NIST Standard Reference Materials® Catalog

NIST SP 260
FEBRUARY 2003

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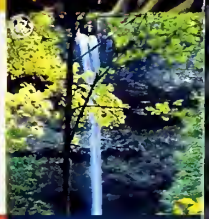

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NIST Standard Reference Materials® (SRMs®) are used by industry, government, and academia to ensure the highest quality measurements. This catalog lists over 1300 individual reference materials produced and sold by NIST, each with carefully assigned values for chemical composition and physical properties.

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

Each SRM comes carefully packaged with documentation containing assigned values with stated uncertainties and a material safety data sheet, if applicable. Details on use, stability, and NIST analytical methods are also included.

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Engineering Materials

Food & Agriculture

Health & Clinical

Environmental

High Purity Materials

Industrial Materials

TABLE OF CONTENTS

Physical Properties

Radioactivity

Industrial Hygiene

Engineering 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)
Glass Beads, Soda Lime		
1021	2 µm to 12 µm	4
1003c	20 µm to 50 µm (No. 635 to No. 325)	28
1004b	53 µm to 125 µm (No. 270 to No. 120)	43
1017b	106 µm to 355 µm (No. 140 to No. 45)	70
1018b	250 µm to 710 µm (No. 60 to No. 25)	87
1019b	850 µm to 2000 µm (No. 20 to No. 10)	200
Sand		
RM 8010	(No. 30 to No. 325)	3 × 150 g
Silicon Nitride (equiaxed)		
659	0.2 µm to 10 µm	5 × 2.5 g
Zirconium Oxide (irregular)		
1978	0.2 µm to 10 µm	5
1982	10 µm to 150 µm	10
Tungsten Carbide/Cobalt (spheroidal)		
1984	9 µm to 30 µm	14
1985	18 µm to 55 µm	14
Polystyrene Spheres *Unit Size: 5 mL vial (unless otherwise noted)*		
1690 (0.5 % in H_2O)	0.895 µm	
1691 (0.5 % in H_2O)	0.269 µm	
1692 (0.25 % in H_2O)	2.982 µm	
1960* (0.4 % in H_2O)	9.89 µm	
1961* (0.5 % in H_2O)	29.64 µm	
1963** (0.5 % in H_2O)	0.1007 µm	
1965 (Slide Mounted: 1 slide)	9.94 µm (hexagonal array) 9.89 µm (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
114p	Portland Cement	Sieve Residue (45 µm (No. 325) Sieve)	8.24 %	20 pouches × 10 g
		Specific Surface Area (Wagner Turbidimeter)	2086 $cm^2 \cdot g^{-1}$	
		Specific Surface Area (Blaine Air Permeability)	3774 $cm^2 \cdot g^{-1}$	

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

SRM	Description	Surface Area (m^2/g)		Unit Size (g)
		Multi-point	*Single Point*	
1897	SSA (Silica Alumina)	258.32	253.08	7
1899	SSA (Silicon Nitride)	10.67	10.52	4
1900	SSA (Silicon Nitride)	2.85	2.79	4

Mercury Porosimetry Standards

SRM	Description	Unit Size (g)
1917	Mercury Porosimetry Standard (Alumina Beads)	10
1918	Mercury Porosimetry Standard (Extended 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
2806	Medium Test Dust in Hydraulic Fluid	2.8 mg/L	400 mL
RM 8631	Medium Test Dust	1 µm to 50 µm	20 g
RM 8632	Ultrafine Test Dust	1 µm to 20 µm	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: 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, R_a (µm)	Wavelength, D (µm)
Sinusoidal Roughness (Knoop Hardness 500)		
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 Heat Evolution Factor, Q = 42.0	4 sheets: 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: 17.2 × 25.4 × 0.165
1007b	Flaming Exposure Condition (plastic)	388 to 512	1 sheet: 25.4 × 25.4 × 0.076

Smoke Toxicity

SRM	Description	Combustion Mode	Observation Time	Values LC_{50}	Values N-Gas	Unit Size
1048	Cup Furnace Smoke Toxicity Method Standard (ABS copolymer)	Flaming	WE*	27	1.4	8 sheets: (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^2	3 sheets: 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)

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

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/mm²)
Copper, Bright			
1893	Knoop	0.245, 0.49, 0.98	125
Nickel, Bright			
1895	Knoop	0.245, 0.49, 0.98	600
1896a	Vickers	0.245, 0.49, 0.98	600
1905	Knoop	2.943	600
1906	Knoop	4.905	600
1907	Knoop	9.81	600
Silicon Nitride, Ceramic			
2830 (22 mm diameter × 9.54 mm)	Knoop	19.6	1500

Coordinate Measuring Machine (CMM) Probe Performance

These SRMs are suitable for use with ANSI/ASME B89.4.1.

SRM	Description	Unit Size
2084	Tungsten Carbide Sphere	10 mm diameter (stem mounted with stand)
2084R	Tungsten Carbide Sphere	10 mm diameter (stem mounted)
2085	Stainless Steel Sphere	25 mm diameter (stem mounted)

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 ($MPa \cdot m^{1/2}$)	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

Trace Elements in Food and Dairy Products

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

** Developed by Agriculture Canada in cooperation with NIST*

Wheat Hardness

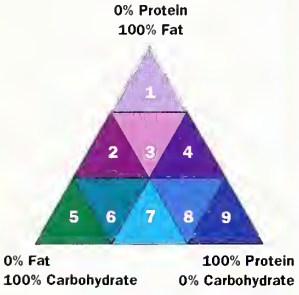
Unit Size: 50 × 20 g

RM	Description	Wheat Numbers
8441*	Wheat Hardness	Hard-1 through Hard-5 Soft-1 through Soft-5

Nutrition Composition

Please visit our website to view the relevant certificate or report of investigation for available certified and non-certified 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 1974a
   RM 8418

** In prep*

SRM	Description	Certified Constituents**	Unit Size (g)
1544	Fatty Acids and Cholesterol in Frozen Diet Composite	Cholesterol, Fatty Acids, Proximates	4 × 15 g
1546	Meat Homogenate	Cholesterol, Fatty Acids, Proximates, Vitamins, Minerals	4 × 85 g
1548a	Typical Diet	Proximates, Trace Elements, Total Dietary Fiber	2 × 6.5 g
1563	Cholesterol and Fat-Soluble Vitamins in Coconut Oil	Cholesterol, Ergocalciferol, dl-α-Tocopheryl Acetate	10 ampoules: 5 fortified, 5 natural
1589a	PCBs, Pesticides, and Dioxins/ Furans in Human Serum	Cholesterol, Triglycerides	5 × 10 mL
1845	Whole Egg Powder	Cholesterol	35
1846	Infant Formula (milk-based)	Minerals, Proximates, Vitamins, Fatty Acids	10 × 30 g
2383	Baby Food Composite	Carotenoids, Cholesterol, Minerals, Proximates, Vitamins	4 × 70 g
RM 8415*	Whole Egg Powder	Fatty Acids, Minerals, Proximates, Vitamins	35
RM 8418*	Wheat Gluten	Fatty Acids, Minerals, Proximates, Vitamins	50
RM 8432*	Corn Starch	Fatty Acids, Minerals, Proximates, Vitamins	50
RM 8433*	Corn Bran	Fatty Acids, Minerals, Proximates, Vitamins	50
RM 8435*	Whole Milk Powder	Fatty Acids, Minerals, Proximates, Vitamins	40
RM 8436*	Durum Wheat Flour	Fatty Acids, Minerals, Proximates, Vitamins	50
1570a	Spinach Leaves	Fatty Acids, Trace Elements, Proximates, Total Dietary Fibers	60
2384	Baking Chocolate	Fat, Fatty Acids, Calcium, Iron, Caffeine, Theobromine, Catechins	5 × 91 g
1566b	Oyster Tissue	Fatty Acids, Nitrogen, Proximates, Total Dietary Fiber, Trace Elements, Mercury, Methylmercury	25
1974a	Organics in Mussel Tissue *(Mytilus Edulis)*	Selected Proximate	3 × 15 g

* *Developed by Agriculture Canada in cooperation with NIST*

** *Proximates are provided as reference values.*

Trace Elements in Botanicals

SRM	Description	Unit Size (g)
1515	Apple Leaves	50
1547	Peach Leaves	50
1570a	Spinach Leaves	60
1575a	Pine Needles	50
1573a	Tomato Leaves	50
2695*	Fluoride in Vegetation	2 × 25 g
RM 8412	Corn Stalk (Zea Mays)	34
RM 8413	Corn Kernel (Zea Mays)	47

** Developed in cooperation with Aluminum Association, Inc.*

Fertilizers

Unit Size: 90 g

SRM	Description	Certified Constituents
120c	Phosphate Rock (Florida)	Minerals
193	Potassium Nitrate	N, K
194	Ammonium Dihydrogen Phosphate	N, P
200a	Potassium Dihydrogen Phosphate	K, P
694	Phosphate Rock (Western)	Minerals

Whole Biomass Feedstock*

Unit Size: 5 × 10 g

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

** Developed by the International Energy Agency (IEA) Biomass Annex, NREL, and NIST*

HEALTH & CLINICAL

Pure, Crystalline Standards

SRM	Description	Purity (%)	Unit Size (g)
938	4-Nitrophenol	(99.75)*	15
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	99.867	30
929	Magnesium Gluconate Dihydrate	5.403 Mg	5
918a	Potassium Chloride	99.9817	30
919a	Sodium Chloride	99.89	30
910	Sodium Pyruvate	98.7	25
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.*

Biological Buffer Systems

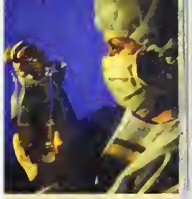
Unit Size: 60 grams

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

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

Human Serum

SRM	Description	Certified Constituents	Reference Values Constituents	Form	No. of Levels
1599	Anticonvulsant Drug Level Assay (Valproic Acid and Carbamazepine)	PCB Congeners (16), Chlorinated Pesticides (5), Total Cholesterol	PCB Congeners (9), Chlorinated Pesticides (5), Total Cholesterol, Triglycerides, "Free" Cholesterol, Phospholipids	Lyophilized	1
900	Antiepilepsy Drug Level Assay	Antiepileptics (4)	—	Lyophilized	3
970	Ascorbic Acid in Frozen Human Serum	Total Ascorbic Acid	—	Frozen	2
1952a	Cholesterol in Human Serum	Cholesterol	—	Lyophilized	3
956a	Electrolytes in Frozen Human Serum	Total Ca, Li, Mg, K, Na	Ionized Ca, Cl	Frozen	3
968c	Fat-Soluble Vitamins, Carotenoids, and Cholesterol in Human Serum	Vitamins (4), Cholesterol, Carotenoids (4)	Carotenoids (8), Vitamin D	Lyophilized	2
965	Glucose in Human Serum	Glucose	—	Frozen	3
909b	Human Serum	Organics (6), Inorganics (6)	Bilirubin	Lyophilized	2
1951a	Lipids in Frozen	Total Cholesterol, Total Glycerides Triglycerides	HDL-, LDL-, and Total Cholesterol, Triglycerides, Free Glycerol		
1589a	PCBs, Pesticides, Dioxins/Furans in Serum	PCB Congeners (16), Chlorinated Pesticides (5), Total Cholesterol	PCB Congeners (9), Chlorinated Pesticides (5), Total Cholesterol (5), Triglycerides, "Free" Cholesterol, Phospholipids	Lyophilized	1



Bovine Serum

SRM	Description	Certified Constituents	Reference Constituents	Form	No. of Levels
927c	Bovine Serum Albumin (7 % Solution)	Protein Concentration	—	Solution	1
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

Ethanol Solutions

This SRM is for use in the calibration of instruments and techniques for the determination of ethanol (ethyl alcohol) in breath and blood.

SRM	Description	Ethanol Mass Fraction (%)	Unit Size
1828a	Ethanol - Water Solutions (Set: 5 ampoules)	95.60	1 × 20 mL
		1.9957	2 × 20 mL
		0.09480	1 × 5 mL
		0.02186	1 × 5 mL

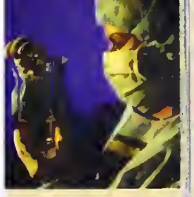
DNA Profiling

SRMs 2390, and 2391a are intended for use in the standardization of forensic and paternity quality assurance procedures and instructional law enforcement or non-clinical research purposes. SRM 2392 is intended to provide quality control when performing the polymerase chain reaction (PCR) and sequencing of human mitochondrial DNA (mtDNA) for forensic identifications, medical diagnosis, or mutation detection. It may also be used as a control when amplifying (PCR) and sequencing any DNA.

SRM	Description	Unit Size
2390	DNA Profiling Standard - RFLP	20 components
2391b	PCR-Based DNA Profiling Standard	12 components
2392	Mitochrondrial DNA Sequencing (Human)	3 components

Biomaterials

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



Drugs of Abuse in Human Hair

SRM	Description	Certified Constituents
2379	Drugs of Abuse in Human Hair I	6
2380	Drugs of Abuse in Human Hair II	4

Drugs of Abuse in Urine

SRM	Description	Certified Constituents	Reference Constituent	Form	Unit Size
1508	Cocaine Metabolites in Urine	Benzoylecgonine		Lyophilized	3 levels, plus 1 blank
RM 8444	Cotinine in Urine		Cotinine (nicotine metabolite)	Lyophilized	2 levels, plus 1 blank
1507b	Marijuana Metabolites in Urine	TH-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

Toxic Substances in Urine

SRM	Description	No. of Levels	Unit Size
2671a	Fluoride	2	4 × 20 mL
2672a	Mercury	2	4 × 20 mL

Miscellaneous Health-Related Materials

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

ENVIRONMENTAL

ORGANICS

Gas Chromatography/Mass Spectrometry (GC/MS) and Characterizing Liquid Chromatography (LC) System Performance

SRM	Description	Certified Constituents	Solvent	No. of Levels	Unit Size
1543	GC/MS System	Methyl Stearate, Benzophenone	Hexane	2	4 × 1 mL
RM 8443	Consists of 5 units of SRM 1543				
877	LC Chiral Selectivity	various Chiral components	Ethanol	—	5 × 1 mL
870	LC Performance	Silanol Activity,Trace Metal Activity, Hydrophobic Retention, Methylene Selectivity	Methanol	1	5 × 1 mL
869a	LC Selectivity	Shape Selectivity: PAHs (3)	Acetonitrile	1	5 × 1 mL

Organic Contaminant Calibration Solutions

SRM	Description	Certified Constituents	Non-Certified Constituents	Unit Size
RM 8467	4,4'-DDE (neat)	—	—	Vial: 100 mg
RM 8469	4,4'-DDT (neat)	—	—	Vial: 100 mg
RM 8466	g-HCH (Lindane) (neat)	—	—	Vial: 100 mg
1491	Aromatic Hydrocarbons in Hexane/Toluene	PAHs (23)	PAHs (1)	5 ampoules
2260	Aromatic Hydrocarbons in Toluene	PAHs (23)	PAHs (1)	5 ampoules
1493	Chlorinated Biphenyl Congeners in 2,2,4 -Trimethylpentane	PCBs (18)	PCBs (2)	5 ampoules
2262	Chlorinated Biphenyl Congeners in 2,2,4-Trimethylpentane	PCBs (25)	PCBs (4)	5 ampoules
2275	Chlorinated Pesticide Solution-II	Pesticides (9)	—	5 ampoules
1492	Chlorinated Pesticides in Hexane	Pesticides (15)	—	5 ampoules
2261	Chlorinated Pesticides in Hexane	Pesticides (15)	—	5 ampoules
2273	DDTs and Metabolites in Solution	DDTs, Metabolites (7)	5 ampoules	
1596	Dinitropyrene Isomers and 1-Nitropyrene in Methylene Chloride	Nitro-PAHs (4)	—	5 ampoules
1614	Dioxin (2,3,7,8-TCDD) in Iso-octane	Dioxins (2)	Dioxins (2)	6 ampoules
1639	Halocarbons (in Methanol) for Water Analysis	Halocarbons (7)	—	5 ampoules
1586	Isotopically Labeled and Unlabeled Priority Pollutants in Methanol	Priority pollutants (10)	—	6 ampoules
1587	Nitrated PAHs in Methanol	Nitro-PAHs (6)	Nitro-PAHs (1)	4 ampoules
2274	PCB Congener Solution-II	PCBs (11)		5 ampoules
2269	Perdeuterated PAH-I	Perdeuterated PAHs (5)	—	5 ampoules
2270	Perdeuterated PAH-II	Perdeuterated PAHs (6)	—	5 ampoules
1647d	Priority Pollutant PAHs (in Acetonitrile)	PAHs (16)	—	5 ampoules
1584	Priority Pollutant Phenols in Methanol	Phenols (10)	Phenols (1)	5 ampoules
2276	Three Planar PCBs in Solution	PCBs (3)	—	5 ampoules

Organic Contaminants in Natural Matrix Materials

SRM	Description	Certified Constituents	Non-Certified Constituents	Unit Size
1597	Complex Mixture of PAHs from Coal Tar	PAHs (12)	PAHs/PASH/PANH (18)	4 ampoules
1975	Diesel Particulate Extract	PAHs (8)	PAHs (29), Nitro-PAHs	4 ampoules
1650	Diesel Particulate Material	PAHs (5), Nitro-PAHs (1)	PAHs (6), Nitro-PAHs (3), PAQ (1)	0.01 g
2975	Diesel Particulate Matter	PAHs (11) (Industrial Forklift)	PAHs (28), Total Extractable Mass, Particle Size Distribution	1 g
2978	Mussel Tissue (Organic Contaminants - Raritan Bay, NJ)	PAHs (7), PCB Congeners (22), Pesticides (12)	PAHs (20), PCBs (2)	10 g
2977	Mussel Tissue	PAHs (14), PCB Congeners (25), Pesticides (7), Trace Elements (6), Methylmercury	PAHs (16), Trace Elements (9)	10 g
2976	Mussel Tissue	Methylmercury, Total Mercury, Trace Elements (7)	Trace elements (20)	25 g
1941b	Organics in Marine Sediment	PAHs (24), PCBs (29), Pesticides (7)	PAHs (43), PCBs (13), Pesticides (2), Tin Species (3) and Total Tin	50 g
1944	New York/New Jersey Waterway Sediment	PAHs (24), PCBs (35), Pesticides (4), Trace Elements (9)	PAHs (32), Pesticides (7), Trace Elements (20), PCDDs/PCDFs (17), Particle Size, Total Organic Carbon	50 g
1588a	Organics in Cod Liver Oil	PCBs (24), Pesticides (4)	PCDDs/PCDFs (7), PCBs (34), Pesticides (3)	5 ampoules
1974a	Organics in Mussel Tissue *(Mytilus Edulis)* (Frozen)	PAHs (15), PCBs (20), Pesticides (7), Total Mercury, Methylmercury	Aliphatics (16), Trace Elements (32), PAHs (18), PCBs (4), Pesticides (4), Proximates, Calories	3 × 15 g
1580	Organics in Shale Oil	PAHs (5), Phenols (3), PANH (1)	Phenols (6), PANH (1)	5 ampoules
1945	Organics in Whale Blubber (Frozen)	PCBs (27), Pesticides (15)	PCBs (2), Pesticides (2)	2 bottles
1589a	PCBs, Pesticides, and Dioxins/Furans in Human Serum	PCBs Congeners (16), Pesticides (5), Total Cholesterol	CDC Lipid Laboratory: PCB Cogeners (9), Pesticides (5), Total Cholesterol, Triglycerides, "Free" Cholesterol, Phospholipids, PCDDs, PCDFs, non-*ortho*, PCBs	5 × 10 mL
1582	Petroleum Crude Oil	PAHs (5), PASH (1)	PAHs (5), Phenols (2), PANH (1)	5 ampoules
1939a	Polychlorinated Biphenyls (Congeners) in River Sediment	PCBs (20), Pesticides (3)	PCBs (4)	50 g
1649a	Urban Dust	PAHs (22), PCBs (35), Pesticides (8)	PAHs (22), Pesticide (1, Mutagenic Activity), PCDD/PCDFs (17), Trace Elements (32), Particle size, Total Organic Carbon	2.5 g

(continued)

Organic Contaminants in Natural Matrix Materials (continued)

SRM	Description	Certified Constituents	Non-Certified Constituents	Unit Size
1648	Urban Particulate Matter	Trace Elements (9)	Trace Elements (25), PAH (13)	2 g

EPA: Organic Compounds Related to Water Analysis

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

SRM	Description	Unit Size
3011	1,1,1-Trichloroethane in Methanol	2 × 2.5 mL
3014	1,2,3-Trichloropropane in Methanol	2 × 2.5 mL
3012	1,2-Dichloroethane in Methanol	2 × 2.5 mL
3009	1,2-Dichloropropane in Methanol	2 × 2.5 mL
3000	Benzene in Methanol	2 × 2.5 mL
3006	Carbon Tetrachloride in Methanol	2 × 2.5 mL
3002	Ethylbenzene in Methanol	2 × 2.5 mL
3015	Isopropylbenzene in Methanol	2 × 2.5 mL
3008	Methylene Chloride in Methanol	2 × 2.5 mL
3004	m-Xylene in Methanol	2 × 2.5 mL
3003	c-Xylene in Methanol	2 × 2.5 mL
3005	p-Xylene in Methanol	2 × 2.5 mL
3016	*sec*-Butylbenzene in Methanol	2 × 2.5 mL
3010	Tetrachloroethene (Tetrachloroethylene) in Methanol	2 × 2.5 mL
3001	Toluene in Methanol	2 × 2.5 mL
3007	Vinyldene in Methanol	2 × 2.5 mL
3074	Adipate and Phthalates Methanol	In Prep
3075	Aroclor 1016 in Transformer Oil	5 × 1.2 mL
3076	Aroclor 1232 in Transformer Oil	5 × 1.2 mL
3078	Aroclor 1248 in Transformer Oil	5 × 1.2 mL
3079	Aroclor 1254 in Transformer Oil	5 × 1.2 mL
3080	Aroclor 1260 in Transformer Oil	5 × 1.2 mL
3090	Aroclors in Transformer Oil (set SRMs 3075-3080)	6 × 1.2 mL

INORGANICS

Metal Constituents in Natural Matrices: Air Particulate, Indoor Dust, Sediment, Mine Waste, Sludge, Soil, and Water

SRM	Description	Elements	Unit Size
Air Particulate			
2783	Air Particulate on Filter Media	18 certified 9 reference	2 filters, plus 2 blanks
1648	Urban Particulate Matter	15 certified	2 g
Indoor Dust, Trace Elements in			
2583	Nominal 90 mg/kg Lead	5 certified	8 g
2584	Nominal 1 % Lead	5 certified 10 reference	8 g
Sediment			
RM 8704	Buffalo River Sediment	25 reference	50 g
1646a	Estuarine Sediment	20 certified	70 g
1944	New York/New Jersey Waterway Sediment	72 certified 78 reference	50 g
2702	Marine Sediment	25 certified 8 reference	50 g
Mine Waste and Sludge			
2780	Hard Rock Mine Waste	12 certified 7 reference	50 g
2781	Domestic Sludge	10 certified	40 g
2782	Industrial Sludge	10 certified 16 reference	70 g
Soil, Trace Elements in			
2710	Montana Soil Highly Elevated Trace Element Concentrations	21 certified	50 g
2711	Montana Soil Moderately Elevated Trace Element Concentrations	24 certified	50 g
2709	San Joaquin Soil	26 certified	50 g
2586	Nominal 500 mg/kg Lead	4 certified 18 reference	8 g
2587	Nominal 3000 mg/kg Lead	4 certified 14 reference	8 g
2780	Hard Rock Mine Waste	12 certified 7 reference	50 g
Water			
1641d	Mercury in Water	1 certified	10 × 10 mL
1640	Natural Water	17 certified 10 reference	250 mL
1643e	Trace Elements in Water (In Prep)	—	250 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 II III	0.70 9.06 17.04

Used Auto Catalysts

Unit Size: 70 g

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

Primary Gas Mixtures

These SRMs are supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a nominal pressure exceeding 12.4 MPa that provides the user with approximately 0.73 m^3 of usable mixture.

SRM	Nominal Amount-of-Substance (µmol/mol)
Ambient Non-Methane Organics in Nitrogen (15 components in large cylinder)	
1800	5 nmol/mol
Carbon Dioxide in Air (Certified for CO_2)	
1671a	340
1672a	350
1676	365

(continued)

Primary Gas Mixtures (continued)

SRM	Nominal Amount of Substance Fraction (µmol/mol)
Carbon Monoxide in Air (Certified for CO)	
2612a	10
2613a	20
2614a	45
Carbon Dioxide in Nitrogen (Certified for 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 %

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

(continued)

Primary Gas Mixtures (continued)

SRM	Nominal Amount of Substance Fraction (µmol/mol)
Carbon Monoxide in Nitrogen (Certified for CO) *continued*	
2740a	10 mol %
2741a	13 mol %
Hydrogen Sulfide in Nitrogen (Certified for H_2S)	
2730	5
2731	20
Methane in Air (Certified for CH_4)	
1658a	1
1659a	10
1660a (also certified for C_3H_8)	4 (methane) 1 (propane)
2750	50
2751	100
Nitric Oxide in Nitrogen (Certified for NO)	
1683b*	50
1684b*	100
1685b*	250
1686b*	500
1687b*	1000
2629a*	20
2630*	1500
2631a*	3000
2735	800
2736a	2000
Oxides of Nitrogen in Air (Certified for NO_x)	
2660a*	100

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

(continued)

Primary Gas Mixtures (continued)

SRM	Nominal Amount of substance Fraction (µmol/mol)
Oxygen in Nitrogen (Certified for O_2)	
2657a*	2 mol %
2658a*	10 mol %
2659a*	21 mol %
Propane in Air (Certified for CH_4)	
1660a (also certified for C_3H_8)	4 (methane) 1 (propane)
1665b	3
1666b	10
1667b	50
1668b*	100
1669b	500
2764	0.25
Propane in Nitrogen (Certified for C_3H_8)	
2643a	100
2644a	250
2645a	500
2646a	1000
2647a	2500
2648a	5000
Sulfur Dioxide in Nitrogen (Certified for SO_2)	
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.

FOSSIL FUELS

Metal Constituents in Fossil Fuels

SRM	Pb Concentration	Unit Size
2713	Lead in Reference Fuels (19.4 µg/g Pb)	6 × 20 mL
2714	Lead in Reference Fuels (28.1 µg/g Pb)	6 × 20 mL
1634c	Trace Elements in Fuel Oil "No. 6" (As, Co, Ni, Pb, S, Se, V)	100 mL
RM 8505	Vanadium in Crude Oil	250 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

Trace Elements in Coals and Coke

SRM	Description	Unit Size (g)
2719	Calcined Petroleum Coke	50
1632c	Coal (Bituminous)	50
1635	Coal (Subbituminous)	75
1633b	Coal Fly Ash	75
2689	Coal Fly Ash	3 × 10 g
2690	Coal Fly Ash	3 × 10 g
2691	Coal Fly Ash	3 × 10 g
2718	Green Petroleum Coke	50

Alcohols and Ethers [Oxygenates] in Reference Fuels

SRM	Description	Constituents	Unit Size
Alcohols in Gasoline			
1829	Alcohols (t-Butanol, Ethanol, Methanol)	4 certified	6 × 20 mL
1838	Ethanol	1 certified	5 × 20 mL
2286	Ethanol	2 certified	3 × 20 mL
2287	Ethanol	2 certified	3 × 20 mL
1839	Methanol	1 certified	5 × 20 mL
1837	Methanol	2 certified	5 × 20 mL
Ethers In Gasoline *Unit Size: 3 × 20 mL*			
2288	t-Amyl Methyl Ether	2 certified	
2289	t-Amyl Methyl Ether	2 certified	
2290	Ethyl t-Butyl Ether ETBE	2 certified	
2291	Ethyl t-Butyl Ether ETBE	2 certified	
2292	Methyl t-Butyl Ether MTBE	2 certified	
2293	Methyl t-Butyl Ether MTBE	2 certified	
Ethers and Ethanol In Reformulated Gasoline *Unit Size: 2 × 20 mL*			
2294	11 % MTBE	4 certified 26 reference	
2295	15 % MTBE	4 certified 26 reference	
2296	13 % ETBE	4 certified 26 reference	
2297	10 % Ethanol	4 certified 26 reference	

Sulfur in Fossil Fuels

SRM	Description	% S
Coke Foundry		
Unit Size: 50 g		
2775	Foundry Coke	0.5816
2776	Foundry Coke	0.825
Diesel Fuel Oil		
Unit Size: 10 × 10 mL		
2723a	Sulfur in Diesel Fuel Oil	0.00108
2724b	Sulfur in Diesel Fuel Oil	0.04304
Gasolines		
2294	Reformulated Gasoline (nominal 11 % MTBE) (2 × 20 mL)	0.00409
2295	Reformulated Gasoline (nominal 15 % MTBE) (2 × 20 mL)	0.0308
2296	Reformulated Gasoline (nominal 13 % ETBE) (2 × 20 mL)	0.00400
2297	Reformulated Gasoline (nominal 10 % Ethanol) (2 × 20 mL)	0.03037
2298	Reformulated Gasoline (5 × 20 mL)	0.00047
2299	Gasoline (High Octane) (5 × 20 mL)	0.00136
Kerosine		
Unit Size: 100 mL		
1616a	Sulfur in Kerosine	0.01462
1617a	Sulfur in Kerosine	0.17307
Petroleum Coke		
Unit Size: 50 g		
2719	Trace Elements in Calcined Petroleum Coke	0.8877
2718	Trace Elements in Green Petroleum Coke	4.7032

Sulfur in Fossil Fuels (continued)

Residual Fuel Oil
Unit Size: 100 mL

1619b	Sulfur in Residual Fuel Oil	0.6960
1620c	Sulfur in Residual Fuel Oil	4.561
1621e	Sulfur in Residual Fuel Oil	0.9480
1622e	Sulfur in Residual Fuel Oil	2.1468
1623c	Sulfur in Residual Fuel Oil	0.3806
2717a	Sulfur in Residual Fuel Oil	2.9957

SRM	Description	% S	Hg (µg/kg)
Crude Oil			
Unit Size: 5 × 10 mL			
2721	Crude Oil	1.5832	0.0525
2722	Crude Oil	0.21037	0.1441
Coals			
Unit Size: 50 g (unless otherwise noted)			
2683b	Sulfur and Mercury in Coal	1.955	90.0
2684b	Sulfur and Mercury in Coal	3.076	97.4
2685b	Sulfur and Mercury in Coal	4.730	146.2
2692b	Sulfur and Mercury in Coal	1.170	133.3
2682b	Sulfur and Mercury in Coal (Subbituminous)	0.4917	108.8
1632c	Trace Elements in Coal Bituminous	1.462	93.8
1635	Trace Elements in Coal (Subbituminous) (75 g)	0.3616	10.9

Moisture in Oils and Alcohols

SRM	Description	Unit Size (mL)
RM 8509	Methanol	5 mL
RM 8507	Mineral Oil	10 mL
RM 8510	Moisture in Methanol	5 mL
RM 8506a	Transformer Oil	5 × 9.5 mL
2890	Water Saturated 1-Octanol	5 × 2 mL

Ores

MINING

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

Ore Bioleaching Substrate

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

RM	Description	Unit Size (g)
8455	Pyrite Ore	100

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
8600	Copper
8601	Copper
8602	Lead
8603	Lead
8605	Molybdenum
8606	Molybdenum
8607	Tungsten
8608	Tungsten
8604	Zinc

COPPER WIRE

Clays

SRM	Description	Unit Size (g)
679	Brick Clay	75
97b	Flint Clay	60
98b	Plastic Clay	60

Rocks and Minerals

SRM	Description	Unit Size (g)
688	Basalt Rock	60
70a	Feldspar, Potash	40
99a	Feldspar, Soda	40
81a	Glass Sand	75
165a	Glass Sand (Low Iron)	75
1413	Glass Sand (High Alumina)	75
1c	Limestone, Argillaceous	50
88b	Limestone, Dolomite	75
278	Obsidian Rock	35

Refractories

SRM	Description	Unit Size (g)
76a	Burnt Refractory (Al2O3-40 %)	75
77a	Burnt Refractory (Al2O3-60 %)	75
78a	Burnt Refractory (Al2O3-70 %)	75
198	Silica Brick	45
199	Silica Brick	45
154c	Titanium Dioxide	90

MICROANALYSIS

Metals

SRM	Description	Unit Size
482	Gold-Copper Wires for Microprobe Analysis	wires: 6
481	Gold-Silver Wires for Microprobe Analysis	wires: 6
480	Tungsten-20 % Molybdenum Alloy Electron Microprobe Standard	rod: 1

Synthetic Glasses

SRM	Description	Unit Size
1873	Barium-Zinc-Silicate Glasses for Microanalysis (K-458, K-489, K-963)	rod: 2 mm × 2 mm × 20 mm
2066	Glass Microspheres (K-411)	glass microspheres: 50 mg
1872	Lead-Germanate Glasses for Microanalysis (K-453, K-491, K968)	rod: 2 mm × 2 mm × 20 mm

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

ELECTRON MICROSCOPE

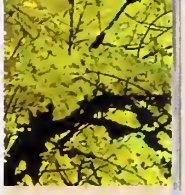
ENGINE WEAR MATERIALS

Metallo-Organic Compounds

Unit Size: 5 g

These SRMs are for preparing solutions in oils of known and reproducible concentrations of metals.

SRM	Description	Elemental Composition
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
1060a	Lithium Cyclohexanebutyrate	4.1 Li
1065b	Nickel Cyclohexanebutyrate	13.89 Ni
1066a	Octaphenylcyclotetrasiloxane	14.14 Si
1077a	Silver 2-Ethylhexanoate	42.60 Ag
1069b	Sodium Cyclohexanebutyrate	12.0 Na
1070a	Strontium Cyclohexanebutyrate	20.7 Sr
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



Lubricating Base Oils

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

Catalyst Characterization Material

This RM is for determining the activity of FCC Catalysts by Microactivity Test and is distributed by NIST in cooperation with ASTM.

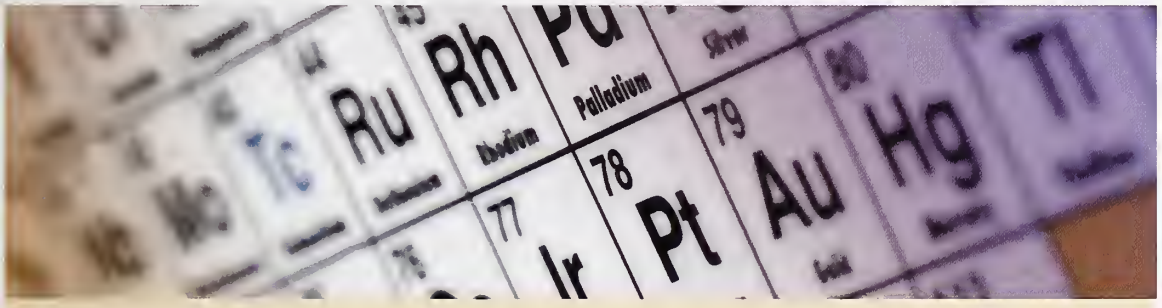
RM	Description	Unit Size
8590	High Sulfur Gas Oil Feed	946 mL

Wear-Metals in Oil

SRM	Description	Unit Size
1848	Lubricating Oil Additive Package	100 mL
1084a	Wear-Metals	5 × 1.6 g
1085b	Wear-Metals	5 × 1.2 g
1083	Wear-Metals (Base Oil)	150 mL

High Purity Materials

Elemental Composition in High Purity Metals



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 × 20 mm); wire (2 mm diameter); and foil (35 mm × 40 mm × 1 mm). There are six sets of RMs in the fine gold series (RMs 8050-8067) available in three forms: block (25 mm × 25 mm × 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 % ± 0.02 % (Purity 99.98+ %)
- Working Standard: a commercially available substance of purity 100 % ± 0.05 % (Purity 99. 95+ %)
- Secondary Standard: a substance of lower purity which can be standardized against a primary grade standard

SRM	Description	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 In Prep	Acidimetric Standard	—	—
987	Strontium Carbonate	Assay and Isotopic Values	99.98	1
999a	Potassium Chloride	Assay Values for: 1. Potassium Chloride 2. Postassium 3. Chloride	 99.9817 52.4354 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
40h	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_3O-
143d	Cystine	C, H, N, S, O
2144	m-Chlorobenzoic Acid	Cl
148	Nicotinic Acid	C, H, N
2143	p-Flurobenzoic Acid	F
2141	Urea	N

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_3 10 %
3102a	Antimony	HNO_3 10 % + HF 2 %
3103a	Arsenic	HNO_3 15 %
3104a	Barium	HNO_3 1 %
3105a	Beryllium	HNO_3 10 %
3106	Bismuth	HNO_3 10 %
3107	Boron	H_2O
3108	Cadmium	HNO_3 10 %
3109a	Calcium	HNO_3 10 %
3110	Cerium	HNO_3 10 %
3111a	Cesium	HNO_3 1 %
3112a	Chromium	HNO_3 10 %
3113	Cobalt	HNO_3 10 %
3114	Copper	HNO_3 10 %
3115a	Dysprosium	HNO_3 10 %
3116a	Erbium	HNO_3 10 %
3117a	Europium	HNO_3 16 %
3118a	Gadolinium	HNO_3 10 %
3119a	Gallium	HNO_3 10 %
3120a	Germanium	HNO_3 10 % + HF 2 %
3121	Gold	HNO_3 5 % + HF 2 %
3122	Hafnium	HNO_3 10% + HF 2%
3123a	Holmium	HNO_3 16 %
3124a	Indium	HNO_3 10 %
3126a	Iron	HNO_3 10 %
3127a	Lanthanum	HNO_3 10 %
3128	Lead	HNO_3 10 %
3129a	Lithium	HNO_3 1 %
3130a	Lutetium	HNO_3 10 %
3131a	Magnesium	HNO_3 10 %
3132	Manganese	HNO_3 10 %

(continued)

Spectrometric Single Element Solutions (continued)

SRM	Element	Nominal Acid Concentration
3133	Mercury	HNO_3 10 %
3134	Molybdenum	HCl 10 %
3135a	Neodymium	HNO_3 10 %
3136	Nickel	HNO_3 10 %
3137	Niobium	HNO_3 10 % + HF 2 %
3138	Palladium	HCl 10 %
3139a	Phosphorus	HNO_3 0.8 %
3140	Platinum	HCl 10 %
3141a	Potassium	HNO_3 1 %
3142a	Praseodymium	HNO_3 10 %
3143	Rhenium	HNO_3 10 %
3144	Rhodium	HCl 10 %
3145a	Rubidium	HNO_3 1 %
3147a	Samarium	HNO_3 10 %
3148a	Scandium	HNO_3 10 %
3149	Selenium	HNO_3 10 %
3150	Silicon	H_2O
3151	Silver	HNO_3 10 %
3152a	Sodium	HNO_3 1 %
3153a	Strontium	HNO_3 10 %
3154	Sulfur	H_2SO_4 0.1 %
3155	Tantalum	HNO_3 10 % + HF 2 %
3156	Tellurium	HCl 20 %
3157a	Terbium	HNO_3 16 %
3158	Thallium	HNO_3 10 %
3159	Thorium	HNO_3 10 %
3160a	Thulium	HNO_3 10 %
3161a	Tin	HNO_3 5 % + HF 2 %
3162a	Titanium	HNO_3 10 % + HF 2 %
3163	Tungsten	HNO_3 7 % + HF 4 %
3164	Uranium	HNO_3 10 %
3165	Vanadium	HNO_3 10 %
3166a	Ytterbium	HNO_3 16 %
3167a	Yttrium	HNO_3 10 %
3168a	Zinc	HNO_3 10 %
3169	Zirconium	HNO_3 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)
3184	Bromide (In Prep)	1000
3182	Chloride	1000
3183	Fluoride	1000
3185	Nitrate	1000
3186	Phosphate	1000
3181	Sulfate	1000

Stable Isotopic Materials

SRM	Description	Chemical Form	Unit Size (g)
951	Boron Isotope Standard	Boric Acid	100
952	Enriched ^{10}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, $^{208}Pb/^{206}Pb$ 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
991	Nitrate Spike Isotope Standard, ^{206}Pb	Nitric Acid	15
994	Gallium Isotope Standard	Metal	disk: 0.25
997	Thallium Isotope Standard	Metal	rod: 0.25

Light Stable Isotopic Materials

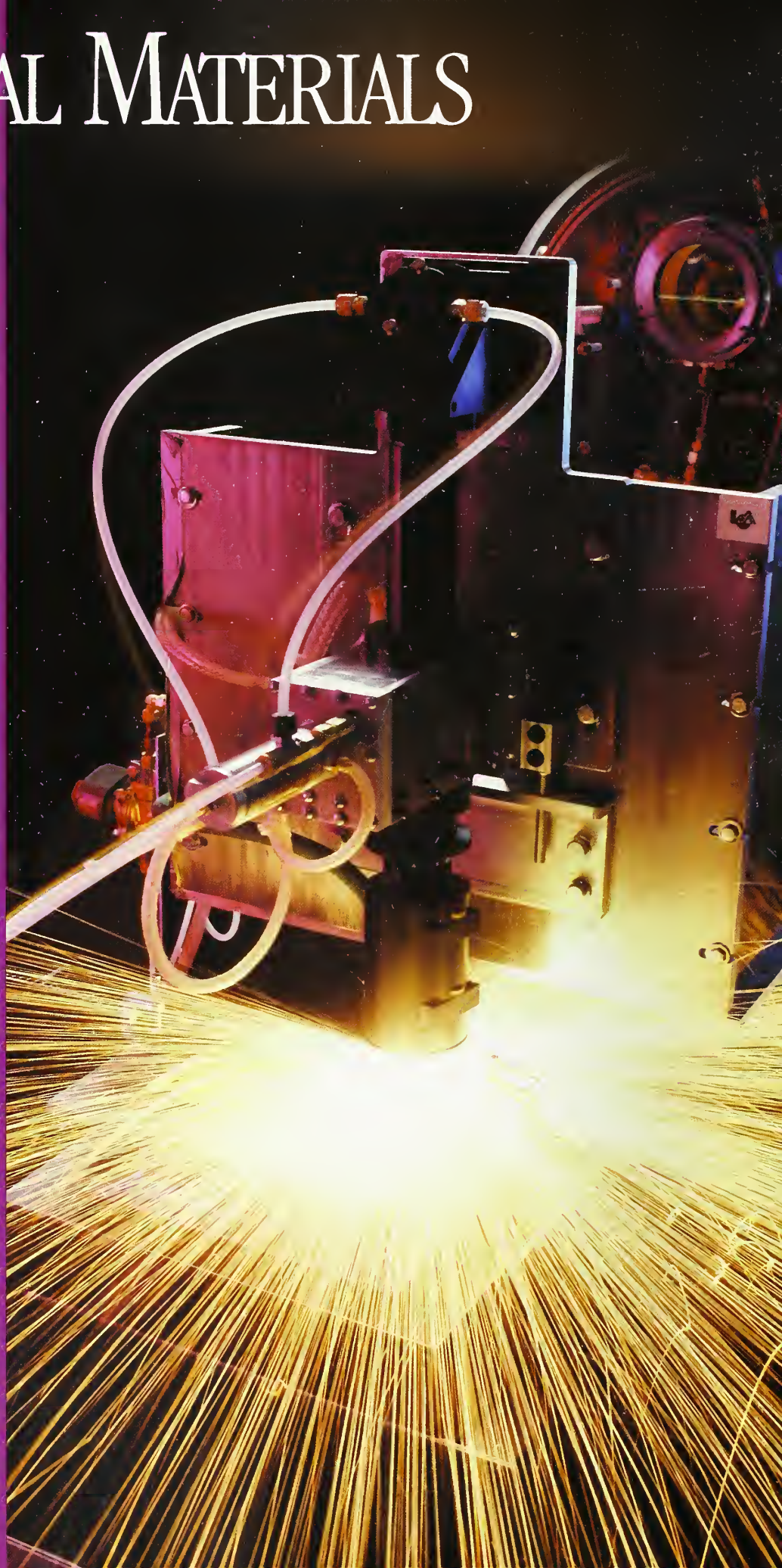
These RMs are distributed by NIST on behalf of the International Atomic Energy Agency (IAEA). At the request of the IAEA, quantities of these materials are limited to *one unit of each RM per laboratory every 3 years.*

Isotopic Ratio Legend:

1. D / H
2. ^{18}O / ^{16}O
3. ^{13}C / ^{12}C
4. ^{6}Li / ^{7}Li
5. ^{30}Si / ^{28}Si
6. ^{15}N / ^{14}N
7. ^{34}S / ^{32}S

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 µmol
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
8562	CO_2-Heavy, Paleomarine Origin	2,3	2 tubes: 9 mm diameter × 300 mm
8563	CO_2-Light, Petrochemical Origin	2,3	2 tubes: 9 mm diameter × 300 mm
8564	CO_2-Biogenic, Modern Biomass Origin	2,3	2 tubes: 9 mm diameter × 300 mm

Industrial Materials



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

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
11h	0.2 % Carbon
12h	0.4 % Carbon
152a	0.5 % Carbon (Tin-Bearing)
337a	1 % Carbon (300 g)

Low Alloy Steels (disk and rod)

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
1224	AISI 1078, Carbon Steel
C1221	AISI 1211, Modified, Resulfurized/Rephosphorized
1269	AISI 1526, Modified (Line Pipe Steel)
1225	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
664	High Carbon Steel, Modified
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)

(continued)

Low Alloy Steels (disk and rod) (continued)

SRM	Description
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

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

Special Low Alloy Steels (chip and pin)

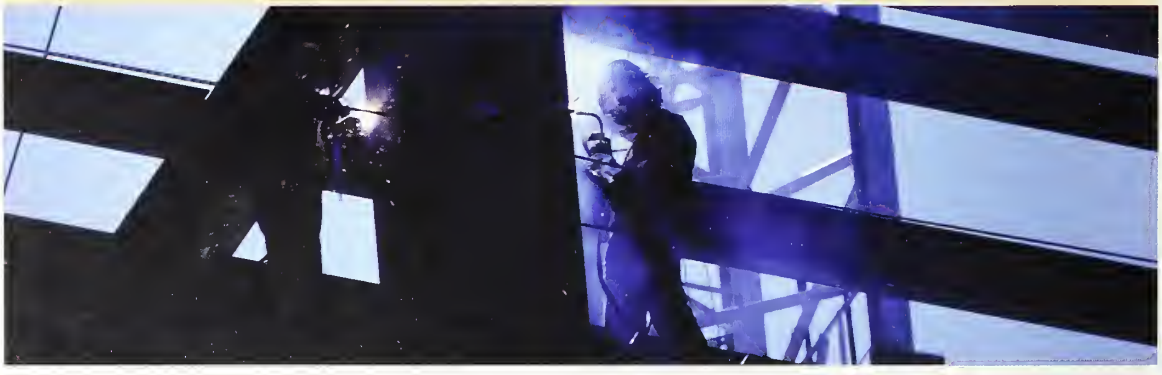
Unit Size: 150 g (unless otherwise noted)

SRM	Description
2159	Low Alloy Steel (pin - 200 g)
2160	Low Alloy Steel (pin - 200 g)
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

High Alloy Steels (chip)

Unit Size: 150 g (unless otherwise noted)

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



Stainless Steels (chip)

Unit Size: 150 g (unless otherwise noted)

SRM	Description
339	SAE 303Se (17Cr - 9Ni - 0.2Se)
101g	AISI 304 L (18Cr - 10Ni)
343a	AISI 431 (16Cr - 2Ni)
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)

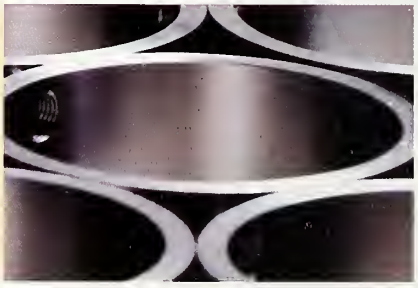
Stainless Steels (disk)

Unit Size: 32 mm diameter × 19 mm

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)

Specialty Steels (disk)

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

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

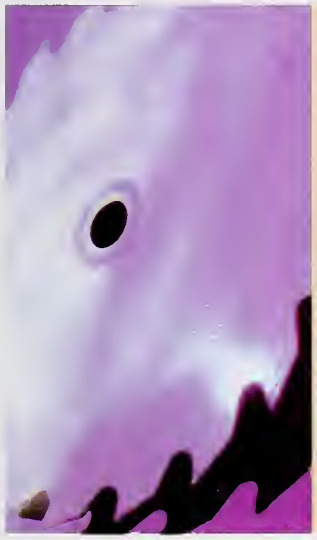
Cast Steels, White Cast Irons, and Ductile Irons (disk)

Unit Size: 32 mm diameter × 19 mm

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

Steelmaking Alloys (fine powder)

Unit Size: 150 g

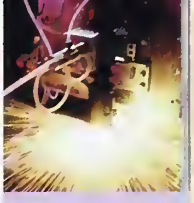


SRM	Description
57a	Silicon Metal
58a	Ferrosilicon (73 % Silicon-Regular Grade)
59a	Ferrosilicon
64c	High Carbon Ferrochromium
68c	High Carbon Ferromanganese
90	Ferrophosphorus
195	Ferrosilicon (75 % Silicon High Purity Grade)
196	Low Carbon Ferrochromium
347	Magnesium Ferrosilicon
689	Silicon Ferrochromium

Cast Irons (chip)

Unit Size: 150 g

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



High Temperature Alloys (chip and disk)

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, ACI 17/4 PH	disk: 32 mm diameter × 19 mm
C2401	High Alloy Steel ACI-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
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.

SRM	Description	Unit Size
87a	Silicon - Aluminum Alloy	75 g
855a	Aluminum Casting Alloy 356	30 g
856a	Aluminum Casting Alloy 380, Fine Millings	30 g
858	Alloy 6011, Modified	35 g
1258	Alloy 6011, Modified	disk: 35 mm diameter × 19 mm
859	Alloy 7075	35 g
1259	Alloy 7075	disk: 35 mm diameter × 19 mm
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

Cobalt Base Alloys (chip and disk)

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 min × 103 mm

SRM		Description
Chip	*Rod*	
395	495	Unalloyed Copper - Cu II
396	496	Unalloyed Copper - Cu III
	457	Unalloyed Copper - Cu IV (6.6 mm diameter × 103 mm)
398	498	Unalloyed Copper - Cu V
399	499	Unalloyed Copper - Cu VI
400	500	Unalloyed Copper - Cu VII
454		Unalloyed Copper - Cu XI (35 g)

Copper Base Alloys (chip and rod)

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

(continued)

Copper Base Alloys (block and disk)

The 1100 series SRMs are wrought disks 32 mm diameter × 19 mm. The C1100 series SRMs are chill cast blocks 32 mm square × 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 × 19 mm
53e	1132	Lead Base Bearing Metal (84Pb - 10Sb - 6Sn)	150	32 mm diameter × 19 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

Nickel Oxides (powder)

Unit Size: 25 g

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

Nickel Base Alloys (chip and disk)

SRM	Description	Unit Size
349a	Waspaloy™	150 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
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

Trace Elements in Nickel Base Superalloys (chip)

Unit Size: 35 g

SRM	Description	Elemental Composition
897	"Tracealloy" A	Pb, Sc, Te, Tl
898	"Tracealloy" B	
899	"Tracealloy" C	

Tin Base Alloys (chip)

SRM	Description	Unit Size
54d	Tin Base Bearing Metal	170 g

Titanium Base Alloys (chip and disk)

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
2431	6Al - 2Sn - 4Zr - 6Mo	50
2432	10V - 2Fe - 3Al	50
2433	8Al - 1Mo - 1V	50

Hydrogen in Titanium (platelet)

SRM	Description	Unit Size
352c	Hydrogen in Unalloyed Titanium	20 g

Zirconium Base Alloys (chip)

SRM	Description	Unit Size
360b	Zircaloy-4	100 g

Zinc Base Alloys (chip and disk)

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

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)

Glasses (powder and solid)

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

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.

Also certified for isotopic ratio: $^{87}Sr/^{86}Sr = 1.20039$

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

CEMENTS

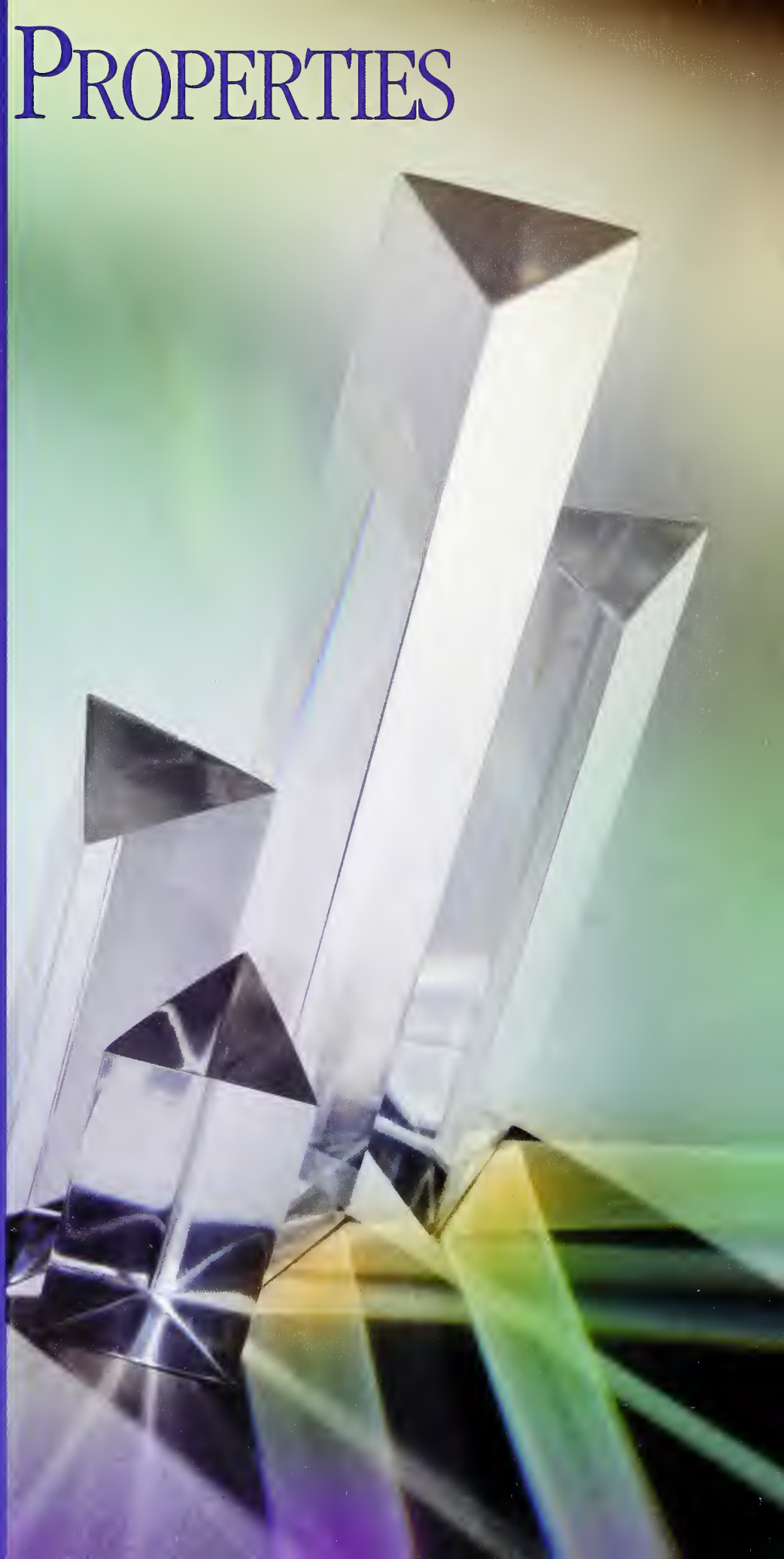
Portland Cements (powder)

SRM	Unit Size
Calcium Aluminate Cement	
1882a	4 × 5 g
1883a	4 × 5 g
Portland Cement	
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

Portland Cement Clinkers (solid)

SRM	Unit Size
Portland Cement Clinkers (5 phases certified)	
2686	3 × 10 g
2687	3 × 10 g
2688	3 × 10 g

PHYSICAL PROPERTIES



ION ACTIVITY

pH Calibration

SRM	Description	pH(S) Values (at 25 °C)	Unit Size (g)
2193	Calcium Carbonate (In Prep)	—	—
723d	Tris(Hydroxymethyl) aminomethane (In Prep)	—	—
185g	Potassium Hydrogen Phthalate	4.006	60
188	Potassium Hydrogen Tartrate	3.557	60
189b	Potassium Tetroxalate	1.719	65
187d	Sodium Tetraborate Decahydrate (Borax)	9.182	30
Admixtures *Unit Size: 30 g (unless otherwise noted)*			
186If	Potassium Dihydrogen Phosphate	6.860*	
186IIf	Disodium Hydrogen Phosphate	7.414**	
191b	Sodium Bicarbonate (25 g)	10.015*	
192b	Sodium Carbonate		

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

Biological Buffer Systems

Unit Size: 60 g

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

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

pD Calibration

SRM	Description	pD(S) Values (at 25°C)	Unit Size (g)
2185	Potassium Hydrogen Phthalate	4.518	60
2186I 2186II	Potassium Dihydrogen Phosphate Disodium Hydrogen Phosphate	7.428*	30 30
2191a 2192a	Sodium Bicarbonate Sodium Carbonate	10.732*	30 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 (µS/cm)
3190	HCl in Deionized Water (In Prep)	—
	KCl in Deionized Water	
3191		100
3192		500
3193		1000
3194		10 000
3195		100 000
	KCl in n-Propanol/Deionized Water	
3198		5
3199		15
	NaCl in deionized Water	
3196		—

Positive Electrophoretic Mobility

SRM	Description	Certified Property	Unit Size
1980	Goethite (α-FeOOH)	+µE, 2.53 µm • cm/V • s	40 mL

POLYMERIC PROPERTIES

Molar Mass/Molecular Weight (M_w)

SRM	M_w (g/mol)	Unit Size (g)
Poly(ethylene oxide)		
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
Poly(methylmethacrylate)		
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
Polyethylene		
2887*	$M_w \approx 196\,400$	0.3
2885*	$M_w \approx 6280$	0.3
2886*	$M_w \approx 87\,000$	0.3
Polyethylene, linear		
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
1483*	$M_w \approx 32\,100$ ($M_w/M_n \approx 1.11$)	1
Polystyrene, linear, broad molecular weight distribution		
706a	$M_w \approx 285\,000$	18
Polystyrene, linear, narrow molecular weight distribution		
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
Polyurethane		
1480	$M_w \approx 47\,300$	1

** Also certified for viscosity*

Melt Flow Rate

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

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 Polythylene *Properties:* - Young's Modulus - Yield Strength - Ultimate Strength - Elongation	bar: 7.62 cm diameter × 152.4 cm (3 in diameter × 60 in)

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: % 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, 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 (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 (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
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 (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)
Pure Metals			
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
Devices (semi-open cell)			
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	Temperature Range (K)	Thermal Resistance ($m^2 \cdot K \cdot W^{-1}$)	Unit Size (cm)
1453	Expanded Polystyrene Board	285 to 310	0.381 to 0.420	66 × 93 × 1.34
1450c	Fibrous Glass Board	280 to 340	0.661 to 0.818	61 × 61 × 2.54
1449	Fumed Silica Board	297	1.195 to 1.253	60 × 60 × 2.54
1459	Fumed Silica Board	297	1.195 to 1.253	30 × 30 × 2.54

Vapor Pressure of Metals

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

Thermal Conductivity of Graphite and Iron

RM	Conductivity Range ($W \cdot m^{-1} \cdot K^{-1}$)	Unit Size
Electrolytic Iron (2 K to 1000 K)		
8420	12.32 to 32.98	0.64 cm diameter × 5.0 cm
8421	12.32 to 32.98	3.17 cm diameter × 5.0 cm
Graphite (5 K to 2500 K)		
8424	0.0354 to 32.96	0.64 cm diameter × 5.0 cm
8426	0.0354 to 32.96	2.54 cm diameter × 5.0 cm

Laboratory Thermometer (mercury in glass)

Unit Size: 1 each

SRM	Description	Calibrated Points (°C)
934	Clinical Laboratory Thermometer	–0.20 to +0.20

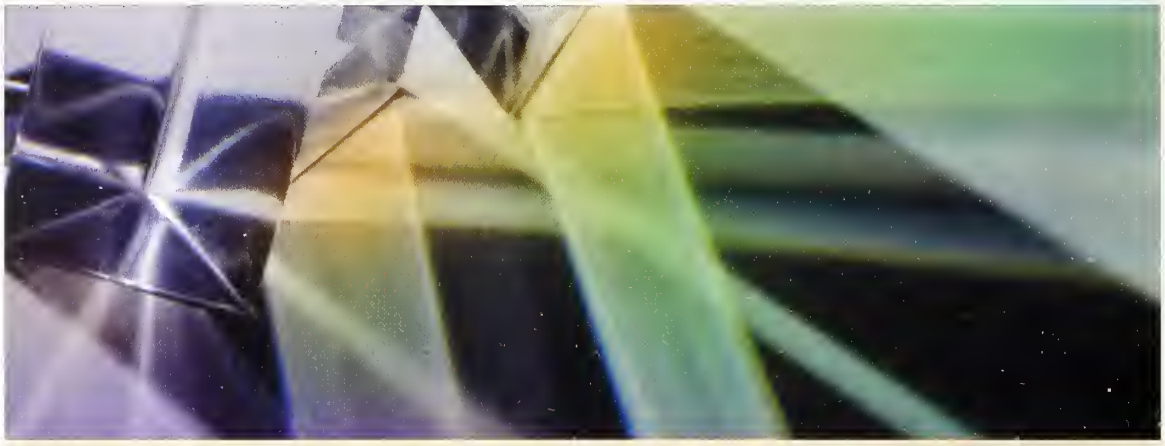
Thermocouple Material, Platinum

Unit Size: 1 each

SRM	Description	Temperature Range
1749	Gold vs. Platinum Thermocouple Thermometer	0 °C to 1000 °C
1967	Platinum Wire, High Purity (99.999+ %)	-197 °C to 1768 °C
1750	Standard Platinum Resistance Thermometer	14 K to 430 K

OPTICAL PROPERTIES

Molecular Transmittance and Absorbance



SRM	Description	Wavelength Range	Unit Size
	Crystalline and Solution Forms		
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: 5 samples, plus 5 blanks
2032	Potassium Iodide, Stray Light	240 nm to 275 nm	25 g
931f	Liquid Filters, Absorbance	302 nm to 678 nm	12 ampoules: 3 × 3 levels, plus 3 blanks
	Glass Filters, Transmittance		
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
2030a	30 % Transmittance	465.0 nm	1 filter, plus 1 blank
2031a	Metal-on-Quartz Filters 10 %, 30 %, 90 % Transmittance	250 nm to 635 nm	3 filters, plus 1 blank
2046	Optical Density = 1	1064 nm	51 mm × 51 mm × 1.0 mm
2047	Optical Density = 2	1064 nm	51 mm × 51 mm × 2.2 mm
2048	Optical Density = 3	1064 nm	51 mm × 51 mm × 3.2 mm
2049	Optical Density = 4	1064 nm	51 mm × 51 mm × 4.2 mm
2050	Optical Density = 5	1064 nm	51 mm × 51 mm × 5.4 mm
2051	Optical Density = 6	1064 nm	51mm × 51 mm × 6.4 mm
2053	20 nm Ni-Cr Film on Silica	2 µm to 25 µm	25 mm diameter × 250 µm
2054	90 nm Ni-Cr Film on Silica	2 µm to 25 µm	25 mm diameter × 250 µm
2055	77 nm Cu-Ni Film on Silica	2 µm to 25 µm	25 mm diameter × 250 µm
2056	97 nm Cu-Ni Film on Silica	2 µm to 20 µm	25 mm diameter × 250 µm

Transmittance Wavelength Standards

SRM	Description	Wavelength Range	Unit Size
2034	Holmium Oxide Solution	240 nm to 650 nm	1 sealed cuvette
2035	Near IR Transmission	971 nm to 1949 nm	25 mm diameter × 1.5 mm
2065	Transmission Wavelength/Vacuum Wavenumber	ultraviolet–visible–near-infared	25 mm diameter × 1.5 mm
1921a	Infrared Transmission	3.2 µm to 18.5 µm	1 polystyrene film

Fluorescence

SRM	Description	Wavelength Range	Unit Size
936a	Quinine Sulfate Dihydrate	375 nm to to 675 nm	1 g
2241	Relative Intensity Correction, Raman Spectroscopy	785 nm	1 glass slide (10.7 × 30.4 × 2.0mm)

Specular Spectral Reflectance

SRM	Description	Wavelength Range	Unit Size
2003	First Surface, Aluminum on Glass	250 nm to 2500 nm	5.1 cm diameter × 0.65 cm
2026	Second Surface, Aluminum on Fused Quartz	250 nm to 2500 nm	5.1 cm diameter × 0.6 cm
2017	Multi-Angle White Reflectance Standard	360 nm to 780 nm	5.7 cm diameter × 1.3 cm
2040	PTFE Diffuser for Spectral Reflectance Factor	380 nm to 780 nm	5 × 26 g

Near Infrared Reflectance Wavelength Standard

SRM	Description	Wavelength Range	Unit Size
1920a	Rare Earth Oxide Mixture	740 nm to 2000 nm	5.1 cm diameter × 1.2 cm

Optical Rotation

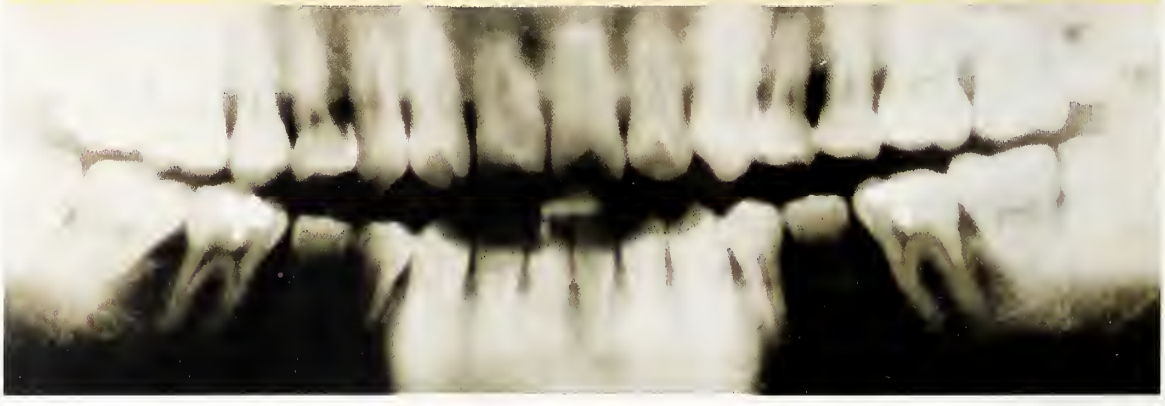
SRM	Description	Wavelength Range	Unit Size
917b	D-Glucose (Dextrose)	546 nm to 589 nm	50 g
17e	Sucrose	546 nm to 633 nm	60 g

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 (μΩ · m)	Unit Size
Electrolytic Iron (2 K to 1000 K)		
8420	0.004 to 0.909	0.64 cm diameter × 5.0 cm
8421	0.004 to 0.909	3.17 cm diameter × 5.0 cm
Graphite (5 K to 2500 K)		
8424	28.78 to 12.59	0.64 cm diameter × 5.0 cm
8426	28.78 to 12.59	2.54 cm diameter × 5.0 cm

Electrical Resistivity and Conductivity of Silicon

SRM	Resistivity (Ω · cm)	Type
Spreading Resistance *Unit Size: 16 chips: (5 × 10 × 0.625) mm*		
2526	0.001 to 200	(111) p-type
2527	0.001 to 200	(111) n-type
Silicon Resistivity *Unit Size: (100 diameter × 0.625) mm*		
2544 2547	10 200	float zone n–type silicon wafer with (III) crystallographic orientation

OPTOELECTRONICS

SRM	Description	Unit Size
	Wavelength Calibration Standards	
2514	Wavelength Calibration Reference for 1560 nm to 1595 nm - Carbon Monoxide ($^{12}C^{16}O$)	Gas Absorption Cell
2515	Wavelength Calibration Reference for 1595 nm to 1630 nm - Carbon Monoxide ($^{13}C^{16}O$)	Gas Absorption Cell
2517a	High Resolution Wavelength Calibration Reference for 1510 nm to 1540 nm - Acetylene ($^{12}C_2H_2$)	Gas Absorption Cell
2519	Wavelength Reference Absorption Cell for 1530 nm to 1560 nm Hydrogen Cyanide ($H^{13}C^{14}N$)	Gas Absorption Cell
	Polarization Mode Dispersion Standards	
2518	Polarization Mode Dispersion Standard	1 each
2538	Deterministic Polarization Mode Dispersion Standard	1 each
	Fiber and Fiber-Connector Geometry Standards	
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 µm diameter
2554	Optical Fiber Coating Diameter (n = 1.515)	1 each: 250 µm diameter

METROLOGY

Optical Microscope Linewidth Measurement

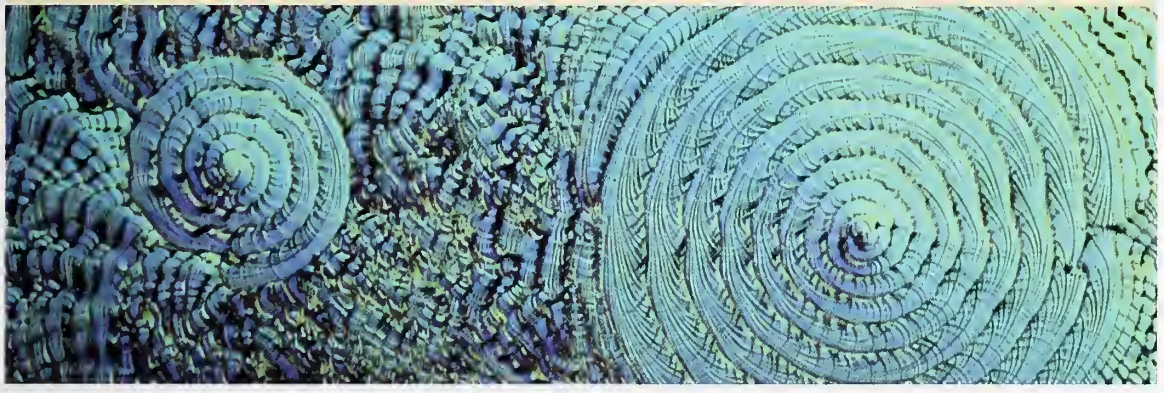
SRM	Linewidth (µm)	Pitch (µm)	Unit Size (cm)
	Linewidth Measurement Standards		
475	0.9 to 10.8	2 to 36	6.35 × 6.35 × 0.15
476	0.9 to 10.8	2 to 36	6.35 × 6.35 × 0.15

Scanning Electron Microscope (SEM)

SRM	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

Depth Profiling

SRM	Description	Value	Unit Size (cm)
2134	Arsenic Implant in Silicon Profile Standard	^{75}As - 7×10^{14} atoms/cm^2	crystal: 1 × 1
2135c	Nickel-Chromium Thin-Film Depth Profile Standard	Cr: 41.3 µg/cm^2 Ni: 49.4 µg/cm^2	1 × 2.54 × 0.04
2137	Boron Implant in Silicon Depth Profile Standard	^{10}B - 1.018 v 1015 atoms/cm^2	1 × 1



SILICON CRYSTAL

Solder Thickness for X-ray Fluorescense

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^2	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	
	(µm)	(mils)
Chromium over Copper on Steel		
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 (Δ) and psi (ψ) 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)
Thin Film Thickness Standards	
2531	50
2532	100
2533	200
2534	25
2535	14

Oxygen Concentration in Silicon

SRM	Description	Unit Size (mm)	Concentration (mg/kg)
2551	Oxygen in Silicon	4 wafers: 25 × 25 × 2	Low: 10 Medium: 13 High: 15 FZ: (<0.1)

Superconducting Critical Current (wire form)

Unit Size: wire: 8.7 cm diameter × 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_2SO_4	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 × 5 cm × 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 × 5 × 2.5	$\log_{10}\rho \approx 9.9$ Ω·cm at 300 °C
774	Lead Silica for Dielectric Constant and ac Loss Characteristics	5 × 5 × 2.5	K ≈ 7.47 at 100 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) at λ = 546.1 nm (Value × 10^{-12} m^2/N)	Unit Size
709	Extra Dense Lead Silica	C = – 1.359	bar: 4 cm × 4 cm × 5 cm

Density

SRM	Description	Density (kg/m^3)	Unit Size
1827b	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	*Iso*octane	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) B (perforated plate)	988 991
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_2O_3, CeO_2, Cr_2O_3, TiO_2, ZnO) (In Prep)	Quantitative Analysis	—

X-ray Stage Calibration

SRM	Description	Unit Size (mm)
1842	Calibration Board (X and Y dimensions)	Board: 300 × 300 × 3
1843	Calibration Board (Z dimension)	Triangular Block: 37 × 20 × 12

RADIOACTIVITY

Radioactive Solutions

Each SRM is contained in a 5 mL flame-sealed glass ampoule and, except as noted, consists of the radionuclide dissolved in an aqueous solution (usually acidic, unless noted).

SRM	Radionuclide	Massic Activity (Bq/g)	Calibration Date
4322B*	Americium-241	40	09/1991
4332D*	Americium-243	40	05/1995
4251C*	Barium-133	500 000	09/1993
4222C	Carbon-14 (as hexadecane)	50 000	09/1990
4233E*	Cesium-137 Burn-up Standard (In Prep)	300 000	—
4943	Chlorine-36 (3 mL)	10 000	12/1984
4915E*	Cobalt-60	75 000	01/1995
4329*	Curium-243	70	06/1984
4320A*	Curium-244	35	02/1996
4370C*	Europium-152	90 000	02/1987
4361C	Hydrogen-3 (as water) (500 mL)	2	09/1998
4926E	Hydrogen-3 (as water) (20 mL)	5 000	09/1998
4927F	Hydrogen-3 (as water)	600 000	09/1998
4947C	Hydrogen-3 (as toluene) (4 mL)	300 000	03/1987
4949C*	Iodine-129 (dilute base solution)	3 000	03/1993
4341*	Neptunium-237	100	03/1992
4226C	Nickel-63	50 000	08/1995
4323B*	Plutonium-238	40	11/1999
4330B*	Plutonium-239	40	11/1999
4338A*	Plutonium-240	40	05/1996
4340B*	Plutonium-241 (In Prep)	250	—
4334G*	Plutonium-242	25	06/1994
4326	Polonium-209	90	03/1994

** These SRMs require a license certification.*

(continued on next page)

Radioactive Solutions (continued)

SRM	Radionuclide	Massic Activity (Bq/g)	Calibration Date
4969	Radium-226	3	09/1998
4965	Radium-226	30	09/1991
4966	Radium-226	270	09/1991
4967	Radium-226	2 700	09/1991
4339B	Radium-228 (In Prep)	500	—
4919H*	Strontium-90	4 000	07/1995
4234A*	Strontium-90	2 500 000	03/1995
4288A	Technetium-99	30 000	09/1996
4328C	Thorium-229 (In Prep)	30	—
4342A	Thorium-230 (In Prep)	40	—
4324B	Uranium-232 (In Prep)	40	—
4321C	Uranium-238, Natural Uranium	250	08/1997

** These SRMs require a license certification.*

Radioactive Point Sources

SRM	Radionuclide	Principal Photon Energies (keV)	Activity (Bq)	Calibration Date
4241C	Barium-133	81 to 384	60 000 to 170 000	01/1999
4203D*	Cobalt-60	1173, 1332	10 000 to 60 000	01/1995
4218F*	Europium-152	122 to 1400	50 000 to 150 000	01/1999
4201B*	Niobium-94	702, 871	4000	04/1970

** These SRMs require a license certification.*

Radiopharmaceuticals

A typical schedule of SRMs for a year:

SRM	Radionuclide	High Level†	Low Level	Month
4401*	Iodine-131	750 MBq (20 mCi)	25 MBq (700 µCi)	January
4412*	Molybdenum-99	1.5 GBq (40 mCi)	75 MBq (2 mCi)	February
4415*	Xenon-133	7.5 GBq (200 mCi)	750 MBq (20 mCi)	March
4416*	Gallium-67	375 MBq (10 mCi)	20 MBq (500 µCi)	April
	OPEN			May
4404*	Thallium-201	375 MBq (10 mCi)	35 MBq (900 µCi)	June
4425*	Samarium-153	375 MBq (10 mCi)	20 MBq (500 µCi)	July
4417*	Indium-111	375 MBq (10 mCi)	20 MBq (500 µCi)	August
4410*	Technetium-99m	7.5 GBq (200 mCi)††	††	September
4407*	Iodine-125	750 MBq (20 mCi)	6 MBq (150 µCi)	October
	OPEN			November
4427*	Yttrium-90	200 MBq (5 mCi)	20 MBq (500 µCi)	December

** These SRMs require a license certification.*

† High level radiopharmaceutical SRMs are distributed through a program with the exception of technetium-99m. This program includes:

- Distribution of radioactivity Standard Reference Materials (usually a high level [10^7 Bq to 10^{10} Bq] and low level [10^6 Bq to 10^8 Bq] pair of sources), for quantification, to sponsoring participating companies ten times per year.
- Two "open" months per year when the sponsors have the opportunity to send in sources of their choice for calibration.

For the more information, please contact Daniel Golas, the program's Project Manager, at NIST (301) 975-5540.

†† Technetium-99m is also available to purchasers of low level radiopharmaceutical SRMs.

Radon Emanation Standard

This SRM is intended for the calibration of radon-222 measuring instruments. It consists of a small heat-sealed polyethylene cylinder containing approximately 0.35g of radium-226 solution. The SRM is calibrated in terms of the radium-226 activity and in terms of the emanation fraction of the radon-222 under specified conditions.

SRM	Radionuclide	Activity (Bq)	Calibration Date
4968	Radium-226	4, 40, or 400	09/1991

Beryllium Isotopic Ratio Standard

SRM	Radionuclide	Isotopic Ratio	Total Nuclide Concentration (mg/g)	Calibration Date	Volume (mL)
4325	Beryllium-10/ Beryllium-9 (in 1N HCl)	3×10^{-11}	5	08/1986	50

Carbon-14 Dating Standard

This SRM is an international standard for contemporary carbon-14 against which world-wide measurements can be compared.

SRM	Description	Unit Size
4990C	Oxalic Acid	8 × 28 g

Natural Matrix Materials

These SRMs are intended for use in testing measurements of low level, biological, and environmental radioactivity contained in matrices similar to the sample, for evaluating analytical methods, or as a generally available calibrated "real" sample matrix in interlaboratory comparisons.

SRM	Description	Unit Size (g)
4350B	Columbia River Sediment	85
4351	Human Lung	45
4352	Human Liver	45
4354	Freshwater Lake Sediment	25
4355	Peruvian Soil	75
4356	Ashed Bone	15
4357	Ocean Sediment	85

Neutron Density Monitor Wire

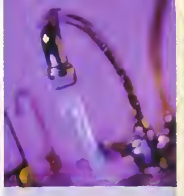
SRM	Description	Cobalt Composition (weight %)	Unit Size
953	Cobalt in Aluminum Wire	0.116	0.5 mm diameter × 1 m

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 ($\times 10^{14}$ n/cm^2)	
				Copper Foil	*Gold Foil*
963a	0.823	0.2792	RT-4	39.5	43.0
			RT-3	41.2	45.8

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	Description	Set Size	Elemental Composition	Diameter (mm)	Pore Size (µm)
2679a	Quartz on Filter Media	2 × 3 levels, plus 2 blanks	Quartz, Clay	47	0.45
2783	Air Particulate on Filter	2 filters, plus 2 blanks	18 certified values 9 reference values	47	0.4

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_D) 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 (%)	Unit Size (g)
1878a	Respirable Alpha Quartz	100.00 ± 0.21	5
1879a	Respirable Cristobalite	95.6 ± 0.4	5

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

Asbestos

SRM	Description	Asbestos Type	Unit Size
1866a	Common Commercial Asbestos	chrysotile grunerite (Amosite) riebeckite (Crocidolite)	3 × 4 g
1876b	Chrysotile Asbestos for TEM	—	10 sections: 3 mm × 3 mm
RM 8411	Mixed Asbestos Research Filter	chrysotile asbestos grunerite (Amosite)	1 cm^2

ASBESTOS TESTING

Subject Index

A

B

C

D

E

F

G

H

M

P

Q

R

S

U

V

W

X

Y

Z

Numeric Index

Numeric Index

SRM	Descriptor	Page
495	Unalloyed Copper II (solid)	57
496	Unalloyed Copper III (solid)	57
498	Unalloyed Copper V (solid)	57
499	Unalloyed Copper VI (solid)	57
500	Unalloyed Copper VII (solid)	57
600	Bauxite, Australian	32
607	Potassium Feldspar	62
610	Trace Elements in Glass	62
611	Trace Elements in Glass	62
612	Trace Elements in Glass	62
613	Trace Elements in Glass	62
614	Trace Elements in Glass	62
615	Trace Elements in Glass	62
616	Trace Elements in Glass	62
617	Trace Elements in Glass	62
620	Soda Lime, Flat	62
621	Soda-Lime Container	62
622	Soda-Lime Silica (Durability)	81
623	Borosilicate (Durability)	81
624	Lead-Silica Glass for dc Resistivity	81
625	Zinc-Base A	61
626	Zinc-Base B	61
627	Zinc-Base C	61
628	Zinc-Base D	61
629	Zinc-Base E-ASTM AC 41A	61
630	Zinc-Base F	61
631	Zinc Spelter (mod)	61
640c	Silicon Line Position (XRD)	83
641	Titanium Alloy, 8 Mn (A)	60
642	Titanium Alloy, 8 Mn (B)	60
643	Titanium Alloy, 8 Mn (C)	60
647	Titanium Alloy, Al-Mo-Sn-Zr	60
648	Titanium Alloy, Al-Sn-Zr-Cr-Mo	60
649	Titanium Alloy V-Al-Cr-Sn	60
650	Unalloyed Titanium A	60
651	Unalloyed Titanium B	60
654b	Titanium Alloy, Al-V	60
656	Silicon Nitride Quantitative Analysis	83
659	Silicon Nitride, Particle Size	1
660a	Line Profile LaB6	83
661	LA Steel (AISI 4340)	48
663	LA Steel, Cr-V (mod.)	48
664	LA Steel, High Carbon, (mod.)	48
670	Rutile Ore	32
671	Nickel Oxide 1	59
672	Nickel Oxide 2	59
673	Nickel Oxide 3	59
674	X-Ray Powder Diffraction Intensity, set	83
675	Line Position, Mica (XRD)	83
676	Quantitative Analysis, Alumina (XRD)	83
679	Brick Clay	33
680L1a	High Purity Platinum	39
682	High Purity Zinc	39
683	Zinc, Metal	39
685R	High Purity Gold	39
685W	High Purity Gold	39
688	Basalt Rock	34
689	Ferrochromium Silicon	53
690	Iron Ore (Canada)	32
691	Iron Oxide, Reduced	32
692	Iron Ore, Labrador	32
693	Iron Ore, Nimba	32
694	Phosphate Rock, Western	32, 11
696	Bauxite, Surinam	32
697	Bauxite, Dominican	32
698	Bauxite, Jamaican	32
699	Alumina (Reduction Grade)	32
705a	Polystyrene 179k Mol/Wt	68, 70
706a	Polystyrene 258k mol/wt	68
709	Extra Dense Lead	82
710a	Soda-Lime Silica Glass	82
713	Barium Glass Anneal Pt	82
714	Alumina Glass Anneal Pt	82
716	Neutral Glass Anneal Pt	82
717a	Hi Boron Glass Viscosity	82
720	Sapphire Heat Capacity	70
723d	Tris (hydroxymethy) amionmethane	40, 65
726	Selenium, Inter-Purity	39
728	Zinc, Intermediate Purity	39
731L1	Borosilicate Glass - Thermal Expansion	72
731L2	Borosilicate Glass - Thermal Expansion	72
731L3	Borosilicate Glass - Thermal Expansion	72

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