500                      | Mar 1993       | 0.7                  | 5                 | Nal                                | 0.01 M NaOH          |       |
| Iron-55        | 4929F      | 30,000                     | #              | #                    | 5                 | FeCl <sub>3</sub>                  | 1 M HCl              |       |
| Lead-210       | 4337       | 10,000                     | #              | #                    | 5                 | Pb (NO <sub>3</sub> ) <sub>2</sub> | 1 M HNO <sub>3</sub> |       |
| Nickel-63*     | 4226C      | 50,000                     | Aug 1995       | 0.9                  | 5                 | NiCl <sub>2</sub>                  | 1 M HCl              |       |
| Plutonium-241* | 4340B      | 500                        | #              | #                    | 5                 | Pu(NO <sub>3</sub> ) <sub>3</sub>  | 3 M HNO <sub>3</sub> |       |
| Radium-228     | 4339B      | 200                        | #              | #                    | 5                 | Ra(NO <sub>3</sub> ) <sub>2</sub>  | 1 M HNO <sub>3</sub> |       |
| Strontium-90*  | 4919H      | 4,000                      | Jul 1995       | 0.8                  | 5                 | SrCl <sub>2</sub>                  | 1 M HCl              |       |
| Technetium-99  | 4288A      | 30,000                     | Sep 1996       | 1.2                  | 5                 | K <sub>2</sub> TcO <sub>4</sub>    | 0.001 M KOH          |       |



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# Material in preparation.

† This standard is not radioactive material for licensing or shipping purposes.



**TABLE 3: Gamma Ray Point Source Standards**

| Radionuclide  | SRM Number | Principal Photon Energies (keV) | Approx. Activity (Bq) | Reference Time | Expanded Uncertainty | Chemical Form (%) | Notes |
|---------------|------------|---------------------------------|-----------------------|----------------|----------------------|-------------------|-------|
| Barium-133    | 4241C      | 81 - 384                        | 60,000 to 140,000     | Jan 1999       | 0.6                  | BaCl <sub>2</sub> | a     |
| Europium-152* | 4218F      | 122 - 1400                      | 60,000 to 140,000     | Jan 1999       | 0.8                  | EuCl <sub>3</sub> | a     |
| Niobium-94*   | 4201B      | 702, 871                        | 4,000                 | Apr 1970       | 1.5                  | NbO               | a     |

\* **License Certification** is required by NIST for this material. The form on the inside back page of this brochure may be used for this purpose.

- a) This standard consists of a dried deposit, usually with a diameter of less than 0.5 cm, of the radionuclide sealed between two layers of 0.006 cm thick polyester tape that are supported on an aluminum annulus. The annulus has an outside diameter of 5.4 cm, an inside diameter of 3.8 cm, and a thickness of 0.05 cm.

**TABLE 4: Radiopharmaceutical Standards**

| Radionuclide    | SRM Number | Approx. MBqg <sup>-1</sup> | Approx. Half Life | Expanded Uncertainty (%) | Solution Mass (g) | Chemical Form                    | Solution Composition | Notes |
|-----------------|------------|----------------------------|-------------------|--------------------------|-------------------|----------------------------------|----------------------|-------|
| Gallium-67*     | 4416L      | 4                          | 3 d               | 0.6                      | 5                 | GaCl <sub>3</sub>                | 2 M HCl              | a     |
| Indium-111*     | 4417L      | 5                          | 3 d               | 0.6                      | 5                 | InCl <sub>3</sub>                | 3 M HCl              | a     |
| Iodine-125*     | 4407L      | 1                          | 60 d              | 0.8                      | 5                 | KI                               | 0.01 M LiOH          | a     |
| Iodine-131*     | 4401L      | 5                          | 8 d               | 0.7                      | 5                 | KI                               | 0.01 M LiOH          | a     |
| Molybdenum-99*  | 4412L      | 10                         | 3 d               | 0.8                      | 5                 | Na <sub>2</sub> MoO <sub>4</sub> | 3 M HNO <sub>3</sub> | a     |
| Technetium-99m* | 4410H      | 1000                       | 6 h               | 0.7                      | 5                 | NaTcO <sub>4</sub>               | 0.15 M NaCl          | a     |
| Thallium-201*   | 4404L      | 4                          | 3 d               | 0.8                      | 5                 | TlNO <sub>3</sub>                | 1 M HNO <sub>3</sub> | a     |
| Xenon-133*      | 4415L      | 500 Total                  | 5 d               | 0.8                      | 5 mL              | Xe                               | Xe gas               | a, b  |
| Yttrium-90*     | 4427L      | 1                          | 3 d               | 0.8                      | 5                 | YCl <sub>3</sub>                 | 1 M HCl              | a     |

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- a) Orders for these radionuclides must be received by the third day of the month in which the distribution is scheduled. For further information contact the NIST Radioactivity Group.
- b) SRM 4415 consists of xenon-133 plus non-radioactive xenon, uncompressed, in a flame-sealed borosilicate glass ampoule. The ampoule has an outside diameter of 1.5 cm and a length of 4.5 cm.

**TABLE 5: Beryllium Isotopic Ratio Standard**

| Nuclides                      | SRM Number | Approx. Bqg <sup>-1</sup> | Isotopic Ratio        | Reference Time | Expanded Uncertainty (%) | Solution Volume (mL) | Chemical Form     | Solution Composition | Beryllium Concentration (mg·mL <sup>-1</sup> ) |
|-------------------------------|------------|---------------------------|-----------------------|----------------|--------------------------|----------------------|-------------------|----------------------|--|
| Beryllium-10/<br>Beryllium-9† | 4325       | 0.0002                    | 3 x 10 <sup>-11</sup> | Aug 1986       | 5.1                      | 50                   | BeCl <sub>2</sub> | 1 M HCl              | 5  |

† This standard is not radioactive material for licensing or shipping purposes.



**TABLE 6: Radiocarbon Dating Contemporary Standard**

| Radionuclide | SRM Number | Approx. Bqg <sup>-1</sup> | Reference Time | Expanded Uncertainty (%) | Mass (g)        | Chemical Form | Physical Form      | Notes |
|--------------|------------|---------------------------|----------------|--------------------------|-----------------|---------------|--------------------|-------|
| Carbon-14†   | 4990C      | 0.08                      | 1980           | 1.6                      | 225<br>(8 x 28) | Oxalic Acid   | Crystalline Powder | a     |

† This standard is not radioactive material for licensing or shipping purposes

- a) This SRM replaces SRM 4990, which has been in use in radiocarbon-dating laboratories since 1958. The material is part of a 450 kg lot of oxalic acid that was prepared by fermentation of French beet molasses from the 1977 spring, summer, and fall harvests. The ratio of the massic activity of SRM 4990C to that of SRM 4990, and the mass spectrometric ratios of carbon-13 to carbon-12 in each, were measured by eleven international carbon-dating laboratories in an intercomparison organized by L.M. Cavallo and W.B. Mann. See Proceedings of the 11th International Radiocarbon Dating Conference, M. Stuiver and R. Kra, Editors, *Radiocarbon* 25, No. 2 (1983).



**TABLE 7: Environmental Natural Matrix Standards**

| SRM Number | Name                 | Mass (g) | Activity Certified  | Activity Given But Not Certified  | Other Data |
|------------|----------------------|----------|---|---|------------|
| 4350B      | River Sediment†      | 85       | <sup>60</sup> Co, <sup>137</sup> Cs, <sup>152</sup> Eu, <sup>154</sup> Eu, <sup>226</sup> Ra, <sup>238</sup> Pu, <sup>239+240</sup> Pu, <sup>241</sup> Am   | <sup>40</sup> K, <sup>55</sup> Fe, <sup>90</sup> Sr, <sup>228</sup> Th, <sup>230</sup> Th, <sup>232</sup> Th, <sup>234</sup> U, <sup>235</sup> U, <sup>238</sup> U    | a, b, c    |
| 4351       | Human Lung†          | 45       | <sup>232</sup> Th, <sup>234</sup> U, <sup>238</sup> U, <sup>239+240</sup> Pu, <sup>238</sup> Pu/( <sup>235+240</sup> Pu)  | <sup>228</sup> Th, <sup>230</sup> Th, <sup>241</sup> Am   | c          |
| 4352       | Human Liver†         | 45       | <sup>238</sup> Pu, <sup>239+240</sup> Pu, <sup>241</sup> Am   | <sup>228</sup> Th, <sup>230</sup> Th, <sup>232</sup> Th, <sup>234</sup> U, <sup>235</sup> U, <sup>238</sup> U   | c          |
| 4353A      | Rocky Flats Soil II† | 85       | In preparation  | In preparation  |            |
| 4354       | Lake Sediment†       | 25       | <sup>60</sup> Co, <sup>90</sup> Sr, <sup>137</sup> Cs, <sup>228</sup> Th, <sup>232</sup> Th, <sup>235</sup> U, <sup>238</sup> U, <sup>238</sup> Pu, <sup>239+240</sup> Pu, <sup>241</sup> Am  | <sup>210</sup> Pb, <sup>226</sup> Ra, <sup>230</sup> Th, <sup>234</sup> U   | a, c       |
| 4355       | Peruvian Soil †      | 75       | <sup>137</sup> Cs, <sup>228</sup> Th, <sup>230</sup> Th, <sup>232</sup> Th, <sup>239+240</sup> Pu, <sup>241</sup> Am, Upper limits on: <sup>60</sup> Co, <sup>125</sup> Sb, <sup>152</sup> Eu, <sup>154</sup> Eu, <sup>155</sup> Eu | <sup>40</sup> K, <sup>55</sup> Fe, <sup>90</sup> Sr, <sup>208</sup> Tl, <sup>214</sup> Bi, <sup>238</sup> Pu  | c          |
| 4356       | Ashed Bone†          | 15       | <sup>90</sup> Sr, <sup>226</sup> Ra, <sup>230</sup> Th, <sup>232</sup> Th, <sup>234</sup> U, <sup>238</sup> U, <sup>238</sup> Pu, <sup>239+240</sup> Pu, <sup>243+244</sup> Cm  | <sup>40</sup> K, <sup>210</sup> Pb, <sup>210</sup> Po, <sup>226</sup> Ac, <sup>228</sup> Ra, <sup>228</sup> Th, <sup>238</sup> U, <sup>241</sup> Am                   |            |
| 4357       | Ocean Sediment†      | 85       | <sup>40</sup> K, <sup>90</sup> Sr, <sup>137</sup> Cs, <sup>226</sup> Ra, <sup>228</sup> Th, <sup>230</sup> Th, <sup>232</sup> Th, <sup>238</sup> Pu, <sup>239+240</sup> Pu  | <sup>129</sup> I, <sup>155</sup> Eu, <sup>210</sup> Pb, <sup>226</sup> Ra, <sup>234</sup> U, <sup>235</sup> U, <sup>238</sup> U, <sup>237</sup> Np, <sup>241</sup> Am | a, c       |
| 4358       | Ocean Shellfish†     | 300      | In preparation  | In preparation  |            |

† This standard is not radioactive material for licensing or shipping purposes.

a) Semi-quantitative elemental analysis by emission spectrographic measurements.

b) Analysis of plutonium isotopes by mass spectrometry.

c) Particle size distribution.

**TABLE 8: Neutron Density Monitor Wire**

| SRM | Description             | Cobalt Composition (weight %) | Unit Size             |
|-----|-------------------------|-------------------------------|-----------------------|
| 953 | Cobalt in Aluminum Wire | 0.116                         | 0.5 mm diameter × 1 m |

**TABLE 9: Fission Track Glass**

Each unit consists of four unirradiated glass wafers and two irradiated wafers.

| SRM  | Uranium Composition (µg/g) | Uranium-235 (Atom %) | Reactor Position | Neutron Fluence (× 10 <sup>14</sup> n/cm <sup>2</sup> ) |           |
|------|----------------------------|----------------------|------------------|---|-----------|
|      |                            |                      |                  | Copper Foil   | Gold Foil |
| 963a | 0.823                      | 0.2792               | RT-4             | 39.5  | 43.0      |
|      |                            |                      | RT-3             | 41.2  | 45.8      |

# INDUSTRIAL HYGIENE

**101 Materials on Filter Media**

**101 Trace Constituent Elements  
in Blank Filters**

**101 Respirable Silica**

**102 Lead in Paint, Dust,  
and Soil**

**103 Asbestos**



## Materials on Filter Media

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

| SRM/RM  | Description                   | Set Size                 | Elemental Composition                     | Diameter (mm) | Pore Size (µm) |
|---------|-------------------------------|--------------------------|---|---------------|----------------|
| 2783    | Air Particulate on Filter     | 2 filters, plus 2 blanks | 18 certified values<br>9 reference values | 47            | 0.4            |
| RM 8785 | Particulate Matter on Filters | 3 filters                | 1 reference value<br>2 information values | 37            | —              |
| RM 8786 | Filter Blank for RM 8785      | 1 blank filter           |   | 37            | —              |

## Trace Constituent Elements in Blank Filters

SRMs 2678 and 2681 are for use in evaluating the performance of air sampling filter methods with either certified values (in µg) or limits of detection ( $X_{\text{LOD}}$ ) for each of 30 constituent elements, as well as six leachable anions and cations.

| SRM  | Description                | Diameter (mm) | Pore Size (µm) | Filter Weight (g) |
|------|----------------------------|---------------|----------------|-------------------|
| 2678 | Cellulose Acetate Membrane | 47            | 0.45           | 0.09              |
| 2681 | Ashless Blank Filter       | 42.5          | —              | 0.14              |

## Respirable Silica

These SRMs are intended for use in determining, by X-ray diffraction, the levels of respirable silica in an industrial atmosphere according to the National Institute for Occupational Safety and Health (NIOSH) Analytical Method 7500 or equivalent methods.

| SRM   | Description                                   | Mass Fraction/Mass Loading            | Unit Size            |
|-------|---|---------------------------------------|----------------------|
| 1878a | Respirable Alpha Quartz                       | 100.00% ± 0.21%                       | 5 g                  |
| 1879a | Respirable Cristobalite                       | 95.6% ± 0.4%                          | 5 g                  |
| 2950  | Respirable Alpha Quartz on Filter Media       | (10, 20, 50, 100, 250, 500) µg/filter | set SRMs 2952-57     |
| 2951  | Respirable Alpha Quartz on Filter Media       | 5 µg/filter                           | 5 filters (5 blanks) |
| 2952  | Respirable Alpha Quartz on Filter Media       | 10 µg/filter                          | 5 filters (5 blanks) |
| 2953  | Respirable Alpha Quartz on Filter Media       | 20 µg/filter                          | 5 filters (5 blanks) |
| 2954  | Respirable Alpha Quartz on Filter Media       | 50 µg/filter                          | 5 filters (5 blanks) |
| 2955  | Respirable Alpha Quartz on Filter Media       | 100 µg/filter                         | 5 filters (5 blanks) |
| 2956  | Respirable Alpha Quartz on Filter Media       | 250 µg/filter                         | 5 filters (5 blanks) |
| 2957  | Respirable Alpha Quartz on Filter Media       | 500 µg/filter                         | 5 filters (5 blanks) |
| 2958  | Respirable Alpha Quartz on Filter Media       | 1000 µg/filter                        | 5 filters (5 blanks) |
| 2960  | Respirable Alpha Cristobalite on Filter Media | (5, 10, 20, 50, 100, 250) µg/filter   | set SRMs 2961-66     |
| 2961  | Respirable Alpha Cristobalite on Filter Media | 5 µg/filter                           | 5 filters (5 blanks) |

(continued)

### Respirable Silica (continued)

| SRM  | Description                                   | Mass Loading  | Unit Size            |
|------|---|---------------|----------------------|
| 2962 | Respirable Alpha Cristobalite on Filter Media | 10 µg/filter  | 5 filters (5 blanks) |
| 2963 | Respirable Alpha Cristobalite on Filter Media | 20 µg/filter  | 5 filters (5 blanks) |
| 2964 | Respirable Alpha Cristobalite on Filter Media | 50 µg/filter  | 5 filters (5 blanks) |
| 2965 | Respirable Alpha Cristobalite on Filter Media | 100 µg/filter | 5 filters (5 blanks) |
| 2966 | Respirable Alpha Cristobalite on Filter Media | 250 µg/filter | 5 filters (5 blanks) |
| 2967 | Respirable Alpha Cristobalite on Filter Media | 500 µg/filter | 5 filters (5 blanks) |

### Lead in Paint, Dust, and Soil

These SRMs and RM have been developed in conjunction with the U.S. EPA to monitor paint, dust, and soil sources of lead.

| SRM  | Lead Concentration               | Unit Size                       |
|--|----------------------------------|---------------------------------|
| <b>Paint Film</b>  |                                  |                                 |
| 2570   | <0.001 mg/cm <sup>2</sup>        | 1 blank film                    |
| 2571   | 3.58 mg/cm <sup>2</sup>          | 1 film, plus 1 blank            |
| 2572   | 1.527 mg/cm <sup>2</sup>         | 1 film, plus 1 blank            |
| 2573   | 1.040 mg/cm <sup>2</sup>         | 1 film, plus 1 blank            |
| 2574   | 0.714 mg/cm <sup>2</sup>         | 1 film, plus 1 blank            |
| 2575   | 0.307 mg/cm <sup>2</sup>         | 1 film, plus 1 blank            |
| 2579a (Set of 6: SRMs 2570 to 2575)                        | 0.307 to 3.58 mg/cm <sup>2</sup> | 5 films, plus 1 blank           |
| 2576 (High Level)  | 5.59 mg/cm <sup>2</sup>          | 1 film, plus 1 blank            |
| <b>Powdered Paint</b>                                      |                                  |                                 |
| 2580   | 4.34 %                           | 30 g                            |
| 2581   | 0.449 %                          | 35 g                            |
| 2582   | 209.8 mg/kg                      | 20 g                            |
| 2589   | 9.99 %                           | 35 g                            |
| <b>Indoor Dust, Trace Elements in (As, Cd, Cr, Hg, Pb)</b> |                                  |                                 |
| 2583   | 85.9 mg/kg                       | 8 g                             |
| 2584   | 9761 mg/kg                       | 8 g                             |
| <b>Soil, Trace Elements in</b>                             |                                  |                                 |
| 2586   | 432 mg/kg                        | 50 g                            |
| 2587   | 3242 mg/kg                       | 50 g                            |
| <b>Paint on Fiberboard</b>                                 |                                  |                                 |
| RM 8680  | 1 to 2 mg/cm <sup>2</sup>        | 1 sheet: (10.2 × 15.2 × 1.3) cm |

## Asbestos

| SRM     | Description                    | Asbestos Type   | Unit Size                   |
|---------|--------------------------------|---|-----------------------------|
| 1866b   | Common Commercial Asbestos     | chrysotile<br>grunerite (Amosite)<br>riebeckite (Crocidolite) | 3 × 4 g                     |
| 1867a   | Uncommon Commercial Asbestos   | anthophyllite<br>tremolite<br>actinolite                      | set (3)                     |
| 1876b   | Chrysotile Asbestos for TEM    | chrysotile  | 10 sections:<br>3 mm × 3 mm |
| RM 8411 | Mixed Asbestos Research Filter | chrysotile asbestos<br>grunerite (Amosite)                    | 1 cm <sup>2</sup>           |



ASBESTOS TESTING

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### ACIDIMETRIC VALUE (STOICHIOMETRY)

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- 46 of Boric Acid
- 75, 76 of Potassium Hydrogen Phthalate

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#### (TAPE ADHESION TESTING)

- 6 Linerboard for ADVANCED MATERIALS

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- 96 as Cesium-137 Burn-up Standard
- 26 as a ORGANO-METALLIC COMPOUND
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## BASIMETRIC VALUE (STOICHIOMETRY)

- 46 of Tris(hydroxymethyl)-aminomethane

## BAUXITE (ORES)

- 30 from Arkansas
- 30 from the Dominican Republic
- 30 from Jamaica
- 30 from Surinam

## BEARING METAL (PB-SB-SN)

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- 80 Calorimetric Value (COMBUSTION CALORIMETRY)

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- 98 Carbon-14 Dating
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- 37 Carbon Dioxide in Nitrogen

## CARBON MONOXIDE (PRIMARY GAS MIXTURES)

- 6 Carbon Monoxide in Air
- 37 Carbon Monoxide in Nitrogen

## B-CAROTENE (FAT SOLUBLE VITAMINS)

- 14 in Human Serum (HEALTH & CLINICAL)

## CAST IRON

- 58 See FERROUS METALS

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CARBIDES

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CESIUM (RADIOACTIVITY)

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CHARPY

- 5 V-NOTCH TEST BLOCKS

CHEMICAL

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CHLORIDE

- 50 ANION ION CHROMATOGRAPHY Solution

CHLORINE

- 96 as Chlorine-36 (RADIOACTIVITY)
- 73 in LUBRICATING BASE OILS
- 50 STABLE ISOTOPIC MATERIAL

CHLORO COMPOUNDS  
(ORGANIC CONSTITUENTS)

- 22 in Biphenyls
- 27 in Cod Liver Oil
- 22 in Halocarbons
- 47 m-Chlorobenzoic Acid (MICROCHEMISTRY)
- 22 in Pesticides
- 22 in Phenols
- 22 in Pollutants

CHOLESTEROL (HEALTH & CLINICAL)

- 9 in Coconut Oil
- 14 in freeze-dried Human Serum
- 14 in frozen Human Serum
- 9 in Whole Egg Powder

CHROMIUM

- 50 as Chromium Nitrate (STABLE ISOTOPIC MATERIALS)
- 31 in CLAYS
- 89 Cr/CrO Thin Film Depth Profile
- 26 Tris (1-phenyl-1,3-butenedion) chromium (III)
- 48 SPECTROMETRY Solution
- 55 in Steels (FERROUS METALS)

CHRYSOTILE

- 103 in ASBESTOS (INDUSTRIAL HYGIENE)

CLAYS

- 31 Brick
- 31 Flint
- 31 Plastic

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- 14 Amino Acids in HCl
- 13 Angiotensin I (Human)
- 14 Anticonvulsant Drug Level Assay
- 14 Antiepilepsy Drug Level Assay
- 13 Bilirubin
- 15 Bone Ash
- 15 Bone Meal
- 14 Bovine Serum Albumin
- 14 Bovine Serum (Inorganic)
- 13 Calcium Carbonate
- 13 Cholesterol
- 14 Cholesterol in Freeze-dried Human Serum
- 13 Cortisol (Hydrocortisone)
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- 13 Potassium Chloride
- 13 Sodium Chloride
- 13 Tripalmitin
- 13 Urea
- 13 Uric Acid
- 14 Vitamins (Fat-Soluble) and Cholesterol in Human Serum
- 13 VMA (4-hydroxy-3-methoxymandelic acid)
- 14 Cardiac Troponin

COAL

- 80 for COMBUSTION

CALORIMETRY

- 33, 35 Sulfur in (SULFUR IN FOSSIL FUELS)
- 33, 35 TRACE ELEMENTS in

COAL FLY ASH

- 33 TRACE ELEMENTS in

COATING THICKNESS

- 90 Nonmagnetic COPPER AND CHROMIUM ON STEEL
- 89 Tin-Lead Alloy (SOLDER THICKNESS)

COBALT

- 96 as Cobalt-60 (RADIOACTIVITY)
- 48 SPECTROMETRY Solution

COBALT BASE ALLOYS

- 61 NONFERROUS METALS

COCAINE METABOLITE

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COCONUT OIL

- 9 Cholesterol in (FOOD & AGRICULTURE)

COD LIVER OIL

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CONDUCTIVITY

- 83 of Electrolytic Iron CONDUCTIVITY, ELECTROLYTIC (ION ACTIVITY)
- 77 Hydrochloric Acid in Water
- 76 Potassium Chloride in Water
- 76 Sodium Chloride in Water CONDUCTIVITY, THERMAL (THERMODYNAMIC PROPERTIES)
- 83 of Electrolytic Iron
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- 26 Bis(1-phenyl-1,3-butenedion)copper (II) (ORGANO-METALLIC COMPOUNDS)
- 63 Brass (COPPER BASE ALLOYS)
- 62 Bronze (COPPER BASE ALLOYS)
- 62 Cupro-Nickel (COPPER BASE ALLOYS)
- 80 ENTHALPY AND HEAT CAPACITY of
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- 82 Freezing Point of (SECONDARY REFERENCE POINTS)
- 45 High-Purity METALS (MICRO-ANALYSIS)
- 62 Nickel Silver (COPPER BASE ALLOYS) in NONFERROUS METALS
- 30 in ORES
- 48 SPECTROMETRY Solution
- 50 STABLE ISOTOPES of
- 63 as Unalloyed Copper (COPPER BENCHMARK)

## COPPER BASE ALLOYS

- 62 See NONFERROUS METALS

## CORN

- 9 Bran (FOOD & AGRICULTURE)  
10 Kernel (FOOD & AGRICULTURAL)  
10 Stalk (FOOD & AGRICULTURAL)  
9 Starch (See Nutrition Composition)

## CORROSION

- 3 Tool Steel (ABRASIVE WEAR)

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### (HYDROCORTISONE)

- 13 See PURE CRYSTALLINE STANDARDS  
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95 as Curium-243  
95 as Curium-244

## CYSTINE

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# D

## DENSITY

- 92 of Lead Silica Glass  
99 Neutron Density Monitor Wire (RADIATION DOSIMETRY)  
4 of Smoke (SMOKE DENSITY CHAMBER) DEPTH PROFILING  
89 Nickel/Chromium Thin Film  
89 Arsenic Implant in Silicon  
89 Boron Implant in Silicon

## DEXTROSE (D-GLUCOSE)

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## DIFFERENTIAL SCANNING CALORIMETRY

- 81 Biphenyl  
81 Indium  
81 Mercury  
81 Thermal Analysis Purity Set  
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- 76 for pD CALIBRATION  
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18 PCR-Based DNA Profiling  
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## DOSIMETRY (RADIOACTIVITY)

- 99 Neutron Density Monitor Wire

## DRUG LEVEL ASSAY (ANTIEPILEPSY)

- 14 See HEALTH & CLINICAL

## DRUGS OF ABUSE

- 19 in FREEZE-DRIED URINE

## DSC

- 81 abbr. for Differential Scanning Calorimetry

## DTA

- 81 abbr. for Differential Thermal Analysis

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- 102 Urban (TRACE ELEMENTS)  
29 Urban (ORGANIC CONSTITUENTS)

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- 5 (NONDESTRUCTIVE EVALUATION)

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- 17 Ethanol-Water (ETHANOL SOLUTIONS)

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- 10 Rice
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- 50 ANION CHROMATOGRAPHY Solution
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- 81 of Aluminum (DEFINING FIXED POINT, ITS-90)
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- 33 in Coal (TRACE ELEMENTS)
- 33 in Coal Fly Ash (TRACE ELEMENTS)
- 97 as Gallium-67 (RADIO PHARMACEUTICALS)
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- 1 PARTICLE SIZE (SIZING)

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- 46 Polarimetric Value of (STOICHIOMETRY)

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- 30 Ore Refractories
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- 1 Zirconium Oxide (PARTICLE SIZE)

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### HAFNIUM

- 48 SPECTROMETRY Solution
- 66 in Zircaloy (ZIRCONIUM BASE ALLOYS)

### HARDNESS (FOOD AND AGRICULTURE)

- 11 WHEAT HARDNESS
- HARDNESS (SURFACE FINISH)
- 6 of Bright Copper (MICROHARDNESS)
- 6 of Bright Nickel (MICROHARDNESS)
- 6 Of Ceramic (MICROHARDNESS)
- 5 ROCKWELL HARDNESS

### HASTELLOY

- 65 NICKEL BASE ALLOYS

### HEALTH, NUTRITION COMPOSITION

- 9 Baby Food Composite
- 9 Cholesterol in Coconut Oil
- 9 Fatty Acids Frozen Diet Composite
- 9 Infant Formula (milk-based)
- 9 Typical Diet
- 9 Whole Egg Powder
- 9 Whole Milk

### HEAT (THERMODYNAMIC PROPERTIES)

- 80 COMBUSTION CALORIMETRY
- 81 DEFINING FIXED POINT, ITS-90
- 81 DEFINING FIXED POINT CELLS, ITS-90
- 81 DIFFERENTIAL SCANNING CALORIMETRY

- 81 DIFFERENTIAL THERMAL ANALYSIS
- 80 ENTHALPY AND HEAT CAPACITY
- 82 FREEZING POINT, MELTING POINT, AND TRIPLE POINT CELLS
- 83 LABORATORY THERMOMETER
- 82 REFERENCE POINTS
- 80 SOLUTION CALORIMETRY
- 83 THERMAL CONDUCTIVITY OF GRAPHITE AND IRON
- 82 THERMAL EXPANSION OF METAL & GLASS
- 82 THERMAL RESISTANCE OF GLASS, SILICA, AND POLYSTYRENE
- 83 THERMOCOUPLE MATERIAL, PLATINUM
- 83 VAPOR PRESSURE OF METALS

#### HEPES (BIOLOGICAL BUFFERS)

- 76 abbr. for N-2-Hydroxyethyl-piperazine-N-2-ethanesul-fonic Acid
- 76 HEPES Free Acid
- 76 NaHEPESate
- n-HEPTANE (FOSSIL FUELS)
- 33 REFERENCE LIQUIDS FOR EVALUATING FUELS HIGH ALLOY STEELS (FERROUS METALS)
- 58 Chromium Nickel (Copper Precipitation Hardening)
- 59 Chromium Nickel (Molybdenum Precipitation Hardening)
- 57 High Nickel
- 57 High Temperature Alloy (A286) Nickel-Chromium
- 57 High Temperature Alloy L605
- 58 High Temperature Alloy Iron-Nickel-Cobalt
- 57 Valve Steel

#### HIGH PURITY METALS

- 45 High Purity Gold
- 45 High Purity Platinum
- 45 High Purity Zinc
- 45 Refined Copper
- 45 Selenium Intermediate Purity
- 45 Zinc Intermediate Purity
- 45 Zinc Metal

#### HIGH TEMPERATURE ALLOYS

- 53 See FERROUS METALS
- HOLMIUM
- 48 SPECTROMETRY Solution
- LIVER (NATURAL MATRIX MATERIALS) (RADIOACTIVITY)
- 99 LUNG (NATURAL MATRIX MATERIALS) (RADIOACTIVITY)

#### HUMAN SERUM (HEALTH & CLINICAL)

- 14 Cholesterol in Human Serum
- 14 Electrolytes in (SERUM MATERIALS)
- 14 Fat Soluble Vitamins in
- 14 Glucose in Frozen (SERUM MATERIALS)
- 14 Lipids in Frozen (SERUM MATERIALS)
- 14 SERUM MATERIALS

#### HYDROGEN

- 96 as Hydrogen-3 (RADIOACTIVITY SOLUTIONS)

#### HYDROXYAPATITE

- 15 See Calcium Hydroxyapatite

#### 4-HYDROXY-3-METHOXY-DL-MANDELIC ACID (VMA) 23

## I

#### ICTAC

- 81 abbr. for International Confederation of Thermal Analysis and Calorimetry
- 86 X-RAY AND PHOTOGRAPHY

#### ITS-90

- 81 DEFINING FIXED POINT CELLS, ITS-90
- 26 Dibutyltin bis (2-ethylhexanoate) (ORGANO-METALLIC COMPOUNDS)
- 81 DIFFERENTIAL SCANNING CALORIMETRY

#### INCONEL

- 65 NICKEL BASE ALLOYS (NON-FERROUS METALS)

#### INDIUM

- 97 as Indium-111 (RADIOPHARMACEUTICALS)
- 81 DEFINED FIXED POINT, ITS-90
- 82 FREEZING POINT, MELTING POINT, AND TRIPLE POINT CELLS
- 48 SPECTROMETRY Solution

#### INDUSTRIAL HYGIENE

- 101 See INDUSTRIAL HYGIENE

#### INFRARED, NEAR

- 85 INFRARED REFLECTANCE

#### INORGANIC SOLUTION STANDARDS 23

#### IODINE (RADIOACTIVITY)

- 97 as Iodine-125 (RADIOPHARMACEUTICALS)
- 50 Iodine, Isotopic
- 97 as Iodine-131 (RADIOPHARMACEUTICALS)

#### ION ACTIVITY

- 76 BIOLOGICAL BUFFER SYSTEMS
- 77 ELECTROLYTIC CONDUCTIVITY
- 76 ION-SELECTIVE ELECTRODE CALIBRATION
- 76 pH CALIBRATION
- 75 pH CALIBRATION

#### IRON

- 83 Electrolytic Iron (THERMAL CONDUCTIVITY OF GRAPHITE AND IRON)
- 53 See FERROUS METALS
- 13 Iron Metal (HEALTH & CLINICAL)
- 48 SPECTROMETRY Solution
- 26 Tris(1-phenyl-1-3 butaine-diono)-iron(III) (ORGANO-METALLIC COMPOUNDS)

#### ISOTOPE(S)

- 51 See LIGHT STABLE ISOTOPIC MATERIALS
- 45 See HIGH PURITY MATERIALS
- 98 See RADIOACTIVITY

## K

#### KEROSINE

- 35 Sulfur in (SULFUR IN FOSSIL FUELS)

#### KNOOP MICROHARDNESS (SURFACE FINISH)

- 6 Bright Copper
- 6 Bright Nickel
- 6 Silicon Nitride

## L

#### LANTHANUM

- 48 SPECTROMETRY Solution

#### LAKE SEDIMENT (RADIOACTIVITY)

- 99 Freshwater Lake Sediment (NATURAL MATRIX MATERIALS)

## LEAD

- 26 Lead Cyclohexanebutyrate (ORGANO-METALLIC COMPOUNDS)
- 14 Lead in Blood (HEALTH & CLINICAL)
- 13 Lead Nitrate (HEALTH & CLINICAL)
- 50 Metal Equal Atom (STABLE ISOTOPIC MATERIALS)
- 50 Metal, Natural (STABLE ISOTOPIC MATERIALS)
- 50 Metal, Radiogenic (STABLE ISOTOPIC MATERIALS)
- 102 In Paint Film
- 102 In Powdered Paint
- 102 In Indoor Dust, Trace Elements
- 102 In Paint on Fiberboard
- 102 In Soil, Trace Elements
- 60 See NONFERROUS METALS
- 102 Powdered Lead Base Paint (LEAD IN PAINT, DUST AND SOIL)
- 33 in Reference Fuel (METAL CONSTITUENTS IN FOSSIL FUELS)
- 48 SPECTROMETRY Solution

## LEAD BASE ALLOYS/ MATERIALS

- 63 See NONFERROUS METALS

## LEAVES (FOOD & AGRICULTURE)

- 11, 27 Apple
- 11, 27 Peach
- 27 Pine Needles
- 11, 27 Spinach
- 11, 27 Tomato

## LIMESTONE (ROCKS AND MINERALS)

- 32 Argillaceous
- 32 Dolomitic

## LINERBOARD

- 6 for TAPE ADHESION TESTING

## LINWIDTH (METROLOGY)

- 88 OPTICAL MICROSCOPE LINewidth MEASUREMENT

## LIPIDS

- 14 in Human Serum (SERUM MATERIALS)

## LIQUID CHROMATOGRAPHY

- 23 GS/MS AND LC SYSTEM PERFORMANCE

## LIQUIDUS TEMPERATURE

- 93 Soda-Lime Silica
- 93 Aluminosilicate

## LITHIUM

- 51 Carbonate (LIGHT STABLE ISOTOPIC MATERIALS)
  - 13 Carbonate (HEALTH & CLINICAL)
  - 30 Ore, Lepidolite
  - 30 Ore, Petalite (ORES)
  - 30 Ore, Spodumene (ORES)
  - 48 SPECTROMETRY Solution
- ## LIVER
- 10 Bovine (FOODS AND BEVERAGES)
  - 99 Human (NATURAL MATRIX MATERIALS) (RADIOACTIVITY)

## LUBRICATING BASE OIL

- 73 Total Chlorine
- 73 Total Nitrogen
- 73 Total Sulfur
- 73 WEAR-METALS IN OIL

## LUNG (RADIOACTIVITY)

- 99 Human (NATURAL MATRIX MATERIALS)

## LUTETIUM

- 48 SPECTROMETRY Solution

## M

## MAGNETIC MOMENT

- 7 Nickel Disk
- 7 Nickel Sphere
- 7 Yttrium Garnet Sphere

## MAGNESIUM

- 13 Magnesium Gluconate Dihydrate (HEALTH & CLINICAL)
- 50 Magnesium Metal (STABLE ISOTOPIC MATERIALS)
- 48 SPECTROMETRY Solution

## MAGNIFICATION

- 89 SCANNING ELECTRON MICROSCOPE (SEM)
- 89 SEM Performance Standard
- 89 SEM Sharpness Standard

## MANGANESE

- 48 SPECTROMETRY Solution

## D-MANNITOL (HEALTH & CLINICAL) 13

## MARIJUANA METABOLITE

- 19 THC-9-COOH (DRUGS OF ABUSE IN URINE)

## MARINE MATERIALS

- 28 Buffalo River Sediment (METAL CONSTITUENTS IN NATURAL MATRICES)
- 28 Estuarine Sediment (METAL CONSTITUENTS IN NATURAL MATRICES)
- 28 Marine Sediment
- 32 Limestone Argillaceous
- 32 Limestone Dolomitic (ROCKS AND MINERALS)
- 28 Organics in Marine Sediment (ORGANIC CONSTITUENTS)
- 27 Organics in Mussel Tissue (ORGANIC CONSTITUENTS)
- 27 Organics in Whale Blubber (ORGANIC CONSTITUENTS)
- 10 Oyster Tissue (FOOD & AGRICULTURE)
- 28 Polychlorinated Biphenyls (Congeners) in River Sediment A (ORGANIC CONSTITUENTS)
- 28 Sediment for Solid Sampling

## MASS SPECTROMETRY

- 23 GC/MS AND LC SYSTEM PERFORMANCE (ORGANICS)
- 23 GC/MS SYSTEM
- 23 LC Chiral Selectivity
- 23 LC Performance
- 23 LC Selectivity
- 51 See LIGHT STABLE ISOTOPIC MATERIALS
- 95 See RADIOACTIVITY
- 50 See STABLE ISOTOPIC MATERIALS

## MATERIALS ON FILTER MEDIA

- 101 Quartz on Filter Media
- 101 Air Particulate on Filter
- 101 Cellulose Acetate Membrane
- 101 Ashless Blank Filter
- 101 Respirable Alpha Quartz
- 101 Respirable Cristobalite

## MELTING POINT AND TRIPLE POINT (THERMODYNAMIC PROPERTIES) 82

## MERCURY

- 15 Mercury (TOXIC SUBSTANCES IN URINE)
- 81 Mercury (Triple Point) (DEFINING FIXED POINT ITS-90)
- 49 SPECTROMETRY Solution
- 33 TRACE ELEMENTS (FOSSIL FUELS)
- 33 Trace Mercury in Coal (TRACE ELEMENTS)
- 23 in Water (METAL CONSTITUENTS IN NATURAL MATRICES)

METAL ALLOYS 54

METALS 53

METALS ON FILTER MEDIA

- 101 See MATERIALS ON FILTER MEDIA

METHANE (PRIMARY GAS MIXTURES)

- 38 Methane in Air

METROLOGY 88

MICROANALYSIS 32

MICROCHEMISTRY (HIGH PURITY MATERIALS)

- 47 Acetanilide  
47 Anisic Acid  
47 m-Chlorobenzoic Acid  
47 Cystine  
47 p-Fluorobenzoic Acid  
47 Nicotinic Acid  
47 Urea

MICROCOPY

- 86 Microcopy Resolution Test Chart(X-RAY AND PHOTOGRAPHY)

MICROHARDNESS (SURFACE FINISH)

- 6 of Bright Copper  
6 of Bright Nickel  
6 of Ceramic

MICROSCOPY (METROLOGY)

- 89 DEPTH PROFILING  
90 ELLIPSOmetry  
88 OPTICAL MICROSCOPE LINEWIDTH MEASUREMENT  
89 SCANNING ELECTRON MICROSCOPE (SEM)

MICROSPHERE (SIZING)

- 1 Glass Spheres (PARTICLE SIZE)  
1 Polystyrene Spheres (PARTICLE SIZE)

MILK (FOOD AND AGRICULTURE)

- 9 Infant Formula  
10 Non-fat Milk Powder

MINERALS

- 32 See ROCKS AND MINERALS

MIXTURES AND POLLUTANTS (PRIMARY GAS MIXTURES)

- 36 Ambient Non-Methane Organics in Nitrogen  
37 Carbon Dioxide in Nitrogen  
36 Carbon Monoxide in Air  
37 Carbon Monoxide in Nitrogen  
38 Hydrogen Sulfide in Nitrogen  
38 Methane in Air  
38 Nitric Oxide in Nitrogen  
39 Oxides of Nitrogen in Air  
39 Oxygen in Nitrogen  
39 Propane in Air  
40 Sulfur Dioxide in Nitrogen

MOLECULAR WEIGHT AND MELT FLOW (POLYMERIC PROPERTIES)

- 79 Polyethylene Gas Pipe Resin  
78 Polyethylene Linear  
78 Poly(ethylene oxide)  
79 Polyethylene Resin  
78 Poly(methylmethacrylate)  
78 Polystyrene

MOLYBDENUM

- 80 ENTHALPY AND HEAT CAPACITY  
97 as Molybdenum-99-Technetium-99m (RADIO-PHARMACEUTICALS)  
49 SPECTROMETRY Solution

N

NAVAL BRASS

- 63 See NONFERROUS METALS

NDE

- 5 abbr. for Nondestructive Evaluation

NEODYMIUM

- 49 SPECTROMETRY Solution

NEUTRON MONITOR (RADIOACTIVITY)

- 99 Neutron Density Monitor Wire (RADIATION DOSIMETRY)

NICKEL

- 96 as Nickel-63 (RADIOACTIVE SOLUTION)  
26 Nickel Cyclohexanecarboxylate (ORGANO-METALLIC COMPOUNDS)  
50 Nickel (STABLE ISOTOPIC MATERIALS)  
89 Nickel-Chromium Thin Film(DEPTH PROFILING)  
65 NICKEL BASE ALLOYS (NON-FERROUS METALS)  
65 NICKEL OXIDES (NONFERROUS METALS)  
7 Nickel Disk (MAGNETIC MOMENT)  
7 Nickel Sphere (MAGNETIC MOMENT)  
49 SPECTROMETRY Solution

NICOTINIC ACID

- 47 MICROCHEMISTRY (HIGH PURITY MATERIALS)

NIOBIUM

- 97 as Niobium-94 (GAMMA RAY POINT SOURCES)  
49 SPECTROMETRY Solution

NITRATE

- 50 ANION CHROMATOGRAPHY Solution

NITRIC OXIDE (PRIMARY GAS MIXTURES)

- 38 Nitric Oxide in Nitrogen

NITRIDE

- 1 Silicon Nitride (SURFACE AREA OF POWDERS)  
6 (MICROHARDNESS)

NITROGEN (PRIMARY GAS MIXTURES)

- 73 Total Nitrogen (LUBRICATING BASE OILS)

NONDESTRUCTIVE EVALUATION

- 5 ARTIFICIAL FLAW FOR EDDY CURRENT NDE

NONFERROUS ALLOYS

- 60 See NONFERROUS METALS

NORTHERN SOFTWOOD

- 7 BLEACHED KRAFT PULPS

## NUCLEAR MATERIALS (RADIOACTIVITY)

- 98 Carbon-14 DATING
- 99 FISSION TRACK GLASS
- 99 NATURAL MATRIX MATERIALS
- 95 RADIOACTIVE SOLUTIONS
- 97 RADIOPHARMACEUTICALS

## NUTRITION

- 9 See FOOD & AGRICULTURE

## NUTRITION COMPOSITION 9

## O

### OBSIDIAN ROCK

- 32 ROCKS AND MINERALS

### OCEAN MATERIALS (RADIOACTIVITY) (NATURAL MATRIX MATERIALS)

- 99 Ocean Sediment

## OIL

- 73 Chlorine in (LUBRICATING BASE OILS)
- 33 Fuel Oil (FOSSIL FUELS)
- 33 High Sulfur Gas Oil Feed (CATALYST CHARACTERIZATION MATERIALS)
- 34 Moisture in Oils (FOSSIL FUELS)
- 73 Nitrogen (LUBRICATING BASE OILS)
- 27 Organics in Cod Liver Oil (ORGANIC CONSTITUENTS)
- 33 Petroleum Crude Oil (ORGANIC CONSTITUENTS)
- 28 Polychlorinated Biphenyls in (ORGANIC CONSTITUENTS)
- 33 Shale Oil (ORGANIC CONSTITUENTS)
- 73 Sulfur in (LUBRICATING BASE OILS)
- 35 Sulfur in Residual Fuel Oil (SULFUR IN FOSSIL FUELS)
- 33 Vanadium in Crude Oil (METAL CONSTITUENTS IN FOSSIL FUELS)
- 73 WEAR-METALS IN OIL (ENGINE WEAR MATERIALS)

## ORGANO-METALLIC COMPOUNDS 26

## ORGANIC CALIBRATION SOLUTIONS 21

## OPTOELECTRONICS (METROLOGY)

- 88 Optical Fiber Coating
- 88 Optical Fiber Diameter
- 88 Optical Fiber Ferrule Geometry
- 88 Pin Gauge for Optical Fiber Ferrules
- 88 Polarization Mode Dispersion
- 88 Wavelength Reference Absorption Cell

## ORES (GEOLOGICAL MATERIALS AND ORES)

- 30 Alumina (Reduction Grade)
- 30 Bauxite, Arkansas
- 30 Bauxite, Dominican
- 30 Bauxite, Jamaican
- 30 Bauxite, Surinam
- 30 Borate Ore
- 31 Chinese Ores
- 30 Copper Ore Mill Heads
- 30 Copper Ore Mill Tails
- 30 Fluorspar, Customs Grade
- 30 Fluorspar, High Grade
- 30 Gold Ore, Refractory
- 30 Iron Ore, Canada
- 30 Iron Ore, Labrador
- 30 Iron Ore, Nimba
- 30 Iron Oxide Reduced
- 30 Lithium Ore (Petalite)
- 30 Lithium Ore (Spodumene)
- 30 Lithium Ore (Lepidolite)
- 30 Manganese Ore
- 30 Phosphate Rock Florida
- 30 Phosphate Rock Western
- 30 Pyrite Ore (ORE BIOLEACHING SUBSTRATE)
- 30 Rutile Ore
- 30 Scheelite Ore
- 30 Tungsten Concentrate
- 30 Zinc

## ORGANICS

- 21 EPA: ORGANIC COMPOUNDS RELATED TO (WATER ANALYSIS)
- 21 ORGANIC CONSTITUENTS GC/MS AND LC SYSTEM PERFORMANCE

## OXALIC ACID (RADIOACTIVITY)

- 98 Carbon-14 Dating

## OXYGEN (PRIMARY GAS MIXTURES)

- 39 Oxygen in Nitrogen

## OXYGENATES

- 34 ALCOHOLS...IN REFERENCE FUELS

## OYSTER TISSUE

- 9 FOOD & AGRICULTURE

## P

### PAINT

- 102 LEAD IN PAINT, DUST AND SOIL

### PALLADIUM

- 49 SPECTROMETRY Solution

### PARTICULAR COUNT MATERIALS

- 2 For suspensions

### PARTICLE SIZE (SIZING)

- 1 Glass Spheres
- 1 Polystyrene Spheres
- 1 Silicon Nitride
- 1 Zirconium Oxide

### PARTICULATES

- 29 Diesel Particulate Matter (ORGANIC CONSTITUENTS)
- 101 MATERIALS ON FILTER MEDIA
- 29 Urban Dust/Organics (ORGANIC CONSTITUENTS)
- 29 Urban Particulate Matter (INORGANICS)
- 76 pD CALIBRATION (ION ACTIVITY)
- 76 Disodium Hydrogen Phosphate
- 76 Potassium Dihydrogen Phosphate
- 76 Potassium Hydrogen Phthalate
- 76 Sodium Bicarbonate
- 76 Sodium Carbonate

### PERUVIAN SOIL (RADIOACTIVITY) 99

### PESTICIDES (ORGANIC CONSTITUENTS)

- 22 Chlorinated Pesticides in Hexane
- 22 Chlorinated Pesticides in Isooctane

### PETROLEUM 33

## PH CALIBRATION (ION ACTIVITY)

- 75 Calcium Carbonate
- 75 Disodium Hydrogen Phosphate
- 75 Potassium Dihydrogen Phosphate
- 75 Potassium Hydrogen Phthalate
- 75 Potassium Hydrogen Tartrate
- 75 Potassium Tetroxalate
- 75 Sodium Bicarbonate
- 75 Sodium Carbonate
- 75 Sodium Tetraborate Decahydrate
- 76 See BIOLOGICAL BUFFER SYSTEMS

## PHOSPHATE

- 76 See pD CALIBRATION
- 75 See pH CALIBRATION
- 50 ANION CHROMATOGRAPHY Solution
- 30 Phosphate Rock (ORES)
- 26 Triphenyl Phosphate (ORGANO-METALLIC COMPOUNDS)

## PHOSPHORUS

- 49 SPECTROMETRY Solution

## PHOTOGRAPHY

- 86 See X-RAY AND PHOTOGRAPHY

## PINE NEEDLES

- 27 See ENVIRONMENTAL BIOLOGICAL TISSUES

## PLASTIC

- 78 See POLYMERIC PROPERTIES

## PLATINUM (HIGH PURITY METALS)

- 45 High Purity Platinum
- 49 SPECTROMETRY Solution

## PLUTONIUM (RADIOACTIVITY)

- 99 Ashed Bone
- 99 Columbia River Sediment
- 99 Human Liver
- 99 Human Lung
- 99 Ocean Sediment
- 99 Peruvian Soil
- 95 Plutonium-238
- 95 Plutonium-239
- 95 Plutonium-240
- 96 Plutonium-241
- 95 Plutonium-242

## POLLUTANTS

- 33 METAL CONSTITUENTS IN FOSSIL FUELS
- 36 PRIMARY GAS MIXTURES

## 21 ORGANIC CONSTITUENTS (ORGANICS)

## POLONIUM (RADIOACTIVITY)

- 95 Polonium-209 (RADIOACTIVE SOLUTIONS)

## POLYCHLORINATED BIPHENYLS PCBs

- 22 Chlorinated Biphenyls
- 22 Chlorinated Biphenyl Congeners in Isooctane
- 22 Polychlorinated Biphenyl Congeners in Isooctane
- 28 Polychlorinated Biphenyls in River Sediment

## POLYETHYLENE (MOLECULAR WEIGHT AND MELT FLOW)

- 79 Polyethylene Gas Pipe Resin
- 78 Polyethylene Linear
- 78 Poly(ethylene Oxide)
- 79 Polyethylene Resin

## POLYMER

- 78 See POLYMERIC PROPERTIES

## POLY(METHYLMETHACRYLATE) (POLYMERIC PROPERTIES)

- 78 MOLECULAR WEIGHT AND MELT FLOW

## POLYSTYRENE

- 80 ENTHALPY AND HEAT CAPACITY
- 80 (THERMODYNAMIC PROPERTIES)
- 78 MOLECULAR WEIGHT AND MELT FLOW
- 78 (POLYMERIC PROPERTIES)

## POTASSIUM

- 49 SPECTROMETRY Solution

## POTASSIUM CHLORIDE

- 13 See PURE CRYSTALLINE STANDARDS
- 77 ELECTROLYTIC CONDUCTIVITY
- 76 ION-SELECTIVE ELECTRODE CALIBRATION
- 50 STABLE ISOTOPIC MATERIALS
- 80 SOLUTION CALORIMETRY
- 46 STOICHIOMETRY

## POTASSIUM DICHROMATE

- 84 MOLECULAR ABSORPTION
- 46 STOICHIOMETRY

## POTASSIUM DIHYDROGEN PHOSPHATE

- 10 FERTILIZERS
- 76 pD CALIBRATION
- 75 pH CALIBRATION

## POTASSIUM FLUORIDE

- 76 ION-SELECTIVE ELECTRODE CALIBRATION

## POTASSIUM HYDROGEN PHTHALATE

- 76 pD CALIBRATION
- 75 pH CALIBRATION
- 46 STOICHIOMETRY

## POTASSIUM HYDROGEN TARTRATE

- 75 pH CALIBRATION

## POTASSIUM IODIDE

- 84 MOLECULAR ABSORPTION

## POTASSIUM NITRATE

- 10 FERTILIZERS
- 51 LIGHT STABLE ISOTOPIC MATERIALS

## POTASSIUM TETROXALATE

- 75 pH CALIBRATION

## POWDERED LEAD BASE PAINT

- 102 LEAD IN PAINT, DUST, AND SOIL

## PRASEODYMIUM

- 49 SPECTROMETRY Solution

## PRIMARY CHEMICALS

- 46 STOICHIOMETRY

## PRIORITY POLLUTANT PAH

- 22 ORGANIC CONTAMINANTS

## PYRITE ORE

- 30 ORE BIOLEACHING SUBSTRATE

## Q

### QUARTZ

- 101 MATERIALS ON FILTER MEDIA

## R

### RADIOACTIVITY

- 99 FISSION TRACK GLASS
- 99 NATURAL MATRIX MATERIALS
- 95 RADIOACTIVE SOLUTIONS
- 97 RADIOPHARMACEUTICALS
- 98 Carbon-14 DATING

### RADIUM (RADIOACTIVITY)

- 95 Radium-226 (RADIOACTIVE SOLUTIONS)

### REFERENCE FUELS

- 33 See FOSSIL FUELS

### REFLECTANCE (OPTICAL PROPERTIES)

- 85 DIFFUSE SPECTRAL REFLECTANCE
- 85 INFRARED REFLECTANCE
- 85 SPECULAR SPECTRAL REFLECTANCE

### REFRACTORIES (GEOLOGICAL MATERIALS AND ORES)

- 32 Burnt Refractory

### REFORMULATED GASOLINES

- 33 See FOSSIL FUELS

### RESIDUAL RESISTIVITY RATIO (ELECTRICAL PROPERTIES) 87

### RESISTANCE (THERMODYNAMIC PROPERTIES)

- 82 THERMAL RESISTANCE OF GLASS, SILICA, AND POLYSTYRENE

### RESISTIVITY (ELECTRICAL PROPERTIES)

- 87 ELECTRICAL RESISTIVITY AND CONDUCTIVITY OF METALS
- 87 ELECTRICAL RESISTIVITY AND CONDUCTIVITY OF SILICON

## RHENIUM

- 49 SPECTROMETRY Solution

## RHODIUM

- 49 SPECTROMETRY Solution

## RICE FLOUR (FOOD & AGRICULTURE) 10

### RIVER SEDIMENT (INORGANICS)

- 28 SOILS, SEDIMENTS, PARTICULATES AND WATER
- 28 Buffalo River Sediment
- 28 Estuarine Sediment

### RIVER SEDIMENT (ORGANICS)

- 28 Polychlorinated Biphenyls in River Sediment A

### RIVER SEDIMENT (RADIOACTIVITY)

- 99 River Sediment (NATURAL MATRIX MATERIALS)

## ROCKS

- 32 Basalt Rock (ROCKS AND MINERALS)
- 32 Obsidian Rock (ROCKS AND MINERALS)
- 10, 30 Phosphate Rock (Florida) (FERTILIZERS)
- 10, 30 Phosphate Rock (Western) (FERTILIZERS)

### ROYAL CANADIAN MINT REFERENCE MATERIALS 46

## RUBIDIUM

- 82 Rubidium (FREEZING POINT, MELTING POINT AND TRIPLE POINT CELLS)
- 50 Rubidium Chloride (STABLE ISOTOPIC MATERIALS)
- 49 SPECTROMETRY Solution

## S

### SAMARIUM

- 49 SPECTROMETRY Solution

### SAND (GLASS)

- 32 See ROCKS AND MINERALS

### SCANDIUM

- 49 SPECTROMETRY Solution

### SCANNING ELECTRON MICROSCOPE (METROLOGY)

- 89 SEM Performance Standard
- 89 SEM Sharpness Standard

### SCHHEELITE ORE

- 30 ORES

### SEDIMENT

- 28 METAL CONSTITUENTS IN NATURAL MATRICES
- 99 NATURAL MATRIX MATERIALS (RADIOACTIVITY)

### SELENIUM

- 49 Selenium Intermediate Purity (HIGH PURITY METALS)
- 49 SPECTROMETRY Solution

### SERUM MATERIALS

- 14 Bovine Serum Albumin
- 14 Electrolytes in Frozen Human Serum
- 14 Glucose in Frozen Human Serum
- 14 Human Serum
- 14 Lipids in Frozen Human Serum

### SHELLFISH

- 27 Mussel Tissue (ORGANIC CONSTITUENTS)
- 9 Oyster Tissue (FOOD & AGRICULTURE)

### SILICA

- 73 Carbon Modified Silica (INORGANICS)
- 82 Fumed Silica Board (THERMAL RESISTANCE OF GLASS, SILICA, AND POLYSTYRENE)
- 82 THERMAL EXPANSION OF GLASS AND SILICA
- 92 Lead Silica Glass (DENSITY AND REFRACTIVE INDEX)
- 101 Respirable Alpha Quartz (RESPIRABLE SILICA)
- 101 Respirable Cristobalite (RESPIRABLE SILICA)
- 32 Silica Brick (REFRACTORIES)

## SILICON

- 87 ELECTRICAL RESISTIVITY AND CONDUCTIVITY OF SILICON
- 26 Octaphenylcyclotetrasiloxane (ORGANO-METALLIC COMPOUNDS)
- 58 Silicon Metal (STEELMAKING ALLOYS)
- 93 Silicon Powder (X-RAY DIFFRACTION)
- 49 SPECTROMETRY Solution
- 58 See STEELMAKING ALLOYS

## SILICON DIOXIDE

- 90 Thin Film Thickness (ELLIPSOMETRY)

## SILICON NITRIDE (SIZING) (SURFACE FINISH)

- 1 PARTICLE SIZE
- 2 SURFACE AREA OF POWDERS
- 6 MICROHARDNESS

## SILVER

- 32 Alloy (METALS) (MICROANALYSIS)
- 46 Royal Canadian Mint Reference Materials
- 26 Silver 2-ethylhexanoate (ORGANO-METALLIC COMPOUNDS)
- 50 Silver Nitrate (STABLE ISOTOPIC MATERIALS)
- 49 SPECTROMETRY Solution

## SINUSOIDAL ROUGHNESS

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| 872  | Bronze, Phosphor (CDA 544)                | 62         | 953   | Cobalt in Aluminum Wire                    | 99     |
| 874  | Cupro-Nickel, 10 % (CDA 706) "H-P"        | 62         | 955b  | Lead in Blood                              | 14     |
| 875  | Cupro-Nickel, 10 % (CDA 706)              | 62         | 956b  | Electrolytes in Frozen Human Serum         | 14     |
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| 886  | Gold, Ore Refractory                      | 30         | 975a  | Chlorine (Isotopic)                        | 50     |
| 887  | Cemented Carbide (W-83, Co-10)            | 68         | 976   | Copper (Isotopic)                          | 50     |
| 888  | Cemented Carbide (W-64, Co-25, Ta-5)      | 68         | 977   | Bromine (Isotopic)                         | 50     |
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| 1053a | Cadmium (Metallo-Organic)           | 26   | C1137a | White Cast Iron                          | 59   |
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| 1073b | Zinc (Metallo-Organic)              | 26   | C1154a | Stainless Steel 19Cr-13Ni                | 55   |
| 1075a | Aluminum (Metallo-Organic)          | 26   | 1155   | Stainless Steel Cr18-Ni12-Mo2 (AISI 316) | 55   |
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| 1079b | Iron (Metallo-Organic)              | 26   | 1159   | Elec/Mag Ni-Fe                           | 65   |
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| 1083  | Wear Metals (Base Oil)              | 73   | 1171   | Stainless Steel Cr17-Ni11-Ti0.3 AISI 321 | 55   |
| 1084a | Wear Metals in Oil, 100 mg/kg       | 73   | 1172   | Stainless Steel Cr17-Ni11-Nb.6 AISI 348  | 55   |
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| 1256b  | Aluminum Alloy 380              | 60     | 1478  | Polystyrene Narrow Mol Wt          | 78            |
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| 1265a  | Electrolytic Iron               | 54     | 1487  | Poly (methyl methacrylate)         | 78            |
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| 1270   | LA Steel, Cr-Mo (A336) (F-22)   | 54     | 1489  | Poly (methyl methacrylate)         | 78            |
| 1271   | LA Steel (HSLA-100)             | 54     | 1491a | Arom Hydro/Hexane Toluene          | 22            |
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| 1297   | Stainless Steel (SAE 201)       | 55     |       | Freeze-Dried Urine                 | 19            |
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| 1359b  | Cu & Cr Coating on Steel        | 90     | 1515  | Apple Leaves                       | 11, 27        |
| 1361b  | Cu & Cr Coating on Steel        | 90     | 1543  | GC/MS System Performance           | 23            |
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| 1363b  | Cu & Cr Coating on Steel        | 90     |       | Diet Composite                     | 9             |
| 1364b  | Cu & Cr Coating on Steel        | 90     | 1546  | Meat Homogenate                    | 9             |
| 1400   | Bone Ash                        | 15     | 1547  | Peach Leaves                       | 11, 27        |
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| 1459   | Fumed Silica Board              | 82     | 1577b | Bovine Liver                       | 10, 27        |
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| 1584  | Phenols in Methanol  | 22     | 1667b | Propane in Air 50 umol/mol                      | 39     |
| 1586  | Isotope Label Pollutants                                       | 22     | 1668b | Propane in Air 100 umol/mol                     | 39     |
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| 1588b | Organics in Cod Liver Oil                                      | 27     | 1674b | CO <sub>2</sub> /N <sub>2</sub> mol 7%          | 37     |
| 1589a | PCBs,Pesti,Dioxins/<br>Furans in Human Serum                   | 14     | 1675b | CO <sub>2</sub> /N <sub>2</sub> mol 14%         | 37     |
| 1595  | Tripalmitin  | 13     | 1676  | CO <sub>2</sub> /Air, 365 umol/mol              | 36     |
| 1596  | Dinitropyrene Imrs,1Nitropyrene Meth-Chl                       | 22     | 1677c | CO/N <sub>2</sub> 10 ppm                        | 37     |
| 1597  | Complex PAH Mix  | 29     | 1678c | CO/N <sub>2</sub> 50 umol/mol                   | 37     |
| 1598  | Inorganic Constituents in Bovine Serum                         | 14     | 1679c | CO/N <sub>2</sub> 100 umol/mol                  | 37     |
| 1599  | 2 Anticonvulsant Drugs   | 14     | 1680b | CO/N <sub>2</sub> 500 umol/mol                  | 37     |
| 1614  | Dioxin in Isooctane  | 22     | 1681b | CO/N <sub>2</sub> 1000 umol/mol                 | 37     |
| 1616b | Sulfur in Kerosene   | 35     | 1683b | NO/N <sub>2</sub> 50 umol/mol                   | 38     |
| 1617a | Sulfur in Kerosene   | 35     | 1684b | NO/N <sub>2</sub> 100 umol/mol                  | 38     |
| 1619b | Sulfur in Residual Fuel Oil 0.7 %                              | 35     | 1685b | NO/N <sub>2</sub> 250 umol/mol                  | 38     |
| 1620c | Sulfur in Residual Fuel Oil 4 %                                | 35     | 1686b | NO/N <sub>2</sub> 500 umol/mol                  | 38     |
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| 1624d | Sulfur in Distillate Fuel Oil                                  | 35     | 1692  | Polystyrene (Particle Size)                     | 1      |
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| 1633b | Trace Elements in Coal Fly Ash                                 | 33     | 1694a | SO <sub>2</sub> /N <sub>2</sub> 100 umol/mol    | 40     |
| 1634c | Trace Elements in Fuel Oil                                     | 33     | 1696a | SO <sub>2</sub> /N <sub>2</sub> , 3500 umol/mol | 40     |
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| 1662a | SO <sub>2</sub> /N <sub>2</sub> 1000 umol/mol                  | 40     | 1747  | Tin Freezing Point Cell                         | 81     |
| 1663a | SO <sub>2</sub> /N <sub>2</sub> 1500 umol/mol                  | 40     | 1748  | Zinc Freezing Point Cell                        | 81     |
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