NIST SP 260-176
January 2013


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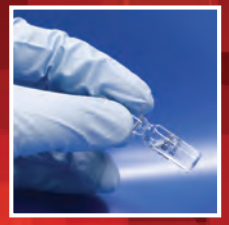
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January 2013

Editors: Regina R. Montgomery and Joan C. Sauerwein

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

SRMs find use in calibrating instruments and in assuring the long-term integrity of quality assurance programs. They are also key mechanisms for verifying important measurement results and in developing new measurement methods. SRMs provide users with tools to assist in establishing traceability of measurement results to 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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PLEASE NOTE: The tables are presented to facilitate comparisons among a family of materials to help customers select the best SRM for their needs. For specific values and uncertainties, the certificate is the only official source.

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Standard Reference Materials for Chemical Composition

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Standard Reference Materials for Chemical Composition

101. Ferrous Metals

101.1 - Plain Carbon Steels (chip form)

These SRMs are for checking chemical methods of analysis. They consist of steel alloys selected to provide a wide range of analytical values for elements.
They are furnished in 150-g units (unless otherwise noted) as chips usually sized between 0.4 mm to 1.2 mm, prepared from selected portions of commercial ingots.

PLEASE NOTE: The tables are presented to facilitate comparisons among a family of materials to help customers select the best SRM for their needs.
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	8k	12h	13g	14g	15h	16f	19h	20g	152a	178	368
Description >>	Bessemer Steel (Simulated), 0.1 % Carbon	Basic Open-Hearth Steel, 0.4% Carbon	0.6% Carbon Steel	Carbon Steel (AISI 1078)	Basic Open-Hearth Steel, 0.1% Carbon	Basic Open-Hearth Steel, 1% carbon	Basic Electric Steel, 0.2% Carbon	AISI 1045 Steel	Basic Open-Hearth Steel, 0.5% Carbon (Tin Bearing)	0.4C Basic Oxygen Furnace Steel	Carbon Steel (AISI 1211)
Unit of Issue >>	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g
Element Composition (mass fraction, in %)											
Aluminum (total)		(0.038)	0.048	0.025	0.061		0.002	0.040			
Carbon	*0.0806*	0.407	0.613	0.735	0.076	0.97	0.215	0.462	0.486	0.395	0.089
Chromium	0.0467	0.074	0.050	0.081	0.018	0.020	0.173	0.036	0.046	0.016	0.030
Cobalt						0.003					
Copper	0.0200	0.073	0.066	0.047	0.013	0.006	0.466	0.034	0.023	0.032	0.010
Manganese	0.5040	0.842	0.853	0.456	0.373	0.404	0.393	0.665	0.717	0.824	0.82
Molybdenum	*0.0397*	0.006		0.011	0.009	0.003	0.038	0.008	0.036	0.003	0.003
Nickel	*0.1174*	0.032	0.061	0.030	0.017	0.008	0.248	0.034	0.056	0.010	0.008
Nitrogen		0.006									0.010
Phosphorus	*0.0956*	0.018	0.006	0.006	0.005	0.014	0.016	0.012	0.012	0.012	0.084
Silicon	*0.0576*	0.235	0.355	0.232	0.008	0.214	0.211	0.305	0.202	0.163	0.007
Sulfur	*0.0775*	0.027	0.031	0.019	0.019	0.026	0.022	0.028	0.030	0.014	0.132
Tin									0.032		
Vanadium	0.0145	0.003	0.001	0.0008	>0.001	0.002	0.003	0.002	0.001	0.001	0.001

101.2 - Low Alloy Steels (chip form) [150 g units (unless otherwise noted)]

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

	30f	32e	33e	36b	72g	100b	106b	125b	129c	131g	139b	155	163	179	291	293	2171
Description >>	LA Steel, Cr-V (SAE 6150)	Nickel-Chromium Steel (SAE 3140)	LA Steel, Ni-Mo (SAE 4820)	Chromium-Molybde-num Steel	LA Steel (AISI 4130)	LA Steel, Manganese (SAE T340)	LA Steel, Cr-Mo-Al (Nitral-loy rG)	LA Steel, High Silicon	LA Steel, High Sulfur (SAE 112)	Low Alloy Sili-con Steel	LA Steel, Cr-Ni-Mo (AISI 8640)	LA Steel, Cr-W	LA Steel, 1.0 C	LA Steel, High Sili-con	LA Steel, Cr-Mo (ASTM A 213)	LA Steel, Cr-Ni-Mo (AISI 8620)	LA Steel, (HSLA 100)
Unit Size >>	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	100 g	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in %)																	
Al (total)			0.030		(0.041)		1.07	0.329						0.0028	0.002	0.039	0.019
Carbon	0.490	0.4086	0.186	*0.1143*	0.278	0.397	0.326	0.0261	0.125	0.0035	0.403	0.905	0.933	0.027	0.177	0.222	0.066
Chromium	0.945	0.6775	0.068	2.178	0.905	0.063	1.18	0.0198	0.014		0.488	0.485	0.982	0.022	1.33	0.510	0.550
Copper	0.074	0.1266	0.070	0.1792	0.011	0.064	0.117	0.0707	0.013		0.097	0.083	0.087	0.056	0.047	0.032	1.47
Manganese	0.79	0.7983	0.525	0.4041	0.492	1.89	0.506	0.2751	0.769		0.778	1.24	0.897	0.094	0.550	0.960	0.73
Molybdenum		0.0228	0.224	0.9960	0.170	0.237	0.199	0.0087	0.002		0.182	0.039	0.029	0.014	0.538	0.204	0.546
Nickel	0.070	1.1938	3.36	0.205	0.016	0.030	0.217	0.0375	0.251		0.510	0.100	0.081	0.050	0.065	0.480	3.35
Niobium																	0.024
Nitrogen	0.010	(0.009)			(0.008)	0.004					0.007		0.007				
Phosphorus	0.011	0.00888	0.005	0.0074	0.009	0.023	0.008	0.0276	0.076		0.013	0.015	0.007	0.006	0.008	0.018	0.006
Silicon	0.283	0.2775	0.262	0.2580	0.223	0.210	0.274	2.889	0.020		0.242	0.322	0.488	3.19	0.230	0.300	0.338
Sulfur		0.0210						0.0095		0.0004255							
Tin		(0.011)						0.0034						0.004			
Tungsten												0.517					
Vanadium		*0.00225*		0.0043	0.003	0.003	0.003		0.012		0.004	0.014		<0.01		0.004	0.003

- Certified values are normal font
- Reference values are italicized
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101.3 - Special Low Alloy Steels (chip and pin forms) [150-g units (unless otherwise noted)]

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

	361	363	364	2159	2160	2165	2166	2167	2168
Description >>	AISI 4340 Steel	Chromium-Vanadium Steel (Modified)	LA Steel, High C (mod.)	LA Steel, Carbon & Sulfur only	LA Steel, Carbon & Sulfur only	Low Alloy Steel	LA Steel, F	LA Steel, G	High Purity Iron
Unit of Issue >>	150 g	150 g	150 g	200 g	200 g	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in % unless noted by an asterik * for mg/kg)									
Aluminum	0.021	0.24	(0.008)			(0.006)	0.012	0.0045	(4*)
Antimony	0.0042	0.002	0.034			0.0010	0.0005	0.0020	(<3*)
Arsenic	0.017	0.010	0.052			0.0010	0.0035	0.0005	(<1*)
Bismuth	(0.0004)	(0.0008)	(0.009)			(<0.0001)	(<0.0001)	(<0.0001)	(<3*)
Boron			0.0106			*0.000944*	*4.365**	*9.72**	*0.064**
Cadmium									(<1*)
Calcium	0.00010	0.00022	0.00003						(<2*)
Carbon	0.383	0.62	0.87	0.016	0.584	*0.0063*	0.015	0.051	10*
Cerium	0.0040	0.0030	0.00057						
Chromium	0.694	1.31	0.063			0.050	0.024	0.0015	*3**
Cobalt	0.032	0.048	0.15			0.0012	0.0022	0.0050	*6**
Copper	0.042	0.10	0.249			0.0013	0.015	0.0014	*5**
Germanium	[0.006]	[0.010]	[0.003]						
Gold	(<0.00005)	0.0005	0.0001						
Hafnium	(0.0002)	(0.0005)	(0.0013)						
Hydrogen	(<0.0005)	(<0.0005)	(<0.0005)						
Iron	(95.6)	(94.4)	(96.7)						
Lanthanum	(0.001)	(0.002)	(0.0002)						
Lead	0.000025	0.00186	0.0230			0.0003	0.003	(<0.0001)	(<1*)
Magnesium	0.00026	0.00062	0.00016			(<0.0001)	(<0.0001)	(<0.0001)	(<3*)
Manganese	0.66	1.50	0.255			0.144	0.066	0.022	*6**
Molybdenum	0.19	0.028	0.49			0.0055	0.0035	0.020	(<7*)

101.3 - Special Low Alloy Steels (chip and pin forms) [150-g units (unless otherwise noted)] (Cont.)

	361	363	364	2159	2160	2165	2166	2167	2168
Description >>	AISI 4340 Steel	Chromium-Vanadium Steel (Modified)	LA Steel, High C (mod.)	LA Steel, Carbon & Sulfur only	LA Steel, Carbon & Sulfur only	Low Alloy Steel	LA Steel, F	LA Steel, G	High Purity Iron
Unit of Issue >>	150 g	150 g	150 g	200 g	200 g	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in % unless noted by an asterik * for mg/kg)									
Neodymium	0.00075	0.0012	0.00018						
Nickel	2.00	0.30	0.144			0.155	0.022	0.002	*10**
Niobium	0.022	0.049	0.157			0.0004	0.005	0.0095	(<5*)
Nitrogen	(0.0037)	(0.0041)	(0.0032)						*6**
Oxygen	(0.0009)	(0.00066)	(0.0010)						*110**
Phosphorus	0.014	0.029	0.01			0.0052	0.0012	0.0031	*14**
Praseodymium	(0.0003)	(0.0004)	(0.0001)						
Selenium	(0.004)	(0.00016)	(0.00021)			(0.0035)	(0.0035)		(<5*)
Silicon	0.222	0.74	0.065			(0.004)	0.010	0.026	(<5*)
Silver	0.0004	0.0037	(0.00002)			0.0002	0.0005	0.0007	
Strontium	(<0.0005)	(<0.0005)	(0.001)						
Sulfur	0.0143	0.0068	0.0250	0.0023	0.012	0.003643	0.002164	0.008731	10.7*
Tantalum	0.020	(0.53)	0.11			(0.004)	(0.011)	(0.002)	(<5*)
Tellurium	(0.0006)	(0.0009)	(0.0002)			(0.003)	(0.003)	(0.0003)	(<1*)
Tin	0.010	0.104	0.008			0.002	0.0010	0.006	(<3*)
Titanium	0.020	0.050	0.24			0.0051	0.0007	0.010	(<3*)
Tungsten	0.017	0.046	0.10						(<10*)
Vanadium	0.011	0.31	0.105			0.0040	0.009	0.033	(<1*)
Zinc	(0.0001)	(0.0004)	[0.001]						(<5*)
Zirconium	0.009	0.049	0.068				(0.0004)	(0.004)	(<5*)

*Value is in mg/kg.

101.4 - High Alloy Steels (chip form) [150-g units (unless otherwise noted)]

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For specific values and uncertainties, the certificate is the only official source.

	126c	344	345a	346a	348a	862	868
Description >>	High-Nickel Steel (36 % Ni)	HA Steel, (Mo Precipitation Hardening)	HA Steel, (Cu Precipitation Hardening)	Valve Steel	Hi Temp. Alloy, (A286) Ni-Cr	High Temp. Alloy L605	High Temp. Alloy Fe-Ni-Co
Unit of Issue >>	150 g	150 g	150 g	150 g	150 g	100 g	100 g
Elemental Composition (mass fraction in %)							
Al (total)		1.16	(<0.001)	(0.001)	0.249	0.026	0.99
Arsenic					(<0.005)		
Bismuth					(<0.0001)		
Boron			(<0.001)	(<0.001)	0.00519	(<0.005)	0.0078
Carbon	0.02540	0.069	0.040	0.502	0.0428	0.120	0.022
Chromium	*0.0625*	14.95	15.52	21.08	14.65	20.0	0.077
Cobalt	*0.0080*		0.099	(0.05)	0.151	15.1	16.1
Copper	*0.0396*	0.106	3.39	0.375	0.137	0.0010	0.022
Iron					55.6	(<0.0001)	40.5
Lead					(<0.0003)		
Manganese	0.4684	0.57	0.79	9.16	0.652	1.59	0.052
Molybdenum	*0.0110*	2.40	0.43	0.237	1.15	1.80	0.014
Nickel	36.054	7.28	4.27	3.43	24.08	9.74	37.78
Niobium			0.27	(0.01)	*0.067*	(<0.01)	2.99
Nitrogen			0.031	0.442	(0.003)		
Phosphorus	*0.00350*	0.018	0.024	0.031	0.0239	0.002	<0.003
S (comb.)	*0.0050*	0.019	0.012	0.002	0.00095	0.0008	0.0025
Silicon	0.1936	0.395	0.61	0.219	0.411	0.017	0.097
Silver					(0.000025)		
Tantalum					(<0.001)	(<0.01)	0.003
Tin				(0.008)	(<0.033)		
Titanium		0.076	(<0.001)	(<0.001)	2.18	51.5	1.48
Tungsten			0.309		*0.0695*		
Vanadium	(0.001)	0.040	0.080	0.096	0.229	0.005	0.077
Zirconium					(<0.018)		

101.5 - Gases in Ferrous Metals (rod form)

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

For further information see SP 260-14

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

	1089	1090	1091a	1093	1094	1754	1755
Description >>	Steels, Set (consists of SRMs 1095, 1096, 1097, 1098 and 1099)	Ingot Iron, Oxygen	Stainless Steel (AISI 431)	Valve Steel, Oxygen	Maraging Steel	Steel (AISI 4320)	Nitrogen in Low Alloy Steel
Unit of Issue >>	5 rods	rod	rod	rod	rod	rod	disk
Elemental Composition (mass fraction, in %)							
Hydrogen (in mg/kg)	(5 levels)						
Nitrogen (in mg/kg*)	(2 levels 3 levels)	(60)	(876)		(71)	81	118.4
Oxygen (in mg/kg)	5 levels	491	132.2	60	4.5	24	

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

101.6 - Stainless Steels (chip form) [150-g units (unless otherwise noted)]

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

	73c	101g	121d	123c	133b	160b	166c	339	343a	893	895
Description >>	Stainless Steel, Cr (SAE 420)	Stainless Steel (AISI 304L)	Stainless Steel, (Cr 17-Ni 11-Ti 0.3) (AISI 321)	Stain-less Steel, Cr-Ni-Nb (AISI 348)	Chromium-Molybdenum Steel	Stainless Steel (Cr 18-Ni 12-Mo 2) (AISI 316)	Stainless Steel, Low-Carbon (AISI 316L)	Stainless Steel, Cr-Ni-Se (SAE 30)	Stainless Steel (AISI 431)	Stainless Steel (SAE 405)	Stainless Steel (SAE 201)
Unit of Issue >>	150 g	100 g	150 g	150 g	150 g	150 g	100 g	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in %)											
Aluminum									(0.001)	(0.20)	
Arsenic						*0.01067*					
Bismuth						(<0.0005)					
Boron									(<0.001)		
Carbon	0.310	0.0136	0.067	0.056	0.128	0.0445	0.00781	0.052	0.149	0.027	0.066
Chromium	12.82	18.46	17.50	17.40	12.63	18.37		17.42	15.64	13.55	16.72
Cobalt		0.09	*0.097*	0.12		*0.109*		0.096	(0.04)	0.020	0.126
Copper	0.080	0.029	0.1205	0.103	0.080	0.175		0.199	0.162	0.261	0.439
Lead						(0.001)			(<0.0001)	(0.0001)	(0.0001)
Manganese	0.330	0.085	1.81	1.75	1.07	1.619		0.738	0.42	0.378	7.09
Molybdenum	0.091	0.004	0.167	0.22	0.052	*2.26*		0.248	0.164	0.023	0.337
Nickel	0.246	10.00	11.18	11.34	0.230	12.35		8.89	2.16	0.192	5.34
Niobium				0.65					(0.01)	(<0.0005)	(<0.009)
Nitrogen	0.037				0.05	(0.04)					
Phosphorus	0.018	0.007	(0.019)	0.024	0.018	*0.0200*		0.129	0.026	0.022	0.038
Selenium								0.247		(<0.0001)	(<0.0001)
Silicon	0.181	1.08	0.536	0.59	0.327	*0.5093*		0.654	0.545	0.326	0.399
Sulfur	0.036	0.0078	(0.013)	0.014	0.328	0.0175		0.013	0.001	0.0003	0.0033
Tantalum				<0.001						(<0.001)	(<0.001)
Titanium			0.346						(<0.001)	(0.01)	(<0.0004)
Tungsten			(0.012)			(0.11)					(0.03)
Vanadium	0.030	0.041			0.071	0.050		0.058	0.056	0.080	0.079

- Certified values are normal font
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101.7 - Tool Steels (chip form) [150-g units]

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

	50c	132b	134a	2172
Description >>	Tungsten-Chromium-Vanadium Steel	Tool Steel (AISI M2)	Tool Steel, Mo-W-Cr-V	S-7 Tool Steel
Unit of Issue >>	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in %)				
Arsenic	0.0225			
Carbon	*0.7193*	0.864	0.808	0.480
Chromium	4.128	4.38	3.67	3.11
Cobalt	(0.035)	0.029		
Copper	0.0792	0.088	0.101	0.083
Manganese	0.3417	0.341	0.218	0.61
Molybdenum	0.0821	4.90	8.35	1.37
Nickel	0.0686	0.230	0.088	1.04
Nitrogen	0.0117			
Phosphorus	0.0222	0.012	0.018	0.008
S (comb.)		0.004	0.007	0.0031
Silicon	0.3102	0.185	0.323	0.263
Sulfur	0.006367		0.007 (Grav)	
Tin	0.0183			
Tungsten	18.445	6.28	2.00	
Vanadium	1.158	1.83	1.25	0.234

101.8 - Low Alloy Steels (disk and rod forms)

Steel and iron SRMs described here are furnished in various forms (disk, rod and chips) for optical emission and X-ray fluorescence spectrometric methods and for other methods of chemical analysis.

See also: Table 101.3 and Table 101.5.
Nominal Sizes for Solid Steel SRMs:
600 Series: 3.2 mm diameter and 51 mm long.
1100 and 1200 Series: 31 mm diameter and 19 mm thick.
1700 Series: 34mm diameter and 19 mm thick.
A “C” preceding the SRM number indicates a chill cast sample; 31 mm diameter and 19 mm thick.

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

	662	663	665	1134	1135	1218	1224	1225	1226	1227	1228	1254	1264a	1265a	1269	1270
Description >>	AISI 94B17 Steel (Modified)	Chromium-Vanadium Steel (Modified)	Electrolytic Iron	LA Steel, High Silicon	LA Steel, High Silicon	LA Steel, High Silicon	LA Steel, Carbon (AISI 1078)	LA Steel (AISI 4130)	LA Steel	LA Steel, Basic Open Hearth, 1% C	LA Steel, 0.1% C	LA Steel (Ca only)	LA Steel, High Carbon (mod.)	Electro-lytic Iron	Line Pipe (AISI 1526 mod.)	LA Steel, Cr-Mo (A336) (F-22)
Unit of Issue >>	rods	5 rods	5 rods	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)																
Al (total)	0.095	0.024	(0.0007)	*0.329*	0.0028	0.005	0.060		0.054	(0.028)	0.061		(0.0080)	(0.0007)	0.016	(0.005)
Antimony	0.012	0.002											0.034			
Arsenic	0.092	0.010	(0.0002)										0.052	(0.0002)	(0.006)	(0.02)
Bismuth	(0.002)	(0.0008)											(0.0009)			
Boron	0.0025	0.0009	0.00013										(0.011)	0.00013	(<0.0001)	(0.0033)
Cadmium																
Calcium	(0.0002)	(<0.0001)										0.0053	0.00004			
Carbon	0.163	0.57	0.008	0.0261	0.027	0.0029	0.75	0.274	0.085	0.97	0.072		0.871	0.0067	0.298	0.077
Cerium	(0.0011)	(0.0016)											0.00022			
Chromium	0.30	1.31	0.0072	0.0198	0.022	0.006	0.071	0.91	0.467	0.019	0.016		0.066	0.0072	0.201	2.34
Cobalt	0.30	0.048	0.0070			(0.002)			0.029	(0.0008)			0.15	0.0070	(0.014)	0.038
Copper	0.51	0.098	0.0058	0.0707	0.056	0.003	0.072		0.125	0.006	0.012		0.250	0.0058	0.095	0.114
Germanium	[0.002]	[0.010]											[0.003]	<50		
Gold	(<0.00005)	0.0005											0.0001			
Hafnium	[0.006]	[0.0015]											(0.0013)			
Hydrogen	[<0.0005]	[<0.0005]											(<0.0005)	<5		

101.8 - Low Alloy Steels (disk and rod forms) (Cont.)

	662	663	665	1134	1135	1218	1224	1225	1226	1227	1228	1254	1264a	1265a	1269	1270
Description >>	AISI 94B17 Steel (Modified)	Chromium-Vanadium Steel (Modified)	Electrolytic Iron	LA Steel, High Silicon	LA Steel, High Silicon	LA Steel, High Silicon	LA Steel, Carbon (AISI 1078)	LA Steel (AISI 4130)	LA Steel	LA Steel, Basic Open Hearth, 1% C	LA Steel, 0.1% C	LA Steel (Ca only)	LA Steel, High Carbon (mod.)	Electro-lytic Iron	Line Pipe (AISI 1526 mod.)	LA Steel, Cr-Mo (A336) (F-22)
Unit of Issue >>	rods	5 rods	5 rods	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)																
Iron	(95.3)	(94.4)	99.9										(96.7)	99.9		
Lanthanum	0.0004	0.0006											0.00007			
Lead	0.0043	0.0022	0.000015						(0.0001)				0.024	0.000015	0.005	(0.0016)
Magnesium	(0.0006)	(0.0005)											0.00015			
Manganese	1.05	1.50	0.0057	0.2751	0.094	0.014	0.41	0.48	0.274	0.402	0.365		0.258	0.0057	1.35	0.626
Molybdenum	0.070	0.30	0.0050	0.0087	0.014	(0.003)	0.013	0.166	0.446	0.003	0.009		0.49	0.0050	0.036	0.956
Neodymium	(0.0005)	(0.0007)											0.00007			
Nickel	0.60	0.32	0.041	0.0375	0.050	(0.002)	0.054	0.018	5.42	0.007	0.018		0.142	0.041	0.108	0.174
Niobium	0.30	0.049							(0.005)				0.157			
Nitrogen	(0.0041)	(0.0041)											(0.0032)	<20		
Oxygen	(0.0011)	(0.0007)											(0.0010)	<70		
Phosphorus	0.044	0.029	0.0025	0.0276	0.006	(0.002)	0.009	0.007	0.0022	0.014	0.004		0.010	0.0011	0.012	0.0065
Praseodymium	(0.00012)	(0.00018)											(0.00003)			
Selenium	[0.001]	[0.0001]											(0.00021)			
Silicon	0.4	0.74	0.0080	2.889	3.19	(3.2)	0.173	0.221	0.231	0.215	0.007		0.066	0.0080	0.189	0.247
Silver	(0.0010)	(0.0038)											(0.000002)	<0.2	(0.0002)	(0.0001)
Sulfur	0.037	0.0055	0.0059	0.0095	0.026	0.0011	0.039	0.014	0.0044	0.026	0.018		0.025	0.0055	0.0061	0.0065
Tantalum	0.21	(0.053)											0.11			
Tellurium	(0.0005)	(0.0022)											0.00018			
Tin	0.016	(0.095)		0.0034	0.004				(0.003)				(0.008)	<2	(0.039)	(0.02)
Titanium	0.084	0.050	0.0006			(0.004)			0.0021				0.24	(0.0001)	(0.009)	(0.003)
Tungsten	0.21	0.046							(0.005)				0.102	<1	(0.001)	(0.003)
Vanadium	0.041	0.31	0.0006		<0.1	(<0.001)	0.002	0.004	0.0018	0.002	<0.001		0.106	0.0006	0.004	0.013
Zinc	(0.0005)	(0.0004)											[0.001]	<3		
Zirconium	0.20	0.050				(0.002)			(0.010)	(0.0006)			0.069			

*Values are in mg/kg.

101.8 - Low Alloy Steels (disk and rod forms) (Cont.)

	1271	1286	1761a	1762a	1763a	1764a	1765	1766	1767	1768	C1221	C1285
Description >>	LA Steel (HSLA-100)	Low Alloy Steel (HY 80)	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	High-Purity Iron	LA Carbon (AISI 1211)	LA Steel (A242) (mod.)
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in % unless noted by an asterik * for mg/kg)												
Al (total)	0.020	0.109	0.055	0.0706	0.0435	0.0098	(0.006)	0.012	0.004	0.0024	0.111	(0.12)
Antimony			*0.0052*		0.011		0.0010	0.0005		(<1.0*)		(0.04)
Arsenic		0.019	*0.011*	0.0173	0.055	0.0100	0.0010	0.0035	0.0005	(<1.0*)		(0.022)
Bismuth							(<0.0001)	(<0.0001)	(<0.0001)	(<4.0*)		
Boron		(0.006)	0.0023	0.0042	0.0054	0.0010	0.0009	0.00012	0.0010	(<2.0*)		
Cadmium										(<1.0*)		
Calcium									(0.0003)	(<1.0*)		
Carbon	0.064	0.196	1.05	0.341	0.202	0.592	0.006	0.015	0.052	0.0010	0.020	0.058
Cerium								(0.002)				(0.0021)
Chromium	0.552	1.53	0.222	0.923	0.498	1.468	0.051	0.024	0.0015	(<2.0*)	0.049	0.80
Cobalt		0.116	*0.027*	0.0616	0.093	0.012	0.0012	0.0020	0.0050	0.0025	(0.010)	0.036
Copper	1.48	0.043	0.298	0.1186	0.042	0.5178	0.0013	0.015	0.0014	0.0006	0.041	0.37
Germanium												
Gold												
Hafnium												
Hydrogen												
Iron			(95.0)	(94.2)		(95.1)						
Lanthanum												
Lead		(0.0002)					0.0003	0.003	(0.0001)	(<1.0*)		
Magnesium							(<0.0001)	(<0.0005)	(<0.0001)	(<6.0*)		
Manganese	0.73	0.152	0.679	1.99	1.584	1.193	0.144	0.067	0.022	0.0014	0.102	0.332
Molybdenum	0.543	0.334	0.103	0.353	0.490	0.2007	0.005	0.0035	0.020	(<3.0*)	0.038	0.164
Neodymium												
Nickel	3.34	2.81	1.981	1.156	0.513	0.2006	0.154	0.021	0.002	0.0014	0.067	1.17

101.8 - Low Alloy Steels (disk and rod forms) (Cont.)

	1271	1286	1761a	1762a	1763a	1764a	1765	1766	1767	1768	C1221	C1285
Description >>	LA Steel (HSLA-100)	Low Alloy Steel (HY 80)	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	Low Alloy Steel	High-Purity Iron	LA Carbon (AISI 1211)	LA Steel (A242) (mod.)
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)												
Niobium	0.025	(0.012)	0.021	0.0692	0.100	0.0416	0.0004	0.005	0.010	(<5.0*)		
Nitrogen			*0.0042*	(0.002)	0.0045	0.0023	0.0010	0.0033	0.0008	0.002		
Oxygen										0.036		
Phosphorus	0.005	0.008	0.042	0.0346	0.0123	0.0210	0.0052	0.002	0.0031	0.0013	0.090	0.072
Praseodymium												
Selenium							(0.0035)	(0.0035)		(<1.0*)		
Silicon	0.334	0.130	0.182	0.351	0.633	0.0595	(0.004)	0.010	0.026	(<10.0)	0.876	0.36
Silver							0.0002	0.0005	0.0008			
Sulfur	0.0013	0.017	0.037	0.0295	0.022	0.0118	0.0038	0.0024	0.0090	0.0003	0.112	0.020
Tantalum			0.050	0.0203	0.012	0.0297	(0.004)	(0.006)	(0.002)	(<1.0*)		
Tellurium							(0.003)	(0.003)	(0.0003)	(<1.0*)		
Tin		0.012	0.050	0.0479	0.011	0.024	0.002	0.0010	0.006	(<1.0*)		0.35
Titanium		0.040	0.173	0.0952	0.308	0.0286	0.0055	0.0005	0.011	(<10.0*)	(0.0014)	
Tungsten		(0.13)	(0.02)		(0.03)	(0.0016)		(0.001)		(<2.0*)		(0.03)
Vanadium	0.003	0.0057	0.054	0.2010	0.307	0.1063	0.0040	0.009	0.033	(<1.0*)	(0.0007)	0.150
Zinc										(<1.0*)		
Zirconium		(0.021)	0.012	0.0285	0.044	0.0012	(0.0002)	(0.0004)	(0.004)	(<1.0*)	(0.0017)	(0.02)

*Values are in mg/kg.

101.9 - High Temperature Alloys (chip and disk forms)

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

	866	867	1230	1246	1247	1250	C2400	C2401
Description >>	Incoloy, 800	Incoloy, 825	High Temp. Alloy, A286	Incoloy® 800	Incoloy® 825	High Temp. Alloy Fe-Ni-Co	HA Steel ACI (17/4 PH)	HA Steel (ACI-C-4M-Cu)
Unit of Issue >>	100 g	100 g	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)								
Aluminum	0.29	0.062	0.249	0.30	0.060	0.99		
Arsenic			(<0.005)					
Bismuth			(<0.0001)					
Boron	<0.001	0.002	0.00519	<0.001	0.002	0.0078	(0.0004)	(0.0004)
Carbon	0.082	0.021	0.0428	0.082	0.021	0.022	0.036	0.062
Chromium	20.1	23.4	14.65	20.1	23.4	0.077	17.06	25.1
Cobalt	0.075	0.089	0.151	0.076	0.089	16.1	0.10	0.19
Copper	0.49	1.74	0.137	0.49	1.75	0.022	2.63	3.17
Iron	46.1	26.6	55.6	46.2	26.5	40.5		
Lead			(<0.0003)					
Manganese	0.92	0.39	0.652	0.91	0.38	0.052	0.71	1.03
Molybdenum	0.36	2.73	1.15	0.36	2.73	0.014	0.23	2.13
Nickel	30.8	43.5	24.08	30.8	43.5	37.78	4.07	5.46
Niobium	(0.09)	(0.45)	*0.067*	(0.09)	(0.46)	2.99	0.15	(0.002)
Nitrogen			(0.003)					
Phosphorus	0.017	0.018	0.0239	0.018	0.018	<0.003	0.013	0.025
Silicon	0.17	0.32	0.411	0.18	0.32	0.097	0.61	0.74
Silver			(0.000025)					
Sulfur	0.001	0.002	0.00095	0.001	0.002	0.0025	0.003	0.027
Tantalum			(<0.001)			0.003		
Tin			(<0.033)					
Titanium	0.31	0.75	2.18	0.32	0.75	1.48		
Tungsten			*0.0695*				(0.1)	(0.18)
Vanadium			0.229			0.077	0.092	0.20
Zinc			(<0.018)					

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

101.10 - Stainless Steels (disk form)

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

	1155	1171	1172	1219	1223	1295	1297	C1151a	C1152a	C1153a	C1154a	C1296
Description >>	Stainless Steel Cr 18-Ni 12-Mo 2 (AISI 316)	Stainless Steel Cr 17-Ni 11-Ti 0.3 (AISI 321)	Stainless Steel Cr 17-Ni 11-Nb 0.6 (AISI 348)	Stainless Steel Cr-Ni (AISI 431)	Chromium Steel	Stainless Steel (SAE 405)	Stainless Steel (SAE 201)	Stainless Steel 23Cr-7Ni	Stainless Steel 18Cr-11Ni	Stainless Steel 17Cr-9Ni	Stainless Steel 19Cr-13Ni	Stainless Steel
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)												
Aluminum				(0.001)	(<0.005)	(0.20)	(0.003)	(0.003)	(0.004)	(0.004)		0.035
Arsenic	*0.01067*					(0.006)	(0.005)					
Bismuth	(<0.0005)											
Boron				(<0.001)								
Calcium					(<0.0005)							
Carbon	0.0445	0.067	0.056	0.149	0.127	0.027	0.066	0.034	0.142	0.225	0.100	0.038
Chromium	18.37	17.50	17.40	15.64	12.64	13.52	16.69	22.59	17.76	16.70	19.31	27.90
Cobalt	*0.109*	0.097	0.12	(0.04)		0.020	0.127	0.033	0.22	0.127	0.38	0.026
Copper	0.175	0.1205	0.105	0.162	0.081	0.260	0.442	0.385	0.097	0.226	0.44	0.056
Lead	(0.001)			(<0.0001)		(0.0001)	(<0.0001)	0.0039	0.0047	0.006	0.017	(<0.001)
Magnesium					(<0.0005)							
Manganese	1.619	1.81	1.76	0.42	1.08	0.387	7.11	2.39	0.95	0.544	1.44	0.256
Molybdenum	*2.26*	0.167	0.22	0.164	0.053	0.023	0.331	0.79	0.44	0.24	0.068	3.43
Nickel	12.35	11.18	11.35	2.16	0.232	0.194	5.34	7.25	10.86	8.76	13.08	0.373
Niobium			0.65	(0.01)		(<0.0005)	(<0.009)	(0.015)	(0.15)	(0.48)	(0.22)	0.20
Nitrogen	(0.04)			0.078	(0.05)			(0.21)	(0.055)	(0.11)	(0.077)	
Phosphorus	*0.0200*	(0.019)	0.025	0.026	0.018	0.022	0.038	0.017	0.023	0.030	0.06	0.024

101.10 - Stainless Steels (disk form) (Cont.)

	1155	1171	1172	1219	1223	1295	1297	C1151a	c1152a	C1153a	C1154a	C1296
Description >>	Stainless Steel Cr 18-Ni 12-Mo 2 (AISI 316)	Stainless Steel Cr 17-Ni 11-Ti 0.3 (AISI 321)	Stainless Steel Cr 17-Ni 11-Nb 0.6 (AISI 348)	Stainless Steel Cr-Ni (AISI 431)	Chromium Steel	Stainless Steel (SAE 405)	Stainless Steel (SAE 201)	Stainless Steel 23Cr-7Ni	Stainless Steel 18Cr-11Ni	Stainless Steel 17Cr-9Ni	Stainless Steel 19Cr-13Ni	Stainless Steel
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)												
Silicon	*0.5093*	0.536	0.59	0.545	0.327	0.321	0.397	0.29	0.64	1.00	0.53	0.66
Sulfur	0.0175	(0.013)	0.014	0.001	0.329	0.0003	0.0033	0.038	0.0064	0.019	0.051	0.013
Tantalum			<0.001			(<0.001)	(<0.001)	(0.004)	(0.001)	(0.03)	(0.045)	(<0.001)
Tin				(0.008)	(0.004)	(0.02)	(<0.010)					(<0.01)
Titanium		0.346		(<0.001)		(0.01)	(<0.0004)			(0.013)	(0.004)	0.23
Tungsten	(0.11)	(0.012)		(0.02)		(0.002)	(0.03)					(<0.01)
Vanadium	0.050			0.056	0.068	0.082	0.080	0.040	0.033	0.176	0.135	0.134
Zirconium					(0.0001)					(0.0001)	(0.001)	

101.11 - Specialty Steels (disk form)

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

	1157	1158	1233	1772
Description >>	Specialty Steel, Tool (AISI M2)	High-Nickel Steel (36% Ni)	Specialty Steel, Valve Steel	Tool Steel (S-7)
Unit of Issue >>	disk	disk	disk	disk
Elemental Composition (mass fraction in %)				
Carbon	0.836	0.02540	0.502	0.447
Chromium	4.36	*0.0625*	21.08	3.10
Cobalt	0.028	*0.0080*		
Copper	0.088	*0.0396*	0.375	0.083
Manganese	0.34	0.4684	9.16	0.61
Molybdenum	4.86	*0.0110*	0.237	1.38
Nickel	0.228	36.054	3.43	0.105
Phosphorus	0.011	*0.00350*	0.031	0.008
Silicon	0.18	0.1936	0.219	0.264
Sulfur	0.004	*0.0050*	0.002	0.0031
Tungsten	6.28		(0.01)	
Vanadium	1.82	(0.001)	0.096	0.236

101.12 - Steelmaking Alloys (powder form)

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

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

	57b	58a	59a	64c	68c	90	195	196	689
Description >>	Silicon Metal	Ferrosilicon (73% Si Regular Grade)	Ferrosilicon	Ferrochromium, High Carbon	Ferromanganese, High Carbon	Ferrophosphorus	Ferrosilicon (75% Si-HP Grade)	Ferrochromium, Low Carbon	Ferrochromium Silicon
Unit of Issue >>	40 g	75 g	50 g	100 g	100 g	75 g	75 g	100 g	100 g pow
Elemental Composition (mass fraction in %)									
Aluminum	0.1690	0.953	0.35				*0.0460*		0.049
Arsenic		(0.002)			0.021				(0.009)
Bismuth									(<0.003)
Boron	*0.00125*	(<0.003)	0.058				0.00105		0.0017
Calcium	*0.00222*	*0.271*	0.042				*0.054*		
Carbon	(0.02)	*0.0143*	0.046	4.68	6.72		*0.03445*	0.035	0.043
Cerium									
Chromium	*0.00173*	0.0193	0.080	68.00	0.074		0.0474	70.83	36.4
Cobalt	(0.0014)	(<0.03)		0.051			(<0.01)		0.034
Copper	(0.00172)	0.0225	0.052	0.005			0.0468		0.013
Iron	0.3400	25.239	50.05	24.98	12.3		23.62		23.2
Lanthanum									
Lead									(0.004)
Magnesium									
Manganese	0.00782	0.1611	0.75	0.16	80.04		0.1710	(0.282)	0.32
Molybdenum		(<0.01)					(0.01)		
Nickel	0.00153	0.0124	0.033	0.43			0.0318		0.20
Nitrogen				0.045					(0.002)
Oxygen	(0.4)	(0.25)					(<1)		(0.06)
Phosphorus	0.00163	*0.0105*	0.016	0.020	0.19	26.17	*0.0190*	0.020	0.026
Silicon		73.13	48.10	1.22	0.225		75.32	0.373	39.5
Sulfur	(0.003)	(<0.002)	0.002	0.067	0.008		(<0.002)	0.003	0.002
Tin		(<0.005)					(<0.005)		
Titanium	0.0346	0.0510		0.02			*0.0367*		0.40
Vanadium	(0.0025)	(0.002)		0.15				(0.12)	0.09
Zirconium	0.00178	(<0.005)					*0.0110*		

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

101.13 - Cast Irons (chip form)

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

	4l	5m	6g	82b	107c	115a	122i	334	338	341	342a	890	891	892
Description >>	Cast Iron	Cast Iron	Cast Iron	Cast Iron (Ni-Cr)	Cast Iron (Ni-Cr-Mo)	Cast Iron (Cu-Ni-Cr)	Cast Iron	Gray Cast Iron (Carbon & Sulfur)	White Cast Iron (Carbon & Sulfur)	Ductile Cast Iron	Nodular Cast Iron	Cast Iron, HC250+V	Cast Iron, Ni-Hard, Type I	Cast Iron, Ni-Hard, Type IV
Unit of Issue >>	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g	150 g
Elemental Composition (mass fraction in %)														
Al (total)	(0.004)											(<0.01)	(0.008)	(0.009)
Antimony	(<0.001)													
Arsenic	(0.03)		0.042									(0.008)	(0.004)	(0.006)
C Graphite	2.66		2.01	2.37	1.98	1.96				1.23	1.38			
C Total	3.21	2.59	2.85	2.85	2.99	2.62	3.47	2.83	3.33	1.81	1.86	2.91	2.71	3.33
Chromium	0.118	0.080	0.370	0.333	0.693	1.98	0.151			1.98	0.034	32.4	2.23	10.18
Cobalt												(0.03)	0.19	0.31
Copper	0.240	0.89	0.502	0.038	0.205	5.52	0.033			0.152	0.135	0.055	0.150	0.270
Iron												(61.8)	(88.5)	(77.4)
Lead	(0.001)													
Magnesium										0.068	0.070			
Manganese	0.825	0.74	1.05	0.745	0.480	1.00	0.530			0.92	0.274	0.62	0.55	0.76
Molybdenum	0.040	0.029	0.035	0.002	0.83	0.050	0.008			0.010	0.006	0.018	0.27	0.20
Nickel	0.042	0.041	0.135	1.22	2.20	14.49	0.047			20.32	0.058	0.397	4.48	5.53
Nitrogen	(0.0016)	0.006	0.005									(0.089)	(0.012)	(0.019)
Phosphorus	0.149	0.32	0.557	0.025	0.079	0.086	0.28			0.024	0.019	0.025	0.038	0.054
S Comb	0.043	0.133	0.124	0.007	0.059	0.065	0.087	0.043	0.015	0.007	0.006	0.015	0.029	0.015
S Grav						0.064				0.007				
Silicon	1.33	1.83	1.05	2.10	1.21	2.13	0.89			2.44	2.73	0.67	0.56	1.83
Tin	(0.004)												(<0.01)	(0.02)
Titanium	(0.03)	0.097	0.059	0.027	0.019	0.020	0.024			0.018	0.020		(0.01)	(0.02)
Vanadium	0.024	0.033	0.056	0.027	0.015	0.014	0.012			0.012		0.45	0.039	0.041
Zinc	(<0.001)													

101.14 - Cast Steels, White Cast Irons, and Ductile Irons (disk form)

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

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

	1138a	1139a	1173	C1137a	C1145a	C1173	C1290	C1291	C1292	C2424
Description >>	Cast Steel (No. 1)	Cast Steel (No. 2)	Ni-Cr-Mo-V Steel	White Cast Iron	White Cast Iron	Cast Steel 3	High Alloy (HC-250 + V)	High Alloy (Ni-Hard, Type I)	High Alloy (Ni-Hard, Type IV)	Ductile Iron C
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	disk
Elemental Composition (mass fraction in %)										
Aluminum	(0.067)	(0.13)		(0.007)	(0.04)	(0.005)				(<0.01)
Arsenic	(<0.005)	(<0.005)			(0.02)	(0.02)				
Boron										(0.002)
Carbon	0.118	0.790	0.423	2.86	2.92	0.453	3.04	2.67	3.47	2.68
Cerium				0.016						0.0046
Chromium	0.13	2.18	2.70	0.643	0.63	2.63	30.5	2.78	11.4	0.13
Cobalt			(0.064)		0.058	(0.064)				(0.05)
Copper	0.09	0.47	0.204	0.192	0.46	0.204	0.065	0.26	0.36	0.125
Iron	(98.7)	(93.0)								
Lanthanum										0.0011
Lead						(0.0006)				
Magnesium				0.032						0.006
Manganese	0.35	0.92	0.19	0.52	0.187	0.174	0.66	1.14	0.55	0.268
Molybdenum	0.05	0.51	1.50	0.86	0.48	1.46	(0.041)	0.32	0.25	0.019
Nickel	0.10	0.98	4.06	2.17	0.62	4.04	0.917	4.34	5.04	0.061
Niobium			(0.045)							
Phosphorus	0.035	0.012	0.033	0.087	0.215	0.031	0.030	0.028	0.049	0.041
Silicon	0.25	0.80	1.28	1.15	0.271	1.38	0.971	1.34	0.59	3.37
Sulfur	0.056	0.013	0.092	0.017	0.191	0.092	0.013	0.032	0.016	0.024
Titanium	(0.0012)	(0.004)	(0.015)	(0.04)	0.012	0.037				0.050
Vanadium	0.020	0.26	0.42	0.019	0.112	0.42	0.442	0.031	0.041	0.083

Standard Reference Materials for Chemical Composition

102. NonFerrous Metals

102.1 - Aluminum Base Alloys (chip and disk forms)

These SRMs are intended for analyses of aluminum alloys by chemical and instrumental methods. SRMs 1710 through 1715 are specially prepared to include low levels of cadmium and lead encountered in the analysis of recycled aluminum. SRM 2426 is a hot-dip coating alloy for sheet steel applications.

PLEASE NOTE: The tables are presented to facilitate comparisons among a family of materials to help customers select the best SRM for their needs.
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	87a	853a	854a	855a	856a	858	1240c	1241c	1255b	1256b
Description >>	Aluminum-Silicon Alloy	Aluminum Alloy 3004	Aluminum Alloy 5182	Aluminum Casting Alloy 356	Aluminum Casting Alloy 380	Aluminum Alloy 6011	Aluminum Alloy 3004	Aluminum Alloy 5182	Aluminum Alloy 356	Aluminum Alloy 380
Unit of Issue >>	75 g	40 g	40 g chip	30 g	30 g	35 g	disk	disk	disk	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).										
Beryllium							*0.000011*			
Cadmium			(0.0006)				*0.00065*	(0.0006)		
Calcium				(0.001)	(0.002)					
Chromium	0.11	0.504	0.0340	0.013	0.060	0.0011	*0.00054*	0.0343	*0.0150*	*0.0572*
Copper	0.30	0.1504	0.0494	0.13	3.50	0.84	0.1484	0.0497	0.1161	3.478
Gallium	0.020	0.0176	*0.0185*				0.0181	0.0184	0.0175	*0.0183*
Iron	0.61		0.1990	0.14	0.85	0.078	0.501	0.1997	0.1170	0.865
Lead	0.093			0.019	0.11		(0.0009)	*0.00052*	0.0182	0.1075
Magnesium	0.37	1.092	4.474	0.37	0.063	1.01	1.110	4.498	0.3822	
Manganese	0.26	1.251	0.3753	0.060	0.35	0.48	1.268	0.3792	0.0527	0.3857
Nickel	0.57	0.00429	0.0195	0.016	0.37	0.0006	0.00434	0.0198	0.0179	0.4135
Silicon	6.24	0.1810	0.1553	7.07	9.21	0.79	0.1804	0.1544	7.298	9.362
Strontium			(0.0002)	0.018	0.018			(0.0002)	0.0164	0.0188
Tin	0.057	(0.0003)		0.010	0.10		(0.0004)	(0.0002)	0.1334	*0.0091*
Titanium	0.18	0.0205	0.0335	0.15	0.065	0.042	0.0218	0.0317	0.1477	0.0877
Vanadium		0.01842	0.0174	(0.012)	(0.014)	0.0030	0.01850		0.0316	0.0212
Zinc	0.16	0.0514	0.0505	0.085	0.96	1.04	0.0514	0.0506	0.0842	1.011
Zirconium		*0.0023*		(0.003)	(0.003)		*0.0023*	(0.002)		

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

102.1 - Aluminum Base Alloys (chip and disk forms) (Cont.)

These SRMs are intended for analyses of aluminum alloys by chemical and instrumental methods. SRMs 1710 through 1715 are specially prepared to include low levels of cadmium and lead encountered in the analysis of recycled aluminum. SRM 2426 is a hot-dip coating alloy for sheet steel applications.

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

	1258-I	1259	1710	1711	1712	1713	1714	1715	2426
Description >>	Aluminum Alloy 6011	Aluminum Alloy 7075	Aluminum Alloy 3004	Aluminum Alloy 3004	Aluminum Alloy 3004	Aluminum Alloy 5182	Aluminum Alloy 5182	Aluminum Alloy 5182	55 % Aluminum - Zinc Alloy
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	40 g chip
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).									
Beryllium		0.0025							
Cadmium			0.000843	0.002090	0.0005165	0.000878	0.002013	0.00502	0.00502
Calcium									
Chromium	*0.0011*	0.173							
Copper	0.848	1.60							
Gallium	(0.011)	(0.022)							
Iron	0.080	0.205							0.454
Lead			0.00177	0.00639	0.01559	0.001712	0.00653	0.01509	Al 58.18
Magnesium	1.00	2.48							
Manganese	0.481	0.079							
Nickel	*0.0006*	0.063							
Silicon	0.80	0.18							1.925
Strontium									
Tin									
Titanium	*0.040*	(0.04)							
Vanadium									
Zinc	1.03	5.44							38.92
Zirconium									

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

102.2 - Cobalt Base Alloys (chip and disk forms)

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

	862	1242	1775	2175
Description >>	High Temp. Alloy L605	High Temp. Alloy L-605	MP 35N Refractory Alloy	MP 35N Refractory Alloy
Unit of Issue >>	100 g	disk	disk	150 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).				
Aluminum	(<0.01)	(<0.01)	*0.024*	*0.024*
Boron	(<0.0001)	(<0.0001)	0.0097	0.0097
Carbon	0.120	0.126	*0.0051*	*0.0051*
Chromium	20.0	20.0	20.4	20.4
Cobalt	51.5	51.5	33.3	33.3
Copper	0.0010	0.0010	*0.0046*	*0.0046*
Iron	1.80	1.80	0.91	0.91
Manganese	1.59	1.58	0.0121	0.0121
Molybdenum			9.508	9.508
Nickel	9.74	9.78	34.91	34.91
Niobium	(<0.005)	(<0.005)	0.03	0.03
Nitrogen	0.026	0.026	0.002	0.002
Phosphorus	0.002	0.002	*0.0006*	*0.0006*
Silicon	0.017	0.016	0.02	0.02
Sulfur	0.0008	0.0007	0.013	0.0013
Tantalum	(<0.01)	(<0.01)		
Tungsten	15.1	15.1	0.02	0.02
Vanadium	0.005	0.005	0.0095	0.0095

102.3 - Copper Base Alloys (chip and rod forms)

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

	158a	458	459	460	871	872	874	875	879	880	1034	1035
Description >>	Bronze, Silicon	Beryllium-Copper (17510)	Beryllium-Copper (17200)	Beryllium-Copper (17300)	Bronze, Phosphor (CDA 521)	Bronze, Phosphor (CDA 544)	Cupro-Nickel, 10% (CDA 706)	Cupro-Nickel, 10% (CDA 706)	Nickel Silver, (CDA 762)	Nickel Silver, (CDA 770)	Unalloyed Copper	Leaded-Tin Bronze Alloy
Unit of Issue >>	150 g	50 g	50 g	50 g	100 g	100 g	100 g	100 g	100 g	100 g	rod	50 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).												
Aluminum	0.46	0.030	0.044	0.048							(<2*)	
Antimony		(<0.005)	(<0.005)	(<0.005)			< 0.001	< 0.001			(0.2*)	
Arsenic							(<0.0006)	(0.0010)			(0.2*)	
Beryllium		0.360	1.82									
Bismuth							<0.0002	0.003			(0.2*)	
Cadmium							<0.0002	0.0022			(<1*)	
Carbon							(0.0023)	(0.0035)				
Chromium		0.004	0.005	0.005							(0.3*)	
Cobalt		0.076	0.221								(0.2*)	
Copper	90.93	(97.9)	(97.7)	(97.5)	91.68	87.36	88.49	87.83	57.75	54.51	(99.96)	(78.5)
Gold											(<0.05*)	
Hydrogen							(0.0016)	(0.004)				
Iron	1.23	0.060	0.079	0.098	<0.001	0.003	1.22	1.45	0.0020	0.004	(2.0*)	(0.001)
Lead	0.097	0.002	0.001	0.258	0.010	4.13	<0.0005	0.0092	0.002	0.002	(0.5*)	(13.5)
Magnesium		0.003	0.007				(0.0002)	(0.0010)			(<1*)	
Manganese	1.11	(<0.002)	(<0.003)	(<0.003)			0.0020	<0.0007	<0.001	<0.001	(< 0.1*)	
Nickel	0.001	1.60	0.039	0.031			10.18	10.42	12.11	18.13	(0.6*)*	(0.75)
Oxygen							(0.06)	(0.14)			(363*)	(0.64)
Phosphorus	0.026				0.082	0.26	0.002	0.0020				(0.004)
Selenium							0.00015	0.0004			(3.3*)	
Silicon	3.03	0.035	0.077	0.77			(0.0006)	(0.0008)			(<2*)	
Silver		(<0.01)	(<0.003)	(<0.002)							(8.1*)	
Sulfur		(<0.002)	(<0.001)				(0.0011)	(0.0011)			2.8*	22.3*
Tellurium								(<0.0001)			(0.5*)	
Tin	0.96	0.004	0.005	0.006	8.14	4.16	0.007	0.009			(<0.2*)	(6.8)
Titanium		(<0.002)	(< 0.003)				(0.0001)	(<0.0002)				
Zinc	2.08	0.002	0.002	0.004	0.025	4.0	0.002	0.11	30.04	27.3	(<11*)	(0.25)
Zirconium		(<0.002)	(<0.002)									

All values in % unless otherwise indicated.
*Value is in mg/kg.

- Certified values are normal font
- Reference values are italicized
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102.4 - Copper Base Alloys (block and disk forms)

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

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

	1107	1110	1111	1112	1113	1114	1115	1116	1117	1124	1276a	C1112	C1113	C1114	C1115	C1117
Description >>	Naval Brass B	Red Brass B	Red Brass C	Gilding Metal A (disk)	Gilding Metal B (disk)	Gilding Metal C (disk)	Commercial Bronze A (disk)	Commercial Bronze B (disk)	Commercial Bronze C (disk)	Free Cutting Brass (UNS C36000)	Cupro-Nickel (CDA 715)	Gilding Metal A (block)	Gilding Metal B (block)	Gilding Metal C (block)	Commercial Bronze A (block)	Commercial Bronze C (block)
Unit of Issue >>	disk	disk	disk	disk	disk	disk	disk	disk	disk	1 disk	disk	disk	disk	disk	disk	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).																
Antimony										232.5*	0.0004					
Bismuth										*202**						
Cadmium										65.1*	0.0002					
Chromium										155*						
Cobalt										(14*)	0.045					
Copper	61.21	84.59	87.14	93.38	95.03	96.45	87.96	90.37	93.01	(62.5*)	67.8	93.38	95.03	96.45	87.96	93.01
Iron	0.037	0.033	0.010	0.070	0.043	0.017	0.13	0.046	0.014	0.2068	0.56	0.070	0.043	0.017	0.13	0.014
Lead	0.18	0.033	0.013	0.057	0.026	0.012	0.013	0.042	0.069	3.363	0.004	0.057	0.026	0.012	0.013	0.069
Magnesium											0.12					
Manganese										(9*)	1.01					
Nickel	0.098	0.053	0.022	0.100	0.057	0.021	0.074	0.048	0.020	0.0801	30.5	0.100	0.057	0.021	0.074	0.020
Phosphorus				0.009	0.008	0.009	0.05	0.008	0.002	*224**	0.006	0.009	0.008	0.009	0.05	0.002
Selenium											0.005					
Silver										131*						
Sulfur										*31**						
Tin	1.04	0.051	0.019	0.12	0.064	0.027	0.10	0.044	0.021	0.3112	0.023	0.12	0.064	0.027	0.10	0.021
Zinc	37.34	15.20	12.81	6.30	4.80	3.47	11.73	9.44	6.87	35.19	0.038	6.30	4.80	3.47	11.73	6.87

102.5 - Copper “Benchmark” (block, chip, and rod forms)

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

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

	399	400	454	457	494	495	498	499	500	C1251a	C1253a	C1252a
Description >>	Unalloyed Copper VI (chips)	Unalloyed Copper VII (chips)	Unalloyed Copper XI (chips)	Unalloyed Copper IV (solid)	Unalloyed Copper I (solid)	Unalloyed Copper II (solid)	Unalloyed Copper V (solid)	Unalloyed Copper VI (solid)	Unalloyed Copper VII (solid)	Phosphorus Copper Cu VIII	Phosphorus Copper X	Phosphorus Copper Cu IX
Unit of Issue >>	50 g	50 g	35 g	rod	rod	rod	rod	rod	rod	block	block	block
Values are expressed in mass fraction units of mg/kg (unless otherwise specified)												
Aluminum	(<2)	(<2)		(<2)	(<2)	(<2)	(<2)	(<2)	(<2)	(<20)	176	(<20)
Antimony	30	102	24	0.2	4.5	8.0	7.4	30	102	14.9	139	42
Arsenic	47	140	46	0.2	2.6	1.6	25	47	140	16	436	118
Beryllium												
Bismuth	10.5	24.5	19	0.2	0.35	0.50	2.0	10.5	24.5	3.7	(56)	(19)
Boron												
Cadmium	(<1)	(<1)		(<1)	(0.5)	(0.4)	(<22)	(<1)	(<1)	(<3)	70	16.9
Calcium												
Chromium	(0.5)	(0.5)		(0.3)	2.0	6.0	(0.3)	(0.5)	(0.5)	(3)	260	19
Cobalt	0.5	0.6	(4)	(0.2)	0.5		2.7	0.5	0.6	13.2	454	87
Copper (Cu)	99.79*	99.70*	99.84*	99.96*	99.908*	99.944*	99.98*	99.79*	99.70*	99.89*	99.46*	99.87*
Gold	(4)	(10)	7.5	(<0.05)	(0.07)	(0.13)	(0.1)	(4)	(10)	15.5	72	33.9
Iron	20.0	41	(50)	2.0	147	96	11	20.0	41	285	290	72
Lead	114	128	66	0.5	26.5	3.25	10	114	128	23.5	243	60
Lithium												
Magnesium	(<1)	(<1)		(<1)	(<1)	(<1)	(<1)	(<1)	(<1)	(<20)	(150)	(<20)
Manganese	(0.3)	(0.2)		<0.1	3.7	5.3	(0.3)	(0.3)	(0.2)	4.6	357	43
Nickel	506	603	(150)	0.6	11.7	5.4	7.0	506	603	23.6	491	128
Palladium			(0.1)									
Phosphorus										420	561	125
Selenium	95	214	479	4.2	2.00	0.63	17.5	95	214	11	136	56
Silicon	(<2)	(<2)		(<2)	(<2)	(<2)	(<2)	(<2)	(<2)	(<50)	(580)	(<100)
Silver	117	181	286	8.1	50.5	12.2	20.1	117	181	80	494	158
Sulfur	(10)	(9)		(4)	15	13	(11)	(10)	(9)	(35)	(50)	(70)
Tellurium	50	153	27	0.29	0.58	0.32	10.1	50	153	16	168	54.6
Tin	(~90)	(~200)	2.2	<0.2	70	1.5	5	(~90)	(~200)	16	499	120
Titanium												
Zinc	45	114	7	<11	405	12.2	25	45	114	24	329	69.4
Zirconium												

* Mass fraction in %

102.10 - Lead Base Alloys (disk and powder forms) [150 g units (unless otherwise noted)]

PLEASE NOTE: The tables are presented to facilitate comparisons among a family of materials to help customers select the best SRM for their needs.
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	53e	127b	1129	1131	1132	1727
Description >>	Bearing Metal (84Pb-10Sb-6Sn)	Solder, 40Sn-60Pb	Solder (63Sn-37Pb)	Solder (60Pb-40Sn)	Bearing Metal (Pb-Sn)	Anode Tin
Unit of Issue >>	150 g	150 g	200 g	disk	disk	block
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).						
Antimony	10.26	0.43	0.13	0.43	10.26	(40*)
Arsenic	0.057	0.01	0.055	0.01	0.057	(<100*)
Bismuth	0.052	0.06	0.13	0.06	0.052	(8*)
Cobalt						(2*)
Copper	0.054	0.011	0.16	0.011	0.054	(4*)
Indium						(20*)
Iron	<0.001				<0.001	(20*)
Lead						33.26*
Nickel	0.003	0.012	0.010	0.012	0.003	(3*)
Silver		0.01	0.075	0.01		
Tin	5.84	39.3	62.7	39.3	5.84	

102.11 - Lead Base Material (disk form)

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

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

	C2415	C2416	C2417	C2418
Description >>	Battery Lead	Bullet Lead	Lead-Base Alloy	High-Purity Lead
Unit of Issue >>	disk	disk	disk	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).				
Aluminum	(<0.0003)	(<0.0001)	(<0.0001)	(<0.0001)
Antimony	2.95	0.79	0.010	(<0.0001)
Arsenic	0.20	0.056	0.011	(<0.0001)
Bismuth	0.054	0.10	0.010	(<0.0005)
Cadmium	0.002	(0.0002)	(<0.0002)	0.0003
Calcium	(<0.001)	<0.001	(<0.001)	(<0.0005)
Cobalt		(<0.0002)	(<0.0002)	(<0.0005)
Copper	0.095	0.065	0.010	(<0.0001)
Iron	<0.001	(<0.0005)	(<0.0003)	(<0.0005)
Manganese	<0.001	(<0.0005)	(<0.0003)	(<0.0005)
Nickel	<0.001	(<0.0005)	(<0.0005)	(<0.0005)
Silver	0.002	0.0044	0.010	0.0001
Sulfur	0.0026	0.0015	(<0.0005)	
Tellurium	0.0045	(<0.0005)	(<0.0005)	(<0.0005)
Tin	0.33	0.09	(<0.010)	(<0.0005)
Zinc	<0.001	(<0.0005)	(<0.0005)	(<0.0005)

102.12 - Nickel Base Alloys (chip and disk forms)

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

	349a	861	864	865	882	1159	1160	1243	1244	1249	1775	2175	C1248	C2402
Description >>	Waspaloy	Nickel-based Superalloy	Inconel 600	Inconel 625	Alloy Ni-Cu-Al	Elec/Mag Ni-Fe	Elec/Mag Ni-Mo-Fe	Waspaloy	Inconel 600	Nickel-based Superalloy	MP 35N Refractory Alloy	MP 35N Refractory Alloy	Nickel-Copper Alloy	Hastelloy7C
Unit of Issue >>	150 g	50 g	100 g	150 g	100 g	disk	disk	disk	disk	disk	disk	150 g	disk	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).														
Aluminum	1.23		0.252	0.21	2.85			1.23	0.252	0.5682	0.024	0.024	0.009	
Antimony										*0.00030*				
Arsenic			*19.0**						*19.0**	*0.0013*				
Boron	0.005		28.3*	<0.001				0.005	28.3*	*0.0023*	0.0097	0.0097		(0.0004)
Carbon	0.035		*0.063*	0.037	0.006	0.007	0.019	0.024	*0.063*	*0.0380*	0.0051	0.0051	0.266	0.010
Chromium	19.3		15.74	21.9		0.06	0.05	19.20	15.74	18.472	20.4	20.4	0.095	16.15
Cobalt	12.46		0.0602	0.072		0.022	0.054	12.46	0.0602	0.3371	33.3	33.3		1.50
Copper	0.007		0.255	0.36	31.02	0.038	0.021	0.007	0.255	0.1402	0.0046	0.0046	29.80	0.19
Gallium				(0.012)						*0.0019*				
Iron	1.15		9.63	4.5	0.009	51.0	14.3	0.79	9.63	17.693	0.91	0.91	2.10	7.3
Lead			2.27*						2.27*				3.8*	
Magnesium			138.3*						138.3*	*0.0012*				
Manganese	0.019		0.288	0.18	0.0007	0.305	0.550	0.019	0.288	0.109	0.0121	0.0121	0.31	0.64
Molybdenum	4.25		0.204	8.6		0.010	4.35	4.25	0.204	3.112	9.508	9.508	0.006	17.1
Nickel	58.1		73.09	59.5	65.25	48.2	80.3	58.78	73.09	53.29	34.91	34.91	65.75	51.5
Niobium	(0.05)		*0.126*	3.5					*0.126*	5.196	(0.03)	(0.03)		(<0.01)
Nitrogen			(0.01)						(0.01)		(0.002)	(0.002)		
Phosphorus	0.003	*0.001271*	*0.011*	0.012		0.003	0.003	0.003	*0.011*	*0.0134*	0.0006	0.0006	0.002	0.007
Silicon	0.018		*0.114*	0.41	0.006	0.32	0.37	0.018	*0.114*	*0.120*	(0.02)	(0.02)	1.61	0.85
Sulfur	0.0024	0.0000561	*0.0028*	0.001	0.0014	0.003	0.001	0.0018	*0.0028*	*0.00064*	0.0013	0.0013	0.0008	0.018
Tantalum										*0.0027*				
Thallium			0.0029*						0.0029*					
Tin			*7.4**						*7.4**	*0.0024*			1.1*	(0.001)
Titanium	3.06		*0.251*	0.28	0.57			3.06	*0.251*	0.959				
Tungsten	(0.06)									*0.0846*	(0.02)	(0.02)		4.29
Vanadium	0.12		0.0327					0.12	0.0327	*0.0338*	0.0095	0.0095		0.22
Zinc													3*	
Zirconium			*3.7**						*3.7**	*0.0029*				

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

102.13 - Trace Elements in Nickel Base Superalloys (chip form)

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

	897	898	899
Description >>	Tracealloy A	Tracealloy B	Tracealloy C
Unit of Issue >>	35 g	35 g	35 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).			
Aluminum	(2.0)	(2.0)	(2.0)
Bismuth	(0.5*)	(1.0)	(0.3)
Boron	(0.010)	(0.010)	(0.010)
Carbon	(0.12)	(0.12)	(0.12)
Chromium	(12.0)	(12.0)	(12.0)
Cobalt	(8.5)	(8.5)	(8.5)
Hafnium	(1.2)	(1.2)	(1.2)
Lead	11.7*	2.5*	3.9*
Nickel	(Bal)	(Bal)	(Bal)
Niobium	(0.9)	(0.9)	(0.9)
Selenium	9.1*	2.00*	9.5*
Tantalum	(1.75)	(1.75)	(1.75)
Tellurium	1.05*	0.54*	5.9*
Thallium	0.51*	2.75*	0.252*
Titanium	(2.0)	(2.0)	(2.0)
Tungsten	(1.75)	(1.75)	(1.75)
Zirconium	(0.10)	(0.10)	(0.10)

102.14 - Nickel Oxides (powder form)

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

	671	672	673
Description >>	Nickel Oxide 1	Nickel Oxide 2	Nickel Oxide 3
Unit of Issue >>	25 g	25 g	25 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).			
Aluminum	0.009	0.004	0.001
Antimony*	(0.4)	(0.5)	(<0.5)
Arsenic*	(59)	(74)	(0.4)
Bismuth*	0.07	0.3	0.06
Cadmium*	(0.7)	(1.7)	(0.5)
Chromium	0.025	0.003	0.0003
Cobalt	0.31	0.55	0.016
Copper	0.20	0.018	0.002
Gallium*	(0.8)	(0.4)	(<0.1)
Iron	0.39	0.079	0.029
Magnesium	0.030	0.020	0.003
Manganese	0.13	0.095	0.0037
Palladium*	16	38	3.5
Selenium*	2.0	0.40	0.2
Silicon	0.047	0.11	0.006
Silver*	(0.5)	(0.3)	(<0.1)
Tellurium*	(<0.2)	(<0.2)	(0.4)
Thallium*	(<0.1)	(<0.1)	(<0.1)
Tin*	(2.7)	(4)	(<0.5)
Titanium	0.024	0.009	0.003
Zinc*	(160)	(140)	(1.7)

102.15 - Tin Base Alloys

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

	54d	1727	1728	1729
Description >>	Bearing Metal (Tin Base)	Anode Tin	Tin Alloy (Sn-3Cu-0.5Ag)	Tin Alloy (97Sn-3Pb)
Unit of Issue >>	170 g	block	1 disk	1 disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).				
Aluminum			(12)	460*
Antimony	7.04	(40*)	*87**	96.4*
Arsenic	0.088	(<100*)	96*	
Bismuth	0.044	(8*)	*128**	114.7*
Cadmium			*58.2**	
Chromium			*1.2**	
Cobalt		(2*)	*57**	
Copper	3.62	(4*)	3.06	24*
Indium		(20*)	*31**	
Iron	0.027	(20*)	111*	14.1*
Lead	0.62	33.26*	544*	3.11
Mercury			111.98*	
Nickel	0.0027	(3*)	81.7*	2.2*
Phosphorus			(10*)	
Silicon			(45*)	(20)*
Silver	0.0032		0.4591	(<75*)
Sulfur			34.9*	
Tin	88.57		(96.3*)	96.9
Zinc			(156*)	518*

102.16 - Titanium Base Alloys (chip, cube and disk forms)

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

	173c	641	642	643	647	648	649	650	654b
Description >>	Titanium Alloy (6Al-4V)	Titanium Alloy, 8 Mn (A)	Titanium Alloy, 8 Mn (B)	Titanium Alloy, 8 Mn (C)	Titanium Alloy, Al-Mo-Sn-Zr	Titanium Alloy, Al-Sn-Zr-Cr-Mo	Titanium Alloy, V-Al-Cr-Sn	Unalloyed Titanium A	Titanium Alloy, Al-V
Unit of Issue >>	50 g	disk	disk	disk	50 g	50 g	50 g	30 g	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).									
Aluminum	6.245				5.88	5.13	3.08	<0.01	6.34
Boron	(<0.0005)								
Carbon	*0.027*				0.006	0.011	0.011		
Chromium	0.0165					3.84	2.96	0.002	0.025
Cobalt	(0.002)								
Copper	0.0040						(<0.001)	0.033	0.008
Hydrogen	(0.006)								(0.002)
Iron	0.2130				0.075	0.15	0.133	0.024	0.23
Manganese	(0.002)	6.68	9.08	11.68			(<0.01)	0.016	
Molybdenum	*0.0068*				1.96	3.75		0.002	0.013
Nickel	0.0203								0.028
Niobium									
Nitrogen	*0.028*				(<0.01)	(0.01)	(0.01)		
Oxygen	*0.164*								(0.17)
Ruthenium	(0.0006)								
Silicon	*0.019*					0.027		0.004	0.045
Sulfur									(0.001)
Tin	*0.010*				2.02	1.98	3.04	0.03	0.023
Titanium	*89.15*								
Tungsten	(0.002)							1.55	
Vanadium	4.154				(<0.02)		15.1	0.009	4.31
Zirconium	*0.0053*				3.90	1.84			0.008

102.16 - Titanium Base Alloys (chip, cube, and disk forms) (Cont.)

	1128	2061	2062	2431	2432	2433	2452	2453	2454
Description >>	Ti Alloy, V-Al-Cr-Sn	Ti Alloy, Al-Nb-W	Ti Alloy, Al-Nb-W	Titanium Base Alloy	Titanium Base Alloy	Titanium Alloy	Hydrogen In Titanium Alloy	Hydrogen In Titanium Alloy	Hydrogen In Titanium Alloy
Unit of Issue >>	disk	cube	disk	50 g	50 g	50 g	10 g	10 g	10 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).									
Aluminum	3.06	30.31	30.31	5.73	3.15	7.63			
Boron					(<0.001)				
Carbon	0.011			0.006	0.008				
Chromium	2.96			(<0.01)	(<0.01)				
Cobalt									
Copper	(<0.003)			(<0.01)	(<0.005)				
Hydrogen							0.00625	0.0114	0.0211
Iron	0.134			0.056	1.77	0.063			
Manganese	(<0.01)			(<0.01)	(<0.01)				
Molybdenum	(0.006)			6.01		0.99			
Nickel				(<0.01)	(<0.01)				
Niobium		10.78	10.78						
Nitrogen	(0.01)	(0.004)	(0.004)						
Oxygen		(0.232)	(0.232)						
Ruthenium									
Silicon				0.088	0.029				
Sulfur									
Tin	3.04			1.98					
Titanium		53.92	53.92						
Tungsten		4.38	4.38	(<0.001)	(<0.001)				
Vanadium	15.13			(<0.01)	10.00	0.98			
Zirconium				4.06	(<0.01)				

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

SRM 1736 through 1742 and SRM 2139 are specially prepared alloys primarily intended for use with spectrometric methods of analysis.

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

	94c	625	626	627	628	629	630	631	1736
Description >>	Zinc-Base Die Casting Alloy	Zinc-Base A	Zinc-Base B	Zinc-Base C	Zinc-Base D	Zinc-Base E-ASTM AC 41A	Zinc-Base F	Zinc Spelter (mod.)	Zinc-Aluminum Alloy
Unit of Issue >>	150 g	block	block	block	block	disk	block	block	disk
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).									
Aluminum	4.13	3.06	3.56	3.88	4.59	5.15	4.30	0.50	0.3076
Cadmium	0.002	0.0007	0.0016	0.0051	0.0040	0.0155	0.0048	0.0002	
Calcium								<0.001	
Chromium		0.0128	0.0395	0.0038	0.0087	0.0008	0.0031	0.0001	
Copper	1.01	0.034	0.056	0.132	0.611	1.50	0.976	0.0013	
Gallium								(0.002)	
Germanium								(0.0002)	
Indium								0.0023	
Iron	0.018	0.036	0.103	0.023	0.066	0.017	0.023	0.005	
Lead	0.006	0.0014	0.0022	0.0082	0.0045	0.0135	0.0083	(0.001)	0.0029
Magnesium	0.042	0.070	0.020	0.030	0.0094	0.094	0.030	(<0.001)	
Manganese	0.014	0.031	0.048	0.014	0.0091	0.0017	0.0106	0.00015	
Nickel	0.006	0.0184	0.047	0.0029	0.030	0.0075	0.0027	(<0.0005)	
Silicon		0.017	0.042	0.021	0.008	0.078	0.022	(0.002)	
Silver								(<0.0005)	
Tin	0.006	0.0006	0.0012	0.0042	0.0017	0.012	0.0040	0.0001	
Zinc									

102.17 - Zinc Base Alloys (chip and disk forms) (Cont.)

	1737	1738	1739	1740	1741	1742	2139	2426
Description >>	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	Zinc-Aluminum Alloy	55 % Aluminum - Zinc Alloy
Unit of Issue >>	disk	disk	disk	disk	disk	disk	100 g	40 g
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).								
Aluminum	0.6302	0.1014	0.2049	0.4177	0.5242	0.7917	0.2042	58.18
Cadmium								
Calcium								
Chromium								
Copper								
Gallium								
Germanium								
Indium								
Iron								0.454
Lead	0.0029	0.0101	0.0302	0.0691	0.1571	(0.0029)	0.0302	
Magnesium								
Manganese								
Nickel								
Silicon								1.925
Silver								
Tin								
Zinc								38.92

102.18 - Zirconium Base Alloys (chip form)

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

	360b					
Description >>	Zirconium (Sn-Fe-Cr) Alloy					
Unit of Issue >>	100 g					
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).						
Aluminum	57*					
Antimony	(1*)					
Arsenic	(7*)					
Boron	0.191*					
Cadmium	(<1*)					
Carbon	*109**					
Chlorine	(<1*)					
Chromium	1043*					
Cobalt	*0.97**					
Copper	12.5*					
Fluorine	(<10*)					
Gallium	(<1*)					
Hafnium	78.5*					
Hydrogen	(11*)					
Iron	2138*					
Lead	(<5*)					
Magnesium	(<1*)					
Manganese	9.2*					
Molybdenum	(<25*)					
Nickel	22.5*					
Niobium	(<50*)					
Nitrogen	45*					
Oxygen	(1430*)					
Phosphorus	*8.7**					
Silicon	*80**					
Sulfur	(30*)					
Tantalum	(<100*)					
Tin	1.555 %					
Titanium	15.5*					
Tungsten	(<50*)					
Uranium	(<2*)					
Vanadium	(<30*)					
Zinc	(<50*)					

Standard Reference Materials for Chemical Composition

103. Microanalysis

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

See Table 104.4 Microchemistry and Table 101.8 Low Alloy Steels

For further information see SP 260-28

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

	480	481	482	2061	2062
Description >>	Tungsten-Molybdenum EPMA	Gold-Silver EPMA	Gold-Copper EPMA	Ti Alloy, Al-Nb-W	Ti Alloy, Al-Nb-W
Unit of Issue >>	disk	set (6)	set (6)	cube	disk
Elemental Composition (mass fraction in %)					
Au-0% Cu B			80.15		
Aluminum				30.31	30.31
Au 100 F Ag		100.00			
Au-0% Cu B			19.83		
Au-20% Ag B		80.05			
Au-20% Ag B Ag		19.96			
Au-40% Ag C		60.05			
Au-40% Ag C Ag		39.92			
Au-40% Cu C			60.36		
Au-40% Cu C Cu			39.64		
Au-60% Ag		40.03			
Au-60% Ag Ag		59.93			
Au-60% Cu			40.10		
Au-60% Cu Cu			59.92		
Au-80% Ag E		22.43			
Au-80% Ag E Ag		77.58			
Au-80% Cu E			20.12		
Au-80% Cu E Cu			79.85		
Cu 100 F			100.00		
Gold		100.00	100.00		
Molybdenum	21.5				
Niobium				10.78	10.78
Titanium				53.92	53.92
Tungsten	78.5			4.38	4.38

103.2 - Synthetic Glasses for Microanalysis (rod and microsphere forms)

The glass SRMs listed below are suitable for microanalysis, such as electron probe microanalysis (EMPA) secondary ion mass spectrometry (SIMS) and other methods that require high homogeneity.

For futher information see SP 260-112

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

	1872	1873	2066
Description >>	Synthetic Glass	Synthetic Glass	K-411 Glass Microspheres
Unit of Issue >>	set (3)	set (3)	50 mg
Concentrations are expressed as mass fractions, in % (unless noted by an asterisk * for mg/kg).			
Aluminum	(1 level)		
Calcium			11.2
Cerium	(1 level)		
Chromium	(1 level)		
Europium	(1 level)		
Germanium	3 levels		
Iron	(1 level)		11.2
Lead	3 levels		
Magnesium	(1 level)		9.2
Nickel	(1 level)		
Oxygen	(3 levels)		42.9
Phosphorus	(1 level)		
Silicon	(1 level)		25.6
Tantalum	(1 level)		
Thorium	(1 level)		
Titanium	(2 levels)		
Uranium	(1 level)		
Zirconium	(2 levels)		

103.3 - Thin Film for Transmission Electron Microscope

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

	2063a			
Description >>	Mineral Glass (Thin Film)			
Unit of Issue >>	3mm grid			
Argon	(0.4)			
Calcium	11.82			
Iron	11.06			
Magnesium	7.97			
Oxygen	43.2			
Silicon	25.34			

103.4 - Semiconductor Thin Film for the Composition of Thin Films

Standard Reference Material SRM 2841 is intended for use as a reference standard for analytical methods that measure the composition of thin films, such as electron microprobe analysis (EMPA), photoluminesence (PL), auger electron spectroscopy (AES) and X-ray photoelectron spectroscopy (XPS). The SRM consists of an epitaxial layer of ALxGa1-xAs, 3µm thick, on a 1 cm x 1 cm square of GaAs substrate. The semiconductor chip is attached with carbon tape to a 2.5 cm diameter stainless steel disk for labeling and handling.

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

	2841	2842	8095
Description >>	Semiconductor Thin Film: $Al_xGa_{1-x}As$ Epitaxial Layers	Semiconductor Thin Film: $Al_xGa_{1-x}As$ Epitaxial Layers	Si1-xGex Films on Si
Unit of Issue >>	disk	disk	2 wafers, 1 each level
Al (x in Al_x Ga_{1-x} As)	0.20	0.30	2 levels

103.5 - Nanomaterials: Composition

For related materials see Table 301.1 Particle Size (powder and solid forms)

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

	2483		
Description >>	Single-Wall Carbon Nanotubes (Raw Soot)		
Unit Size >>	250 mg		
Aluminum	*723*		
Arsenic	(12.5)		
Barium	119.0		
Boron	(74.7)		
Calcium	(0.303*)		
Carbon	(94.6*)		
Cesium	192.7		
Chlorine	0.2125*		
Cobalt	0.963*		
Copper	(186)		
Dysprosium	8.36		
Europium	2.27		
Gadolinium	10.57		
Hafnium	(0.38*)		
Lanthanum	104.0		
Magnesium	*0.1150**		
Manganese	*4.482*		
Molybdenum	3.406*		
Samarium	13.09		
Sodium	*0.1187*		
Thorium	*25.7*		
Tungsten	*7.50*		
Vanadium	*6.89*		

Standard Reference Materials for Chemical Composition

104. High-Purity Materials

104.1 - High Purity Metals (solid forms)

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

For further information see SP 260-86

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

	680A-L1	682	683	685r	726	728	885
Description >>	High Purity Platinum	High Purity Zinc	Zinc, Metal	High Purity Gold (Rod)	Selenium, Inter-Purity	Zinc, Intermediate Purity	Refined Copper
Unit of Issue >>	10 cm	block	block	rod 15g	450 g	450 g	200 g
Concentrations are in mass fractions, in mg/kg (ppm), unless noted as %							
Aluminum					<1		
Antimony							<0.0002 %
Arsenic					<2		<0.0002 %
Bismuth							<0.0001 %
Boron					<1		
Cadmium		(0.1)	1.1			1.14	
Calcium					<1		
Chromium					<1		
Copper	0.1	0.042	5.9	0.1	<1	5.68	
Gold	<1					(<0.02)	
Indium				0.007		(<0.0005)	
Iridium	<0.01					(<0.005)	
Iron	1.3	(0.1)	2.2	0.2	1	1.84	<0.0005 %
Lead	<1		11.1		<1	11.13	0.0002 %
Magnesium	<1	(<0.1)		(<0.2)	<1	(<0.001)	
Manganese					<0.3		
Molybdenum					<0.3		
Nickel	<1	(<0.1)		(<0.05)	<0.5	(0.45)	<0.0001 %
Oxygen	4	(<0.5)		(<2)			0.031 %
Palladium	0.2					(<0.05)	
Rhodium	<0.2					(<0.05)	
Silver	<0.1	(0.02)	1.3	[0.1]	<1	1.08	0.0005 %
Sulfur					12		0.0018 %
Tellurium					0.3		
Thallium			(0.2)			0.2	
Tin		(0.02)	(0.02)	(<0.07)	<1	*0.02*	<0.0001 %
Zinc							<0.0001 %
Zirconium	<0.1					(<0.01)	

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

104.3 - Stoichiometry (powder form)

These SRMs are defined as primary, working, and secondary standards in accordance with recommendations of the Analytical Chemistry Section of the International Union of Pure and Applied Chemistry [Ref. Analyst 90, 251 (1965)]. These definitions are as follows:

Primary Standard: a commercially available substance of purity 100 ± 0.02% (Purity 99.98 + %).

Working Standard: 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.

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

	17f	83d	84l	136f	350b	351a	723e	917c	973	999b	8040
Description >>	Sucrose Optical Rotation	Arsenic Trioxide (Reductometric)	Potassium Hydrogen Phthalate	Potassium Dichromate, (Oxidimetric Standard)	Benzoic Acid (Acidimetric)	Sodium Carbonate	Tris Acidimetric	D-Glucose (Dextrose)	Boric Acid Acidimetric Standard	Potassium Chloride (Primary Chemical)	Sodium Oxalate (Reductometric)
Unit of Issue >>	60 g	60 g	60 g	60 g	30 g	50 g	50 g	50 g	100 g	30 g	60 g
Chloride Cl										47.5519	
Intended Use	Optical Rotation	Reductometric Standard	Acidimetric Standard	Oxidimetric Standard	Acidimetric Standard	Acidimetric Standard		Purity Optical Rotation	Acidimetric Value		Reductometric Standard
Potassium Chloride KCl										99.977	
Potassium K							99.97			52.4379	
Stoichiometeric Purity (mass fraction %)	99.956	99.9926	99.9934	99.9954	99.9978	99.970		99.7	100.009		*99.951*

104.4 - Microchemistry (powder form)

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

	141d	142	143d	148	2141	2143	2144
Description >>	Acetanilide	Anisic Acid	Cystine	Nicotinic Acid	Urea	p-Fluorobenzoic Acid	m-Chlorobenzoic Acid
Unit of Issue >>	2 g	2 g	2 g	2 g	2 g	2 g	2 g
Carbon	71.089		29.99	58.54			
Chlorine							22.62
Fluorine						13.54	
Hydrogen	6.711		5.03	4.09			
Methoxyl		20.40					
Nitrogen	10.363		11.66	11.38	46.63		
Oxygen	11.837		26.63				
Sulfur			26.69				

104.5 - Spectrometry, Single Element Standard Solutions

These SRMs are intended as standard solutions for calibrating instruments used in atomic spectrometry, including atomic absorption spectrophotometry, inductively coupled plasma optical emission spectrometry, and inductively coupled plasma mass spectrometry. They can also be used in conjunction with any other analytical technique or procedure where standard solutions are required. Each SRM is a single element solution of 50 mL with a nominal concentration of 10 mg/g, except where indicated. Each unit is provided in either a single high density polyethylene bottle or in 5 x 10 mL borosilicate glass ampoules. NOTE: The certified values for SRM standard solution lots produced after March 1997 are stated in mass units, mg/g, rather than mg/mL. For the convenience of the user, each certificate provides instructions for preparing SRM dilutions by volume as well as by mass. Commercial Producers of Elemental Standard Solutions: Instructions and a spreadsheet have been designed as an aid for establishing traceability of a batch of an elemental solution to the corresponding elemental spectrometric solution from the NIST SRM 3100 Series. Spreadsheet with ICP-OES example data is also included. When all required input fields are filled, the spreadsheet will calculate the traceable mass fraction and uncertainty of the batch elemental solution standard. The uncertainty provided by the spreadsheet assumes that the tested lot is stable. Any uncertainty due to changes over time to the lot tested, need to be quantified by the producer of the lot, and incorporated into the total uncertainty of the lot.

Instructions: http://www.nist.gov/mml/csd/inorganic/upload/SRM-3100_Version-1-2-Instructions.pdf

Spreadsheet: http://www.nist.gov/mml/csd/inorganic/upload/SRM-3100_Traceability-Tool-Version-1-2.xls

Sample Data: http://www.nist.gov/mml/csd/inorganic/upload/SRM-3100_Example-Data-Set-for-Traceability-Tool-Version-1-2.xls

SRMs marked by an asterisk (*) are subject to license requirement by the NRC (or Agreement State) for transfer within the United States (U.S.). License certification is required of purchaser by NIST prior to shipment.

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

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

SRM	Description	Unit of Issue	Nominal Acid Concentration of Matrix	NRC License or Equivalent Required*
3101a	Aluminum (Al) Standard Solution	50 mL	HNO_3 10%	--
3102a	Antimony (Sb) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3103a	Arsenic (As) Standard Solution	50 mL	HNO_3 10%	--
3104a	Barium (Ba) Standard Solution	50 mL	HNO_3 10%	--
3105a	Beryllium (Be) Standard Solution	5 x 10 mL	HNO_3 10%	--
3106	Bismuth (Bi) Standard Solution	5 x 10 mL	HNO_3 10%	--
3107	Boron (B) Standard Solution (nominal 5 mg/g)	50 mL	H_2O	--
3108	Cadmium (Cd) Standard Solution	50 mL	HNO_3 10%	--
3109a	Calcium (Ca) Standard Solution	5 x 10 mL	HNO_3 10%	--
3110	Cerium (Ce) Standard Solution	5 x 10 mL	HNO_3 10%	--
3111a	Cesium (Cs) Standard Solution	50 mL	HNO_3 1%	--
3112a	Chromium (Cr) Standard Solution	5 x 10 mL	HNO_3 10%	--
3113	Cobalt (Co) Standard Solution	5 x 10 mL	HNO_3 10%	--
3114	Copper (Cu) Standard Solution	5 x 10 mL	HNO_3 10%	--
3115a	Dysprosium (Dy) Standard Solution	5 x 10 mL	HNO_3 10%	--
3116a	Erbium (Er) Standard Solution	5 x 10 mL	HNO_3 10%	--
3117a	Europium (Eu) Standard Solution	5 x 10 mL	HNO_3 10%	--

104.5 - Spectrometry, Single Element Standard Solutions (Cont.)

SRM	Description	Unit of Issue	Nominal Acid Concentration of Matrix	NRC License or Equivalent Required*
3118a	Gadolinium (Gd) Standard Solution	5 x 10 mL	HNO_3 10%	--
3119a	Gallium (Ga) Standard Solution	5 x 10 mL	HNO_3 10%	--
3120a	Germanium (Ge) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3121	Gold (Au) Standard Solution	5 x 10 mL	HCl 10%	--
3122	Hafnium (Hf) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3123a	Holmium (Ho) Standard Solution	5 x 10 mL	HNO_3 10%	--
3124a	Indium (In) Standard Solution	5 x 10 mL	HNO_3 10%	--
3126a	Iron (Fe) Standard Solution	50 mL	HNO_3 10%	--
3127a	Lanthanum (La) Standard Solution	5 x 10 mL	HNO_3 10%	--
3128	Lead (Pb) Standard Solution	5 x 10 mL	HNO_3 10%	--
3129a	Lithium (Li) Standard Solution	5 x 10 mL	HNO_3 1%	--
3130a	Lutetium (Lu) Standard Solution	5 x 10 mL	HNO_3 10%	--
3131a	Magnesium (Mg) Standard Solution	50 mL	HNO_3 10%	--
3132	Manganese (Mn) Standard Solution	5 x 10 mL	HNO_3 10%	--
3133	Mercury (Hg) Standard Solution	5 x 10 mL	HNO_3 10%	--
3134	Molybdenum (Mo) Standard Solution	5 x 10 mL	HCl 10%	--
3135a	Neodymium (Nd) Standard Solution	5 x 10 mL	HNO_3 10%	--
3136	Nickel (Ni) Standard Solution	5 x 10 mL	HNO_3 10%	--
3137	Niobium (Nb) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3138	Palladium (Pd) Standard Solution	5 x 10 mL	HCl 10%	--
3139a	Phosphorus (P) Standard Solution	5 x 10 mL	HNO_3 0.8%	--
3140	Platinum (Pt) Standard Solution	5 x 10 mL	HCl 10%	--
3141a	Potassium (K) Standard Solution	50 mL	HNO_3 1%	--
3142a	Praseodymium (Pr) Standard Solution	5 x 10 mL	HNO_3 10%	--
3143	Rhenium (Re) Standard Solution	5 x 10 mL	HNO_3 10%	--
3144	Rhodium (Rh) Standard Solution (nominal 1 mg/g)	5 x 10 mL	HCl 10%	--
3145a	Rubidium (Rb) Standard Solution	5 x 10 mL	HNO_3 1%	--
3147a	Samarium (Sm) Standard Solution	5 x 10 mL	HNO_3 10%	--
3148a	Scandium (Sc) Standard Solution	5 x 10 mL	HNO_3 10%	--
3149	Selenium (Se) Standard Solution	5 X 10 mL	HNO_3 10%	--
3150	Silicon (Si) Standard Solution	50 mL	H_2O	--
3151	Silver (Ag) Standard Solution	5 x 10 mL	HNO_3 10%	--
3152a	Sodium (Na) Standard Solution	50 mL	HNO_3 1%	--
3153a	Strontium (Sr) Standard Solution	5 x 10 mL	HNO_3 10%	--
3154	Sulfur (S) Standard Solution	5 x 10 mL	H_2SO_4 0.1%	--
3155	Tantalum (Ta) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3156	Tellurium (Te) Standard Solution	5 x 10 mL	HCl 10%	--

104.5 - Spectrometry, Single Element Standard Solutions (Cont.)

SRM	Description	Unit of Issue	Nominal Acid Concentration of Matrix	NRC License or Equivalent Required*
3157a	Terbium (Tb) Standard Solution	5 x 10 ml	HNO_3 10%	--
3158	Thallium (Tl) Standard Solution	5 x 10 mL	HNO_3 10%	--
3159	Thorium (Th) Standard Solution	50 mL	HNO_3 10%	X
3160a	Thulium (Tm) Standard Solution	5 x 10 mL	HNO_3 10%	--
3161a	Tin (Sn) Standard Solution	50 mL	HNO_3 5% + HF 1%	--
3162a	Titanium (Ti) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3163	Tungsten (W) Standard Solution	50 mL	HNO_3 7% + HF 4%	--
3164	Uranium (U) Standard Solution (Radioactive)	5 x 10 mL	HNO_3 10%	X
3165	Vanadium (V) Standard Solution (nominal 5 mg/g)	5 x 10 mL	HNO_3 10%	--
3166a	Ytterbium (Yb) Standard Solution	5 x 10 mL	HNO_3 10%	--
3167a	Yttrium (Y) Standard Solution	5 x 10 mL	HNO_3 10%	--
3168a	Zinc (Zn) Standard Solution	50 mL	HNO_3 10%	--
3169	Zirconium (Zr) Standard Solution	50 mL	HNO_3 10% + HF 2%	--
3177	Mercuric Chloride Standard Solution	5 x 10 mL	HNO_3 3% + HCl 4 %	--

*If no "X", then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

104.8 - Anion Chromatography (solution form)

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

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

	3180	3181	3182	3183	3184	3185	3186
Description >>	Iodide Anion Standard Solution	Sulfate Anion Standard Solution	Chloride Anion Standard Solution	Fluoride Anion Standard Solution	Bromide Anion Standard Solution	Nitrate Anion Standard Solution	Phosphate Anion Standard Solution
Unit of Issue >>	5 x 5 mL	5 x10 mL	5 x 10 mL	50 mL	5 x 10 mL	5 x 10 mL	5 x 10 mL
Anion	Iodide	Sulfate	Chloride	Fluoride	Bromide	Nitrate	Phosphate
Nominal Mass Fraction (in mg/kg)	1000	1000	1000	1000	1000	1000	1000

104.9 - Stable Isotopic Materials (solid and solution forms)

The isotopic composition of these SRMs has been determined by mass spectrometry.

For light stable isotopic materials value assigned on an artifact based scale, see Table 104.10.

SRMs marked by an X are subject to license requirement by the NRC (or Agreement State) for transfer within the United States (U.S.). License certification is required of purchaser by NIST prior to shipment.

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

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

SRM	Description	Unit of Issue	Isotopic Measurand	NRC License or Equivalent Required*
951a	Boric Acid Isotopic Standard	10 g	Boron	--
952	Enriched Boric Acid Standard	0.25 g powder	Boron	--
973	Boric Acid Acidimetric Standard	100 g	Boron	--
975a	Chlorine Isotopic Standard	0.25 g	Chlorine	--
977	Bromine Isotopic Standard	0.25 g	Bromine	--
978a	Silver Isotopic Standard	0.25 g	Silver	--
979	Chromium Isotopic Standard	0.25 g	Chromium	--
980	Magnesium Isotopic Standard	0.25 g	Magnesium	--
981	Common Lead Isotopic Standard	1 g wire	Lead	--
982	Equal-Atom Lead Isotopic Standard	1 g wire	Lead	X
983	Radiogenic Lead Isotopic Standard	1 g wire	Lead	X
984	Rubidium Assay Isotopic Standard	0.25 g	Rubidium	--
986	Nickel Isotopic Standard	0.5 g	Nickel	--
987	Strontium Carbonate Isotopic Standard	1 g	Strontium	--
994	Gallium Isotopic Standard	0.25 g	Gallium	--
997	Thallium Isotopic Standard	0.25 g	Thallium	--
8599	Henderson Molybdenite	1 bottle at 10 g		--

*If no "X", then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

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

These RMs are for calibration of isotope-ratio mass spectrometers and associated sample preparation systems. They are distributed by NIST on behalf of the International Atomic Energy Agency (IAEA). At the request of the IAEA, quantities of these materials are limited to one unit of each RM per laboratory every 3 years.

The isotopic compositions are given in parts per thousand difference from isotope-ratio standards-Hydrogen and oxygen: Vienna Standard Mean Ocean Water (VSMOW), Carbon: Vienna PeeDee Belemnite (VPDB), Nitrogen: atmospheric N2 (Air), Silicon: NBS28 Silica Sand (optical), and Sulfur: Vienna Canyon Diablo Troilite (VCDT). In RM 8545 (LSVEC) is also expressed as an absolute isotopic ratio.

For further information see: SP260-149.

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

(see Certificate of Analysis for uncertainties and other details)

SRM	Description	Unit Size	δ13CVPDB × 1000	δ15NAir × 1000	δ17OVSMOW	δ18OVPDB × 1000	δ18OVSMOW × 1000	δ2HVSMOW × 1000	δ30SiNBS28 × 1000	δ34SVCDT x 1000	6Li/7Li
8535a	VSMOW2 Vienna Standard Mean, Ocean Water	20 mL									
8536	GISP-Water	20 mL					*-24.78 Ref [2]*	*-189.5 Ref [2]*			
8537	SLAP-Water Light Stable Isotopic Standard	20 mL					*-55.5* Ref [1]*	*-428* Ref [1]*			
8539	NBS 22-Oil	1 mL	*-30.03 Ref [5]*					*-118 Ref [3]*			
8540	PEFI-Polyethylene Foil	mg	*-32.15 Ref [5]*					*-100 Ref [2]*			
8541	USGS24-Graphite	0.8 g	*-16.05 Ref [5]*								
8542	Sucrose ANU-Sucrose	1 g	*-10.45 Ref [5]*								
8543	NBS18-Carbonatite	0.4 g	*-5.01 Ref [5]*			*-23.01 Ref [14]*	*+7.20 Ref [15]*				
8544	NBS19-Limestone	0.4 g	*+1.95* Ref [16]*			*-2.2* Ref [16]*	*+28.65 Ref [15]*				
8545	LSVEC-Lithium Carbonate	0.4 g	*-46.6* Ref [5]*			*-26.41 Ref [14]*	*+3.69 Ref [15]*				*0.08215** Ref [4]*
8546	NBS28-Silica Sand	0.4 g					*+9.58 Ref [2]*		*0* Ref [12]*		
8547	IAEAN1-Ammonium Sulfate	0.4 g		*+0.43ˆ Ref [7]*							
8548	IAEAN2-Ammonium Sulfate	0.4 g		*+20.41 Ref [7]*							
8549	IAEA-NO3 Nitrogen and Oxygen Isotopes in Nitrate	0.4 g		*+4.7 Ref [7]*	*-0.2 Ref [17]*		*+25.6 Ref [8]*				
8550	USGS25-Ammonium Sulfate	0.5 g		*-30.41 Ref [7]*							
8551	USGS26-Ammonium Sulfate	0.5 g		*+53.75 Ref [7]*							
8552	NSVEC-Gaseous Nitrogen	300 umol		*-2.78 Ref [7]*							
8553	Soufre De Lacq-Elemental Sulfur	0.5 g								*+16.90 Ref [10]*	
8554	NZ1-Silver Sulfide	0.5 g								*-0.3* Ref [11]*	
8555	NZ2-Silver Sulfide	0.5 g								*+22.67 Ref [12]*	
8556	NBS123-Sphalerite	1.5 g								*+17.44 Ref [13]*	
8557	NBS127-Barium Sulfate	0.5 g					*+8.6 Ref [8]*			*+21.1 Ref [12]*	
8558	USGS32 Nitrogen and Oxygen Isotopes in Nitrate	0.9 g		*+180ˆ Ref [7]*			*+25.7 Ref[8]*				
8559	Natural Gas, Coal Origin	cyl	*-29.0(CH4) Ref [3]*					*-138(CH4) Ref [3]*			
8561	Natural Gas, Biogenic	cyl	*-72.8(CH4) Ref [3]*					*-176(CH4) Ref [3]*			

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

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

These RMs are for calibration of isotope-ratio mass spectrometers and associated sample preparation systems. They are distributed by NIST on behalf of the International Atomic Energy Agency (IAEA). At the request of the IAEA, quantities of these materials are limited to one unit of each RM per laboratory every 3 years.

The isotopic compositions are given in parts per thousand difference from isotope-ratio standards-Hydrogen and oxygen: Vienna Standard Mean Ocean Water (VSMOW), Carbon: Vienna PeeDee Belemnite (VPDB), Nitrogen: atmospheric N2 (Air), Silicon: NBS28 Silica Sand (optical), and Sulfur: Vienna Canyon Diablo Troilite (VCDT). In RM 8545 (LSVEC) is also expressed as an absolute isotopic ratio.

For further information see: SP260-149.

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

(see Certificate of Analysis for uncertainties and other details)											
SRM	Description	Unit Size	δ13CVPDB × 1000	δ15NAir × 1000	δ17OVSMOW	δ18OVPDB × 1000	δ18OVSMOW × 1000	δ2HVSMOW × 1000	δ30SiNBS28 × 1000	δ34SVCDT x 1000	6Li/7Li
8562	CO2-Heavy, Paleomarine Origin	set (2)	*-3.72 Ref [5]*			*-18.49 Ref [14]*	*+11.86 Ref [15]*				
8563	CO2-Light, Petrochemical Origin	set (2)	*-41.59 Ref [5]*			*-33.52 Ref [14]*	*-3.64 Ref [15]*				
8564	CO2-Biogenic, Modern Biomass Origin	set (2)	*-10.45 Ref [5]*			*-10.09 Ref [14]*	*+20.52 Ref [15]*				
8568	USGS34 Nitrogen and Oxygen Isotopes in Nitrate	0.9 g		*-1.8 Ref [8]*	*-0.1*		*-27.9 Ref [8]*				
8569	USGS35 Nitrogen and Oxygen Isotopes in Nitrate	0.9 g		*+2.7 Ref [8]*	*+21.6 Ref [17]*		*+57.5 Ref [8]*				
8573	L-glutamic Acid USGS40(Light Carbon and Nitrogen Isotopes in L-glutamic Acid)	1 g	*-26.39 Ref [12]*	*-4.52 Ref [1,2]*							
8574	L-glutamic Acid USGS41 (Heavy Carbon and Nitrogen Isotopes in L-glutamic Acid)	0.5 g	*+37.63 Ref [12]*	*+47.57 Ref [1,2]*							

* Exact values defining the delta scale

^ Interim consensus values used for scale normalization

**Absolute isotope amount ratio

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Standard Reference Materials for Chemical Composition

105. Health and Industrial Hygiene

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

The following SRMs are for calibrating apparatus and validating analytical methods used in clinical and pathology laboratories.
Additional information on the serum materials is given in table 105.2.

For further information see: SP 260-36, SP 260-72 and SP 260-83

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

SRM	Description	Unit Size	Purity/Constituent (mass fraction in %)
900a	Antiepilepsy Drugs in Frozen Human Serum	4 vials	2 levels: phenobarbital, phenytoin, lamotrigine, topiramate
909c	Human Serum	3 bottles x 2 mL each	Cholesterol Glucose Creatinine Total Gylcerides Urea Uric Acid *Protein*
911c	Cholesterol	2 g	99.2
912a	Urea-Clinical	25 g	99.9
913a	Uric Acid	10 g	99.6
914a	Creatinine	10 g	99.7
915b	Calcium Carbonate (Clinical Standard)	20 g	$^{W}CaCo_3$ 99.907 ^{W}Ca 40.0104 $^{W}CO_3$ 59.923
916a	Bilirubin	100 mg	98.3
917c	D-Glucose (Dextrose)	50 g	99.7
918b	Potassium Chloride (Clinical)	30 g	^{W}KCl 99.927 ^{W}K 52.4121 ^{W}Cl 47.5284
919b	Sodium Chloride (Clinical)	30 g	$^{W}NaCl$ 99.835 $^{W}Cl^-$ 60.564 $^{W}Na^+$ 39.2747
920	D-Mannitol	50 g	99.8
921	Cortisol (Hydrocortisone)	1 g	98.9
924a	Lithium Carbonate (Clinical)	30 g	99.867*
925	VMA (Clinical)	1 g	99.4
927d	Bovine Serum Albumin (7%, solution)	set (10)	BSA Conc. 65.41 mg/L
928	Lead Nitrate (Clinical)	30 g	100.00

105.1 - Clinical Laboratory Materials (gas, liquid, and solid forms) (Cont.)

SRM	Description	Unit Size	Purity/Constituent (mass fraction in %)
929a	Magnesium Gluconate	5 g	Mg Conc. 5.362
937	Iron Metal (Clinical)	50 g	99.90
955c	Toxic Metals in Caprine Blood	4 vials	4 Levels: Pb, As, Cd, Hg 1 Level: ethyl-, methyl-, and inorganic Hg species
956c	Electrolytes in Frozen Human Serum	6 x 2.0 mL	3 Levels: Ca, Cl, Li, Mg, K, Na 3 Levels: *ionized calcium*
965b	Glucose in Frozen Human Serum	set (8) (2 each conc)	4 Levels: glucose
967a	Creatinine in Frozen Human Serum	set (4) (2 each conc)	2 Levels: creatinine
968e	Fat-Sol Vitamins, Carotenoids, and Cholesterol in Human Serum	set (3) (1 each conc)	3 Levels: vitamins, carotenoids, and cholesterol
970	Ascorbic Acid in Frozen Human Serum	set (4) (2 each conc)	2 Levels: Total Ascorbic Acid
971	Hormones in Frozen Human Serum	2 x 5 mL	cortisol, testosterone, progesterone
972	Vitamin D in Human Serum	set (4) (1 each level)	4 Levels: 25-hydroxyvitamin D_2, 25-hydroxyvitamin D_3, 3-epi-25-hydroxyvitamin D_3,
998	Angiotensin I (Human)	0.5 mg	94.1
1400	Bone Ash	50 g	8 elements
1486	Bone Meal	50 g	8 elements
1595	Tripalmitin	2 g	99.5
1598a	Inorganic Constituents in Animal Serum	2 vials	12 elements *5 elements*
1599	2 Anticonvulsant Drugs	set (4)	3 Levels: Valproic Acid, carbamazepine
1950	Metabolites in Human Plasma	5 vials @ 1.0 mL each	Cholesterol, Creatinine, Urea, Uric Acid, Homocysteine, Glucose, Total Gylcerides, 3 Hormones, 8 Fatty Acids, 12 Amino Acids, 9 Vitamins, 4 Elements, 2 carotenoids, *Bilirubin, Selenium Species, Total protein,* *6 PFCs, 19 Fatty Acids,* *6 Amino Acids, 6 Vitamins,* *3 Elements, 2 carotenoids,*
1951b	Lipids in Frozen Human Serum	set (4) (2 each conc)	2 Levels: Total Cholesterol, Triglycerides only, 1 Level: Total Glycerides
1952a	Cholesterol in Human Serum	set (6) (2 each conc)	3 Levels: cholesterol
1955	Homocysteine and Folate in Frozen Human Serum	set (3) (1 each conc)	3 Levels: Homocysteine, 5-Methyltetrahydrofic Acid, *Folic Acid*

105.1 - Clinical Laboratory Materials (gas, liquid, and solid forms) (Cont.)

SRM	Description	Unit Size	Purity/Constituent (mass fraction in %)
2366	Cytomegalovirus (CMV) for DNA Measurements	3 vials	3 Levels: cytomegalovirus (copies per micro liter)
2389a	Amino Acids in 0.1 mol/L Hydrochloric Acid	5 x 1.2 mL	17 Amino Acids
2668	Toxic Elements in Frozen Human Urine	Set (10) (5 each conc)	2 Levels: 14 Elements *2 Levels: 9 Elements*
2669	Arsenic Species in Frozen Human Urine	Set (10) (5 each conc.)	2 levels: Arsenic species *2 levels: Total Arsenic*
2670a	Toxic Elements in Urine (Freeze-Dried)	set (4) (2 each conc)	2 Levels: 14 Elements *10 Elements*
2921	Human Cardiac Troponin Complex	5 x 115 µL	Cardiac Troponin cTnI, *cTnT, cTnC*
2972	25-Hydroxyvitamin D2 and D3 Calibration Solutions	10 ampoules x 1.2 mL each	25-hydroxvitamin D_2 25-hydroxyvitamin D_3
3668	Mercury, Perchlorate, and Iodide in Frozen Human Urine	Set (10) (5 each conc)	2 Levels: Hg, Nitrate, Perchlorate *2 Levels: I, Thiocyanate*
3950	Vitamin B6 in Frozen Human Serum	2 vials, 1 level each	2 Levels: Vitamin B_6
8323	Yeast Protein Extract	3 vials x 0.2 mL	*0.191 mg/mL*
8327	Peptide Reference Material for Molecular Mass and Purity Measurements	set 3 (1 mg each)	*Molecular Mass,* *Purity of Peptides,* *Amino Acid Sequence,* for 3 synthetic peptides
8642	FDA Saxitoxin Dihydrochloride Solution	10 x 1.2 mL	*0.0103*

* Conforms to National Committee for Clinical Laboratory Standards (NCCLS) specification ACC-1.

105.2 - Serum and Plasma Materials (frozen, liquid, and lyophilized forms)

These SRMs serve a variety of clinical measurement needs. SRM 909c is a frozen human serum for use in determining specified constituents. SRM 927d is a bovine serum albumin in a sterile 7% solution for use in the calibration and standardization of procedures to analyze total serum protein. SRM 956c is a frozen human serum for use in the calibration and standardization of procedures for the determination of specific electrolytes in either diluted or undiluted human serum or plasma. SRM 965b is a frozen human serum for evaluating the accuracy of procedures used to determine glucose in human serum and to validate secondary reference materials. SRM 967a is a frozen human serum for evaluating the accuracy of procedures for the determination of creatinine in human serum. SRM 968e is a lyophilized human serum for validating methods used to determine fat-soluble vitamins, carotenoids, and cholesterol in human serum and plasma.

SRM 970 is a frozen human serum for validating methods for determining ascorbic acid in human serum and similar matrices. SRM 971 is a hormone in frozen human serum for evaluating the accuracy of procedures for the determination of the steroid hormones cortisol and progesterone in human serum. SRM 1951a is a frozen human serum for evaluating the accuracy of clinical procedures for the determination of total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides (triglyerides and total glyceride species). SRM 972 is a frozen human serum for evaluating vitamin D metabolites. SRM 1951b is a frozen human serum for evaluating the accuracy of clinical procedures for the determination of total cholesterol. SRM 1957 is a freeze-dried human serum for evaluating PCB congeners, chlorinated pesticides and total cholesterol in human serum and similar matrices. SRMs 1957 and 1958 are freeze-dried human serums for evaluating PCB congeners, chlorinated pesticides, and PBDE congeners with non-certified values for PFCs and dioxins/furans. SRM 2921 is a human cardiac troponin complex. SRM 2921 is primarily intended for use in calibrating clinical procedures and devices for the determination of cardiac troponin I (cTnI) in human serum. It can also be used for value-assignment of calibrators and control materials.

For further information see: SP 260-83

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

	909c	927d	956c	965b	967a	968e	970	971	972
Description >>	Human Serum	Bovine Serum Albumin (7%, solution)	Electrolytes in Frozen Human Serum	Glucose in Frozen Human Serum	Creatinine in Frozen Human Serum	Fat-Soluble Vitamins, Carotenoids, and Cholesterol in Human Serum	Ascorbic Acid in Frozen Human Serum	Hormones in Frozen Human Serum	Vitamin D in Human Serum
Unit Size >>	3 bottles x 2 mL each	set (10)	6 x 2.0 mL	set (8) (2 each conc)	set(4) (2 each conc)	set (3) (1 each conc.)	set (4) (2 each conc)	2 x 5 mL	set (4) (1 each level)
α-Carotene-Total						X			
α-Tocopherol						3 levels			
γ-Tocopherol						3 levels			
β-cryptoxanthin-total			X			3 levels			
Calcium Ionized			X						
5-Methyltetra-hydrofolic Acid									
Albumin		X							
Amino Acids									
Ascorbic Acid							2 levels		
Bilirubin									
Cardiac troponin C (cTnC)									
Cardiac troponin I (cTnI)									
Cardiac troponin T (cTnT)									
Chlorine Cl			X						
Cholesterol	X					3 levels			
Cis-B-Carotene									
Coenzyme Q10						(3 levels)			

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

105.2 - Serum and Plasma Materials (frozen, liquid, and lyophilized forms) (Cont.)

	1950	1951b	1952a	1955	1957	1958	1959	2921	3950
Description >>	Metabolites in Human Plasma	Lipids in Frozen Human Serum	Cholesterol in Human Serum	Homocysteine and Folate in Frozen Human Serum	Organic Contaminants in Non-Fortified Human Serum	Organic Contaminants in Fortified Human Serum	Drugs of Abuse in Frozen Human Serum	Human Cardiac Troponin Complex	Vitamin B6 in Frozen Human Serum
Unit Size >>	5 vials @ 1.0 mL each	set (4) (2 each conc)	set (6) (2 each conc)	set (3) (1 each conc)	5 vials x 10 mL	5 vials x 10 mL	2 vials x 5 mL	5 x 115 uL	2 vials, 1 level each
α-Carotene-Total	X								
α-Tocopherol	X								
γ-Tocopherol	X								
β-cryptoxanthin-total									
Calcium Ionized									
5-Methyltetra hydrofolic Acid	X			3 levels					
Albumin									
Amino Acids	X								
Ascorbic Acid									
Bilirubin	X								
Cardiac troponin C (cTnC)								X	
Cardiac troponin I (cTnI)								X	
Cardiac troponin T (cTnT)								X	
Chlorine Cl									
Cholesterol	X	2 levels	3 levels						
Cis-B-Carotene	X								
Coenzyme Q10									

105.2 - Serum and Plasma Materials (frozen, liquid, and lyophilized forms)

	909c	927d	956c	965b	967a	968e	970	971	972
Description >>	Human Serum	Bovine Serum Albumin (7%, solution)	Electrolytes in Frozen Human Serum	Glucose in Frozen Human Serum	Creatinine in Frozen Human Serum	Fat-Sol Vitamins, Carotenoids, and Cholesterol in Human Serum	Ascorbic Acid in Frozen Human Serum	Hormones in Frozen Human Serum	Vitamin D in Human Serum
Unit Size >>	3 bottles x 2 mL each	set (10)	6 x 2.0 mL	set (8) (2 each conc)	set(4) (2 each conc)	set (3) (1 each conc.)	set (4) (2 each conc)	2 x 5 mL	set (4) (1 each level)
Cortisol								2 levels	
Creatinine	X				2 levels				
Dioxins/Furans									
Drugs of Abuse									
Elements (Selected)	X	3 levels							
Fatty Acids									
Folic Acid									
Glucose	X			4 levels					
Glycerides-Total	X								
HDL-Cholesterol									
Homocysteine									
LDL-Cholesterol									
Lutein-Total						3 levels			
Lycopene-Total						3 levels			
Perflourinated compounds (PFCs)									
Pesticides									
Polybrominated diphenyl ethers (PBDEs)									
Polychlorinated biphenyl (PCB) Congeners									
Progesterone								2 levels	
Prox, Protein	X	X							
Pyridoxal 5" phosphate									
Retinol-Total						3 levels			
Retinyl palmitate									
Retinyl Stearate									
Selenium Species									
Testosterone								2 levels	
Total B-Cryptoxantin									
trans-Carotene						3 levels			
trans-Lycopene						3 levels			
Triglycerides									
Urea	X								
Uric Acid	X								
Vitamin D									4 levels
Vitamin, 25-hydroxyvitamin D2									
Vitamin, 25-hydroxyvitamin D3						3 levels			
Vitamin, 3-epi-25-hydroxyvitamin D3									
Zeaxanthin-total						3 levels			

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

105.2 - Serum and Plasma Materials (frozen, liquid, and lyophilized forms) (Cont.)

	1950	1951b	1952a	1955	1957	1958	1959	2921	3950
Description >>	Metabolites in Human Plasma	Lipids in Frozen Human Serum	Cholesterol in Human Serum	Homocysteine and Folate in Frozen Human Serum	Organic Contaminants in Non-Fortified Human Serum	Organic Contaminants in Fortified Human Serum	Drugs of Abuse in Frozen Human Serum	Human Cardiac Troponin Complex	Vitamin B6 in Frozen Human Serum
Unit Size >>	5 vials @ 1.0 mL each	set (4) (2 each conc)	set (6) (2 each conc)	set (3) (1 each conc)	5 vials x 10 mL	5 vials x 10 mL	2 vials x 5 mL	5 x 115 uL	2 vials, 1 level each
Cortisol	X								
Creatinine	X								
Dioxins/Furans					X	X			
Drugs of Abuse							X		
Elements (Selected)	X								
Fatty Acids	X								
Folic Acid	X			3 levels					
Glucose	X								
Glycerides-Total	X	2 levels							
HDL-Cholesterol		2 levels							
Homocysteine	X			3 levels					
LDL-Cholesterol		2 levels							
Lutein-Total	X								
Lycopene-Total	X								
Perflourinated compounds (PFCs)	X				X	X			
Pesticides					X	X			
Polybrominated diphenyl ethers (PBDEs)					X	X			
Polychlorinated biphenyl (PCB) Congeners					X	X			
Progesterone	X								
Prox, Protein	X								
Pyridoxal 5'-phosphate	X								2 levels
Retinol-Total	X								
Retinyl palmitate	X								
Retinyl Stearate	X								
Selenium Species	X								
Testosterone	X								
Total B-Cryptoxantin	X								
trans-Carotene	X								
trans-Lycopene	X								
Triglycerides		2 levels							
Urea	X								
Uric Acid	X								
Vitamin D									
Vitamin, 25-hydroxyvitamin D2	X								
Vitamin, 25-hydroxyvitamin D3	X								
Vitamin, 3-epi-25-hydroxyvitamin D3									
Zeaxanthin-total	X								

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

105.3 - 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 1828b consists of four concentrations of ethanol-water solutions in a set of five ampoules.

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

	1828b	1847	2891	2892	2893	2894	2895	2896	2897	2898	2899a	2900
Description >>	Ethanol-Water Solutions	Ethanol-Water Solutions	Ethanol-Water Solution (nominal 0.02 %)	Ethanol-Water Solution (nominal 0.04 %)	Ethanol-Water Solution (nominal 0.08 %)	Ethanol-Water Solution (nominal 0.1 %)	Ethanol-Water Solution (nominal 0.2 %)	Ethanol-Water Solution (nominal 0.3 %)	Ethanol-Water Solution, (nominal 2%)	Ethanol-Water Solution, (nominal 6%)	Ethanol-Water Solution, (nominal 25 % by mass)	Ethanol-Water Solution, (nominal 95.6%)
Unit Size >>	6 x 1.2 mL	6 x 10 mL	5 x 1.2 mL	5 x 1.2 mL	5 x 1.2 mL	5 x 1.2 mL	5 x 1.2 mL	5 x 1.2 mL	5 x 10 mL	5 x 10 mL	5 ampoules x 10 mL	10 mL
Nominal Concentration (mass fraction in %)	0.02, 0.04, 0.08, 0.1, 0.2, 0.3	2, 6, 25	0.02	0.04	0.08	0.1	0.2	0.3	2	6	25	95.6

105.4 - Toxic Substances in Urine (powder and frozen form)

SRM 2669 are for determination of arsenic species in human urine. A unit consists of five pouches, each containing one vial of Level I Arsenic Species and one vial of Level II Arsenic Species.

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

	2668	2669	2670a	3668
Description >>	Toxic Elements in Frozen Human Urine	Arsenic Species in Frozen Human Urine	Toxic Elements in Urine (Freeze-Dried)	Mercury, Perchlorate, and Iodide in Frozen Human Urine
Unit of Issue >>	Set (10) (5 each conc.)	Set (10) (5 each conc.)	set (4) (2 each conc.)	Set (10) (5 each conc.)
Concentrations in µg/L				
Aluminum (Al)			(2 levels)	
Antimony (Sb)	2 levels		2 levels	
Arsenic (As)	2 levels	*2 levels*	(3)	
Arsenic acid (AsV)		2 levels		
Arsenobetaine (AB)		2 levels		
Arsenocholine (AC)		3.74		
Arsenous acid (AsIII)		2 levels		
Barium (Ba)	2 levels		(2)	
Beryllium (Be)	2 levels		(5)	
Cadmium (Cd)	2 levels		2 levels	
Calcium (Ca)			2 levels	
Cesium (Cs)	2 levels		*2 levels*	
Chlorine (Cl)	*2 levels*			
Chromium (Cr)	2 levels		2 levels	
Cobalt (Co)	2 levels		(2 levels)	
Copper (Cu)	2 levels			
Dimethylarsinic acid (DMA)		2 levels		
Fluoride (F)	*2 levels*			
Iodine (I)				*2 levels*
Iodine[b]			(5)	
Lead (Pb)	2 levels		2 levels	
Magnesium (Mn)			2 levels	
Manganese (Mn)	2 levels		2 levels	
Mercury (Hg)			2 levels	2 levels

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

105.4 - Toxic Substances in Urine (powder and frozen form) (Cont.)

	2668	2669	2670a	3668
Description >>	Toxic Elements in Frozen Human Urine	Arsenic Species in Frozen Human Urine	Toxic Elements in Urine (Freeze-Dried)	Mercury, Perchlorate, and Iodide in Frozen Human Urine
Unit of Issue >>	Set (10) (5 each conc)	Set (10) (5 each conc.)	set (4) (2 each conc)	Set (10) (5 each conc)
Concentrations in µg/L				
Molybdenum (Mo)	2 levels		114.1	
Monomethylarsonic acid (MMA)		2 levels		
Nickel (Ni)	2 levels		(2 levels)	
Nitrate (NO_3^-)				2 levels
Perchlorate (ClO_4)				2 levels
Platinum (Pt)	*2 levels*		51.5	
Potassium (K)	*2 levels*		*2 levels*	
Selenium (Se)	*2 levels*		2 levels	
Sodium (Na)	*2 levels*		*2 levels*	
Thallium (Ti)	*2 levels*		2 levels	
Thiocyanate (SCN^-)				*2 levels*
Thorium (Th)			2 levels	
Tin (Sn)	*2 levels*		(<1)	
Trimethylarsine oxide (TMAO)		194		
Tungsten (W)	*2 levels*		(<1)	
Uranium (U)	*2 levels*		2 levels	
Vanadium (V)	*2 levels*		(2 levels)	
Zinc (Zn)			*2 levels*	

[a] Flourine concentrations, as measured, are for Fluoride, mass concentration.

[b] Iodine concentrations, as measured, are for Iodide.

[c] These levels are not spiked, but are endogenous to the matrix.

105.7 - Drugs of Abuse (hair, serum, and urine)

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

	1507b	1508a	1511	1959	2379	2380	2381	2382	8444
Description >>	THC-COOH in Freeze-Dried Urine	Benzoylecgonine (Cocaine Metabolite) in Freeze-dried Urine	Multi Drugs of Abuse in Urine	Drugs of Abuse in Frozen Human Serum	Drugs of Abuse in Human Hair I	Drugs of Abuse in Human Hair II	Morphine and Codeine in Urine	Morphine Glucuronide in Urine	Cotinine in Freeze-Dried Human Urine
Unit of Issue >>	set (3)	set (4)	3 bottles	2 vials x 5 mL	100 mg	100 mg	set (4)	set (4)	set (4)
Concentrations in ng/mL unless noted by an asterisk* for ng/mg									
Amphetamine					5.49*	---			
Benzoylecgonine		3 levels	162	1033	4.01*	---			
Cocaethylene					2.67*	---			
Cocaine					6.84*	---	3 levels		
Codeine			288		---	9.82*			
Cotinine Glucuronide								3 levels	*3 levels*
G-Monoacetymorphine					---	2.71*			
Methadone				1010					
Methamphetamine				1014	5.20*	---			
Morphine			309	1012	---	10.54*	3 levels		
Phencylidine			23.8	1004	6.24*	---			
Tetrahydrocannabinol					---	0.99*			
THC-9-COOH	2 levels		14.1	*1008*					

105.8 - DNA Profiling (solid forms)

SRMs 2390, and 2391c 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 2390 DNA Profiling Standard, based on Restriction Fragment Length Polymorphism (RFLP) testing, is certified for the sizes of each allelic band of five commonly used DNA probes of two human DNA samples; one is from a female cell line, and the other is from a male source. SRM 2390 consists of 20 components packaged in three boxes.

SRM 2391c includes short tandem repeat (STR) information for all genomic DNA samples in the SRM. The STR data includes the Federal Bureau of Investigation's (FBI's) CODIS (Combined DNA Index System) 13 core STR loci, including loci that were commercially available at the time of certification. Certified values for a total of 41 STR loci, 17 of which are Y-STRs, and Reference values for 26 STR loci are included in this issue. The new standard includes well-characterized DNA in two forms: genomic DNA and DNA to be extracted from cells spotted onto 903 and FTA filter papers. SRM 2391c consists of 6 components packaged in one box and stored at refrigeration temperatures (NOT frozen).

SRM 2392 Mitochondrial DNA Sequencing contains DNA extracted from two cell lines plus cloned DNA from a region that is difficult to sequence. The certificate accompanying the SRM details the base pair sequences of the DNA, and the sequences of 58 unique primer sets which permit the amplification and sequencing of any specific area or the entire human mitochondrial DNA (strand). SRM 2392 consists of three frozen components packaged in one box.

SRM 2392-I Mitochondrial DNA Sequencing compliments and adds another DNA template to SRM 2392 for the amplification and sequencing of human mtDNA. The selection of the HL-60 cell culture line for this additional DNA template was based on a suggestion from the Federal Bureau of Investigation (FBI) that this DNA would be particularly useful to the forensic community.

SRM 2394 Heteroplasmic Mitochondrial DNA Mutation Standard contains mixtures of a 285 base pair polymerase chain reaction (PCR) product from two different cell culture lines that differ by one base pair. These mixtures contain varying ratios of the minor/major heteroplasmy including 1/99, 2.5/97.5, 5/95, 10/90, 20/80, 30/70, 40/60, and 50/50. This SRM is intended to provide quality control in determining the sensitivity of heteroplasmic low-frequency single nucleotide mutation detection techniques.

SRM 2399 Fragile X Human DNA Triplet Repeat Standard is the leading heritable cause of mental retardataion and the number of Fragile X tests conducted for carrier screening, pre-natal screening and diagnoses is second only to that for cystic fibrosis. SRM 2399 is intended to provide quality control to clinical laboratories that test human samples for Fragile X and need to determine the number of CGG trinucleotide repeats. This SRM consists of nine vials of amplified DNA (PCR) products containing 20 to 118 trinucleotide repeats; this range encompasses individuals with normal and premutation numbers of repeats.

For further information see: SP260-155

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

SRM	Description	Unit of Issue
2366	Cytomegalovirus (CMV) for DNA Measurements	3 vials
2372	Human DNA Quantitation Standard	set (3 x 1 each)
2391c	PCR Based DNA Profiling Standard	6 vials
2392	Mitochondrial DNA Sequencing	set (3)
2392-I	Mitochondrial DNA Sequencing	each
2393	CAG Repeat Length Mutation in Huntington's Disease	set (6)
2394	Heteroplasmic Mitochondrial DNA Mutation Detection Std	set (10)
2395	Human Y-Chromosome DNA Profiling Standard	set (6)
2396	Oxidative DNA Damage Mass Spectrometry Standards	set (10)
2399	Fragile X Human DNA Triplet Repeat Standard	set (9)

105.9 - Biomaterials (solid forms)

Biomaterials are materials that are applied for use in medical devices that require intimate contact with tissues and body fluids.

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

	2910a	8011	8012	8013	8395	8396	8397	8456	8457
Description >>	Calcium Hydroxyapatite	Gold Nanoparticles, Nominal 10 nm Diameter	Gold Nanoparticles, Nominal 30 nm Diameter	Gold Nanoparticles, Nominal 60 nm Diameter	Tissue Engineering Reference, Scaffold	Tissue Engineering Reference, Scaffold	Tissue Engineering Reference, Scaffold	Ultra High Molecular Weight Polyethylene	Ultra High Molecular Weight Polyethylene
Unit Size >>	2 g	two 5 mL ampoules	two 5 mL ampoules	two 5 mL ampoules	1 scaffold	1 scaffold	1 scaffold	each	10 cubes x 0.5 cm
Properties	Calcium Phosphorus Ca/P Molar Ratio	Reference Values for Particle Size Information Values for Chemical and Electrochemical Properties	Reference Values for Particle Size Information Values for Chemical and Electrochemical Properties	Reference Values for Particle Size Information Values for Chemical and Electrochemical Properties				Young's Modulus Yield Strength Ultimate Tensile Strength Elongation	Young's Modulus Yield Strength Ultimate Tensile Strength Elongation

105.10 - Respirable 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. SRMs 2676d, 2677a, and 3087a have been superceded by SRM 2783 Air Particulate on Filter Media.

Also, see Table 105.12 Respirable Materials

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

SRM	Description	Unit of Issue	Elemental Composition in (µg/filter)
2783	Air Particulate on Filter Media	2 + 2 Blnk (47 mm dia)	Certified: 18 elements *Reference values: 9 elements*
2950	Respirable Alpha Quartz on Filter Media, 10-500 µg	30 filters plus 30 blanks	See Composition Value for SRM 2952, 2953, 2954, 2956, 2957
2951	Respirable Alpha Quartz on Filter Media, 5 µg	5 filters plus 5 blanks	Alpha Quartz 5 µg
2952	Respirable Alpha Quartz on Filter Media, 10 µg	5 filters plus 5 blanks	Alpha Quartz 10 µg
2953	Respirable Alpha Quartz on Filter Media, 20 µg	5 filters plus 5 blanks	Alpha Quartz 20 µg
2954	Respirable Alpha Quartz on Filter Media, 50 µg	5 filters plus 5 blanks	Alpha Quartz 50 µg
2955	Respirable Alpha Quartz on, Filter Media, 100 µg	5 filters plus 5 blanks	Alpha Quartz 100 µg
2956	Respirable Alpha Quartz on Filter Media, 250 µg	5 filters plus 5 blanks	Alpha Quartz 250 µg
2957	Respirable Alpha Quartz on Filter Media, 500 µg	5 filters plus 5 blanks	Alpha Quartz 500 µg
2958	Respirable Alpha Quartz on Filter Media, 1000 µg	5 filters plus 5 blanks	Alpha Quartz 1000 µg
2960	Respirable Cristobalite on Filter Media, 5 µg - 250 µg	30 filters plus 30 blanks	See Composition Value for SRM 2961, 2962, 2963, 2964, 2965 and 2966
2961	Respirable Cristobalite on Filter Media, 5 µg	5 filters plus 5 blanks	Cristobalite 5 g
2962	Respirable Cristobalite on Filter Media, 10 µg	5 loaded plus 5 blanks	Cristobalite 10 g
2963	Respirable Cristobalite on Filter Media, 20 µg	5 loaded plus 5 blanks	Cristobalite 20 g
2964	Respirable Cristobalite on Filter Media, 50 µg	5 loaded plus 5 blanks	Cristobalite 50 g
2965	Respirable Cristobalite on Filter Media, 100 µg	5 loaded plus 5 blanks	Cristobalite 100 g
2966	Respirable Cristobalite on Filter Media, 250 µg	5 loaded plus 5 blanks	Cristobalite 250 g
2967	Respirable Cristobalite on Filter Media, 500 µg	5 loaded plus 5 blanks	Cristobalite 500 g
8785	Air Particulate Matter on Filter Media	3 filters	*Total Carbon,* (Elemental Carbon, Organic Carbon)
8786	Filter Blank for RM 8785	filter	(average Organic Carbon)

105.11 - Trace Constituent Elements in Blank Filters

SRMs 2678 and 2681 are for use in evaluating the performance of air sampling filter methods with two different filter types or sizes commonly used in air sampling of industrial atmospheres.

For both SRMs, either certified values (in mg), or limits of detection (XD), for each of 30 constituent elements as well as six leachable anions and cations are provided.

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

	2678	2681	
Description >>	Membrane Blank Filter	Ashless Blank Filter	
Unit of Issue >>	set (10)	set (10)	
Diameter (in mm)	47	42.5	
Elemental Composition	30 elements	30 elements	
Filter Weight (in g)	0.09	0.14	
Leachable Cations and Anions	6 cations	6 cations	
Pore Size (in um)	0.45		

105.12 - Respirable Materials

SRMs 1878a and 1879a are crystalline silica materials with particles in the respirable range. They are intended for use in determining, by x-ray diffraction, the levels of respirable silica in an industrial atmosphere according to National Institute for Occupational Safety and Health (NIOSH) Analytical Method 7500 or equivalent methods. NOTE: These SRMs are not certified for particle size.

Also, see Table 105.10 Respirable Materials on Filter Media

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

SRM	Description	Unit of Issue	Measurand(s)
1648a	Urban Particulate Matter	2 g	Certified: 24 elements Reference values: 8 elements
1649b	Urban Dust	2 g	Certified: 23 PAHs, 13 PCBs, 4 pesticides Reference values: 38 PAHs, 16 nitro-PAHs, 49 PCBs, 34 pesticides
1650b	Diesel Particulate Matter	200 mg	Certified: 30 PAHs, 6 nitro-PAHs Reference values: 45 PAHs, 16 nitro-PAHs
1877	Beryllium Oxide Powder	20 g	35.76 % beryllium
1878a	Respirable Alpha Quartz	5 g	93.7 % alpha quartz
1879a	Respirable Cristobalite	5 g	88.2 % cristobalite
1975	Diesel Particulate Extract	4 x 1.2 mL	Certified: 8 PAHs, 4 nitro-PAHs Reference values: 23 PAHs, 15 nitro-PAHs, mutagenicity, residue mass
2583	Trace Elements in Indoor Dust	8 g	Certified: 5 elements
2584	Trace Elements in Indoor Dust	8 g	Certified: 5 elements Reference values: 10 elements
2585	Organic Contaminants in House Dust	10 g	Certified: 33 PAHs, 30 PCBs, 4 pesticides, 15 PBDEs Reference values: 33 PAHs, 12 PCBs, 10 pesticides, 3 PBDEs
2786	Fine Particulate Matter (<4 µm)	1 bottle	Certified: 25 PAHs, 3 nitro-PAHs, 2 PBDE, 6 elements Reference values: 26 PAHs, 4 nitro-PAHs, 12 elements, 3 sugars, 5 PBDE, 12 dioxins, 15 furans
2787	Fine Particulate Matter (<10 µm)	1 bottle	Certified: 23 PAHs, 3 nitro-PAHs, 2 PBDE, 5 elements Reference Values: 27 PAHs, 3-nitro-PAHs, 5 PBDE, 13 elements, 3 sugars, 12 dioxins, 15 furans
2975	Diesel Particulate Matter	1 g	Certified: 11 PAHs Reference values: 28 PAHs, 17 nitro-PAHs, particle-size, total extractable mass

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

These SRMs and RM have been developed in conjunction with the U.S. EPA to monitor paint, soil, and dust sources of lead. SRMs 2570 through 2576 consist of one MylarTM sheet per unit. Each sheet, 7.6cm x 10.2cm, is coated with a single uniform paint layer for use with portable x-ray fluorescence analyzers. SRM 2579a consists of a set of six polyester sheets, one each of SRMs 2570 through 2575. SRMs 2580, 2581, 2582, and 2589 consist of paint that has been ground and homogenized into a powder, 99+% of which passes a 100 µm sieve. SRM 2583 and SRM 2584 consist of dust, 99+% of which passes a 100 µm sieve, that was collected in vacuum cleaner bags during cleaning of dwelling interiors. SRM 2583 and SRM 2584 are certified for arsenic, chromium, cadmium, lead, and mercury. [Also see Category 106.] SRMs 2584, 2586, and 2587 are dust or soil matrices containing lead from paint. RM 8680 consists of a 10.2 cm wide x 15.2 cm long x 1.3 cm thick section of painted fiberboard and is intended for use in the evaluation of destructive and nondestructive methods of measuring lead in paint on fiberboard.

For organic contaminants in indoor dust see SRM 2585. See Table 109.1

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

SRM	Description	Unit Size	Lead Concentration and Other Elements
1648a	Urban Particulate Matter	2 g	0.655 % Pb, 24 elements certified, *8 reference values*
2569	Lead Paint Films for Children's Products	8 sheets	3 levels Pb (mg/kg): <0.2, 85.0, 314.4 *3 reference values* for density of paint
2570	Lead Paint Film, White/Blank Nominal <0.001 mg/cm2	1 film	<0.001 mg/cm^2 Pb
2571	Lead Paint Film (Yellow), Nominal 3.5 mg/cm^2	1 + blank	3.58 mg/cm^2 Pb
2572	Lead Paint Film (Orange), Nominal 1.6 mg/cm^2	1 + blank	1.527 mg/cm^2 Pb
2573	Lead Paint Film (Red), Nominal 1.0 mg/cm^2	1 + blank	1.040 mg/cm^2 Pb
2574	Lead Paint Film (Gold), Nominal 0.7 mg/cm^2	1 + blank	0.714 mg/cm^2 Pb
2575	Lead Paint Film (Green), Nominal 0.3 mg/cm^2	1 + blank	0.307 mg/cm^2 Pb
2576	Lead Paint Film, High Level	1 + blank	5.59 mg/cm^2 Pb
2579a	Lead Paint Films for Portable XRF Analyzers	set (6)	0.307 to 3.58 mg/cm^2 Pb 5 levels plus blank
2580	Powdered Paint Nominal 4 % Lead	30 g	4.34 % Pb
2581	Powdered Paint Nominal 0.5 % Lead	35 g	0.449 % Pb
2582	Powdered Paint Nominal 200 mg/kg Lead	20 g	208.8 mg/kg Pb
2583	Trace Elements in Indoor Dust	8 g	85.9 mg/kg Pb, 5 elements certified
2584	Trace Elements in Indoor Dust	8 g	9761 mg/kg Pb, 5 elements certified, *10 reference values*
2586	Trace Elements in Soil (contains lead from paint)	55 g	432 mg/kg Pb, 4 elements certified, *18 reference values*
2587	Trace Elements in Soil (contains lead from paint)	55 g	3242 mg/kg Pb, 4 elements certified, *14 reference values*
2589	Powdered Paint Nominal 10 % Lead	35 g	9.99 % Pb
2783	Air Particulate on Filter Media	2 + 2 Blank (47 mm dia)	317 ng/filter Pb, 18 elements certified *9 reference values*
8680	Paint on Fiberboard	each	*individually value assigned*

Standard Reference Materials for Chemical Composition

106. Inorganics

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

Also see:
105.13 Lead in Paint, Dust, Soil
108.2 Metal Constituents in Fossil Fuels (liquid forms)
108.3 Sulfur and Mercury in Fossil Fuels
108.6 Fossil Fuel Trace Elements (solid forms)
110.1 Foods and Beverages
110.3 USA/Canada Collaborative Materials
111.2 Ores
111.4 Clay
111.5 Rocks and Minerals
111.7 Soils, Sediments, and Sludges

These SRMs and RM are for analysis of materials of health or environmental interest. [Also see Categories 105 and 111.]

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

SRM	Description	Unit Size	Elemental Composition
1640a	Trace Elements in Natural Water	1 bottle x 250 mL	22 elements certified *7 reference values* 1 element certified
1641d	Mercury In Water	10 x 10 mL	
1643e	Trace Elements in Water	250 mL	29 elements certified (1 information value) 20 elements certified
1646a	Estuarine Sediment	70 g	
1648a	Urban Particulate Matter	2 g	24 elements certified *8 reference values* (6 information values)
1944	New York/New Jersey Waterway Sediment	50 g	9 elements certified *20 reference values*
1946	Lake Superior Fish Tissue	5 x 7-9 grams	3 elements certified *9 reference values*
1947	Lake Michigan Fish Tissue	5 x 8 grams	8 elements certified
2385	Slurried Spinach	4 x 70 g	7 elements certified
2387	Peanut Butter	3 x 170 g	9 elements certified plus numerous non-elemental constituents
2451	Fine Carbon (Activated) - From Cyanide Ore Leaching	100 g	1 element certified (Hg) *1 reference value (Au)*

106.1 - Metal (Inorganics) Constituents in Natural Matrices (liquid and solid forms) (Cont.)

SRM	Description	Unit Size	Elemental Composition
2583	Trace Elements in Indoor Dust	8 g	5 elements certified
2584	Trace Elements in Indoor Dust	8 g	5 elements certified *10 reference values*
2586	Trace Elements in Soil (contains lead from paint)	55 g	4 elements certified *18 reference values*
2587	Trace Elements in Soil (contains lead from paint)	55 g	4 elements certified *14 reference values*
2702	Inorganics in Marine Sediment	50 g	25 elements certified 8 reference values
2703	Sediment for Solid Sampling (Small, Sample) Analytical Techniques	5 g	22 elements certified *7 reference values* (9 information values)
2709a	San Joaquin Soil	50 g	19 elements certified *15 reference values* (10 information values)
2710a	Montana I Soil	50 g	22 elements certified *13 reference values* (13 information values)
2711a	Montana II Soil	50 g	25 elements certified *8 reference values* (12 information values)
2780	Hard Rock Mine Waste	50 g	12 elements certified *7 reference values*
2781	Domestic Sludge	40 g	10 elements certified
2782	Industrial Sludge	70 g	10 elements certified *16 reference values*
2783	Air Particulate on Filter Media	2 + 2 Blank (47 mm dia)	18 elements certified; 9 ref values
2855	Additive Elements in Polyethylene	3 bottles	Level I (12 info values) Level II & III 7 cert values 1 ref value, (4 info values)
2976	Mussel Tissue (Trace Elements & Methylmercury) Freeze-dried	25 g	8 elements certified *20 reference values* (3 information values)
8704	Buffalo River Sediment	50 g	25 reference values
8785	Air Particulate Matter on Filter Media	3 filters	1 reference value
8786	Filter Blank for RM 8785	filter	(1 information value)

106.3 - Mercury in Activated Carbon

This SRM is for use in the evaluation of chemical methods of analysis and in the calibration of instrumental methods of analysis.

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

SRM	Description	Unit of Issue	Mercury (mg/kg)
2451	Fine Carbon (Activated) - From Cyanide Ore Leaching	100 g	688

106.4 - Environmental Matrices with Carbon Values

These materials are intended for use in evaluating analytical methods used to measure carbon; SRM 1216 is intended for the calibration of instruments, used to measure total carbon. Also see:

Table 104.4 Microchemistry (powder form)
Table 104.10 Light Stable Isotopic Materials (gas, liquid and solid forms)
Table 107.1 Primary Gas Mixtures

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

SRM	Description	Unit of Issue	Carbon (mass fraction, in %)
1216	Carbon Modified Silica	3 x 1 g	3 Levels: 0.70, 9.06, 17.04
1632d	Trace Elements in Coal, (Bituminous)	50 g	*76.88*
1944	New York/New Jersey Waterway Sediment	50 g	*4.4l(TOC)*
2718	Green Petroleum Coke	50 g	*88.99*
2719	Calcined Petroleum Coke	50 g	*97.06*
2775	Foundry Coke	50 g	*91.34*
2776	Furnace Coke	50 g	*89.15*
8704	Buffalo River Sediment	50 g	*3.351*
8785	Air Particulate Matter on Filter Media	3 filters	*22.3*
8786	Filter Blank for RM 8785	filter	*3.3 g/cm2*

106.6 - Used Auto Catalysts (powder form)

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

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

	2556	**2557**		
Description >>	Recycled Pellet (Autocatalyst)	Recycled Monolith (Autocatalyst)		
Unit of Issue >>	70 g	70 g		
Elemental Composition (in mg/kg)				
Lead	6228	13931		
Palladium	326.0	233.2		
Platinum	697.4	1131		
Rhodium	51.2	135.1		

106.7 - Zeolites (powder form)

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

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

	8850	8851	8852	
Description >>	Zeolite Y	Zeolite A	Ammonium ZSM-5 Zeolite	
Unit of Issue >>	35-40 g	35-40 g	35-40 g	
Major Components of Zeolite RMs (mass fractions are given in %)				
Aluminum	*8.49*	*14.766*	*1.396*	
LOF	*25.37*	*22.1*	*8.47*	
LOI	*25.679*	*21.464*	*8.5*	
Si*	*22.52*	*15.27*	*41.18*	
Si**	*30.336*	*19.541*	*45.19*	
Sodium	*7.225*	*12.732*		

*Value relative to the hydrated sample mass.

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

Standard Reference Materials for Chemical Composition

107. Primary Gas Mixtures

107.1 - Primary Gas Mixtures

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

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

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

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

SRM	Description	Unit of Issue	Certified Component	Nominal Amount-of-Substance Fraction
1658a	Methane in Air (Nominal 1 µmol/mol)	cylinder	1 µmol/mol	CH_4
1659a	Methane in Air (Nominal 10 µmol/mol)	cylinder	CH_4	10 µmol/mol
1660a	Methane and Propane in Air (Nominal: Methane 4 µmol/mol; Propane 1 µmol/mol)	cylinder	CH_4:C_3H_8	4:1 µmol/mol
1661a*	Sulfur Dioxide in Nitrogen (Nominal 500 µmol/mol)	cylinder	SO_2	500 µmol/mol
1662a*	Sulfur Dioxide in Nitrogen (Nominal 1000 µmol/mol)	cylinder	SO_2	1000 µmol/mol
1663a*	Sulfur Dioxide in Nitrogen (Nominal 1500 µmol/mol)	cylinder	SO_2	1500 µmol/mol
1664a*	Sulfur Dioxide in Nitrogen (Nominal 2500 µmol/mol)	cylinder	SO_2	2500 µmol/mol
1665b	Propane in Air (Nominal 3 µmol/mol)	cylinder	C_3H_8	3 µmol/mol
1666b	Propane in Air (Nominal 10 µmol/mol)	cylinder	C_3H_8	10 µmol/mol
1667b	Propane in Air (Nominal 50 µmol/mol)	cylinder	C_3H_8	50 µmol/mol
1668b*	Propane in Air (Nominal 100 µmol/mol)	cylinder	C_3H_8	100 µmol/mol
1669b	Propane in Air (Nominal 500 µmol/mol)	cylinder	C_3H_8	500 µmol/mol
1674b*	Carbon Dioxide in Nitrogen (Nominal 7 % mol/mol)	cylinder	CO_2	7 % mol/mol
1677c*	Carbon Monoxide in Nitrogen (Nominal 10 µmol/mol)	cylinder	CO	10 µmol/mol
1678c*	Carbon Monoxide in Nitrogen (Nominal 50 µmol/mol)	cylinder	CO	50 µmol/mol
1679c*	Carbon Monoxide in Nitrogen (Nominal 100 µmol/mol)	cylinder	CO	100 µmol/mol
1680b*	Carbon Monoxide in Nitrogen (Nominal 500 µmol/mol)	cylinder	CO	500 µmol/mol

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

107.1 - Primary Gas Mixtures (Cont.)

SRM	Description	Unit of Issue	Certified Component	Nominal Amount-of-Substance Fraction
1681b*	Carbon Monoxide in Nitrogen (Nominal 1000 µmol/mol)	cylinder	CO	1000 µmol/mol
1683b*	Nitric Oxide in Nitrogen (Nominal 50 µmol/mol)	cylinder	NO	50 µmol/mol
1684b*	Nitric Oxide in Nitrogen (Nominal 100 µmol/mol)	cylinder	NO	100 µmol/mol
1685b*	Nitric Oxide in Nitrogen (Nominal 250 µmol/mol)	cylinder	NO	250 µmol/mol
1686b*	Nitric Oxide in Nitrogen (Nominal 500 µmol/mol)	cylinder	NO	500 µmol/mol
1687b*	Nitric Oxide in Nitrogen (Nominal 1000 µmol/mol)	cylinder	NO	1000 µmol/mol
1689	Sulfur Dioxide in Nitrogen	cylinder	SO_2	5 µmol/mol
1693a*	Sulfur Dioxide in Nitrogen (Nominal 50 µmol/mol)	cylinder	SO_2	50 µmol/mol
1694a*	Sulfur Dioxide in Nitrogen (Nominal 100 µmol/mol)	cylinder	SO_2	100 µmol/mol
1696a*	Sulfur Dioxide in Nitrogen (Nominal 3500 µmol/mol)	cylinder	SO_2	3500 µmol/mol
1800b	Eighteen Non-Methane Hydrocarbon Compounds in Nitrogen (Nominal 5 nmol/mol)	6 L Water Volume Cyl	(Eighteen components in small cylinder)	5 nmol/mol
1804c	Toxic Volatile Organic Compounds in Nitrogen (Nominal 5.0 nmol/mol)	cylinder	(Thirty components)	5 nmol/mol
2612a	Carbon Monoxide in Air (Nominal 10 µmol/mol)	cylinder	CO	10 µmol/mol
2613a	Carbon Monoxide in Air (Nominal 20 µmol/mol)	cylinder	CO	20 µmol/mol
2614a	Carbon Monoxide in Air (Nominal 42 µmol/mol)	cylinder	CO	42 µmol/mol
2617	Carbon Dioxide in Nitrogen (Nominal 500 µmol/mol)	cylinder	CO_2	500 µmol/mol
2619a	Carbon Dioxide in Nitrogen (Nominal 0.5 % mol/mol)	cylinder	CO_2	0.5 % mol/mol
2620a	Carbon Dioxide in Nitrogen (Nominal 1.0 % mol/mol)	cylinder	CO_2	1.0 % mol/mol
2621a	Carbon Dioxide in Nitrogen (Nominal 1.5 % mol/mol)	cylinder	CO_2	1.5 % mol/mol
2622a	Carbon Dioxide in Nitrogen (Nominal 2.0 % mol/mol)	cylinder	CO_2	2.0 % mol/mol
2623a	Carbon Dioxide in Nitrogen (Nominal 2.5 % mol/mol)	cylinder	CO_2	2.5 % mol/mol
2624a	Carbon Dioxide in Nitrogen (Nominal 3.0 % mol/mol)	cylinder	CO_2	3.0 % mol/mol
2625a*	Carbon Dioxide in Nitrogen (Nominal 3.5 % mol/mol)	cylinder	CO_2	3.5 % mol/mol
2627a	Nitric Oxide in Nitrogen (Nominal 5 µmol/mol)	cylinder	NO	5 µmol/mol
2628a	Nitric Oxide in Nitrogen (Nominal 10 µmol/mol)	cylinder	NO	10 µmol/mol
2629a*	Nitric Oxide in Nitrogen (Nominal 20 µmol/mol)	each	NO	20 µmol/mol
2630*	Nitric Oxide in Nitrogen (Nominal 1500 µmol/mol)	each	NO	1500 µmol/mol
2631a*	Nitric Oxide in Nitrogen (Nominal 3000 µmol/mol)	cylinder	NO	3000 µmol/mol
2635a*	Carbon Monoxide in Nitrogen (Nominal 25 µmol/mol)	cylinder	CO	
2636a*	Carbon Monoxide in Nitrogen (Nominal 250 µmol/mol)	cylinder	CO	250 µmol/mol

107.1 - Primary Gas Mixtures (Cont.)

SRM	Description	Unit of Issue	Certified Component	Nominal Amount-of-Substance Fraction
2637a*	Carbon Monoxide in Nitrogen (Nominal 2500 µmol/mol)	cylinder	CO	2500 µmol/mol
2638a*	Carbon Monoxide in Nitrogen (Nominal 5000 µmol/mol)	cylinder	CO	5000 µmol/mol
2639a	Carbon Monoxide in Nitrogen (Nominal 1 % mol/mol)	cylinder	CO	1 % mol/mol
2640a	Carbon Monoxide in Nitrogen (Nominal 2 % mol/mol)	cylinder	CO	2 % mol/mol
2641a	Carbon Monoxide in Nitrogen (Nominal 4 % mol/mol)	cylinder	CO	4 % mol/mol
2642a*	Carbon Monoxide in Nitrogen (Nominal 8 % mol/mol)	cylinder	CO	8 % mol/mol
2644a	Propane in Nitrogen (Nominal 250 µmol/mol)	cylinder	C_3H_8	250 µmol/mol
2646a	Propane in Nitrogen (Nominal 1000 µmol/mol)	cylinder	C_3H_8	1000 µmol/mol
2647a	Propane in Nitrogen (Nominal 2500 µmol/mol)	cylinder	C_3H_8	2500 µmol/mol
2657a*	Oxygen in Nitrogen (Nominal 2 % mol/mol)	cylinder	O_2	2 % mol/mol
2658a*	Oxygen in Nitrogen (Nominal 10 % mol/mol)	cylinder	O_2	10 % mol/mol
2659a*	Oxygen in Nitrogen (Nominal 21 % mol/mol)	cylinder	O_2	21 % mol/mol
2660a*	Total Oxides of Nitrogen (NOx) in Air (Nominal 100 µmol/mol)	cylinder	NO_x	100 µmol/mol
2730	Hydrogen Sulfide in Nitrogen (Nominal 5 µmol/mol)	cylinder	H_2S	5 µmol/mol
2731	Hydrogen Sulfide in Nitrogen (Nominal 20 µmol/mol)	cylinder	H_2S	20 µmol/mol
2735	Nitric Oxide in Nitrogen (Nominal 800 µmol/mol)	cylinder	NO	800 µmol/mol
2737	Nitric Oxide in Nitrogen (500 nmol/mol)	cylinder	NO	500 nmol/mol
2738	Nitric Oxide in Nitrogen (Nominal 1000 nmol/mol)	cylinder	NO	1000 nmol/mol
2740a	Carbon Monoxide in Nitrogen (Nominal 10 % mol/mol)	cylinder	CO	10 % mol/mol
2741a	Carbon Monoxide in Nitrogen (Nominal 13 % mol/mol)	cylinder	CO	13 % mol/mol
2745*	Carbon Dioxide in Nitrogen (Nominal 16 % mol/mol)	cylinder	CO_2	16 % mol/mol
2750	Methane in Air (Nominal 50 µmol/mol)	cylinder	CH_4	50 µmol/mol
2751	Methane in Air (Nominal 100 µmol/mol)	cylinder	CH_4	100 µmol/mol
2764	Propane in Air (Nominal 0.25 µmol/mol)	cylinder	C_3H_8	0.25 µmol/mol
2765	Propane in Air (Nominal 100 nmol/mol)	cylinder	C_3H_8	100 nmol/mol

Those SRMs that are marked "*" are available as NTRMs from commercial suppliers.

Standard Reference Materials for Chemical Composition

108. Fossil and Alternative Fuels

108.1 - Alcohols and Ethers [Oxygenates] in Gasoline

SRMs 1829, 1837, 1838, and 1839 are for calibrating instruments and validating methods used to determine various alcohols in gasoline. SRM 1829 is issued as a set of six sealed 20mL ampoules; SRMs 1837, 1838 and 1839 are each issued as a set of five sealed 20mL ampoules.

SRMs 2286 through 2297 were produced in response to the U.S. EPA Final Rule on Reformulated Gasoline aimed at reducing the volatile organic compounds emitted from gasoline. They consist of varying quantities of alcohol and ether (oxygenate) solutions in gasoline. SRMs 2286 through 2293 are certified for constituent oxygenate concentration and resultant oxygen concentration in gasoline. Each SRM unit is issued as a set of three sealed 20 mL ampoules two ampoules contain oxygenate and one ampoule contains base reference gasoline. SRMs 2294 through 2297 are certified for oxygenate, sulfur, benzene, and toluene, with reference values for olefins and aromatics. Each SRM unit is issued as a set of two sealed 20mL ampoules.

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

			Concentration (mass fraction, in %)							
SRM	**Description**	**Unit of Issue**	**Benzene**	**Ethanol**	**Methanol**	**Methanol and t-Butanol**	**Oxygen**	**Oxygenate**	**Sulfur**	**Toulene**
1829	Alcohols in Reference Fuels	set (6)		11.39	0.335	10.33 + 6.63				
1837	Methanol and Butanol (in Gasoline)	5 x 20 mL				10.33 + 6.63				
1838	Ethanol (in Gasoline)	5 x 20 mL		11.39						
1839	Methanol (in Gasoline)	5 x 20 mL			0.335					
2286	Ethanol (in Gasoline)	set (3)		5.73			2.02			
2287	Ethanol (in Gasoline)	set (3)		10.07			3.53			
2288	t-Amyl-methyl Ether (in Gasoline)	set (3)					2.02	12.78		
2289	t-Amyl-methyl Ether (in Gasoline)	set (3)					2.73	17.30		
2290	Ethyl-t-butyl Ether (in Gasoline)	set (3)					2.01	12.78		
2291	Ethyl-t-butyl Ether (in Gasoline)	set (3)					2.70	17.18		
2293	Methyl-t-butyl Ethyl (in Gasoline)	set (3)					2.71	14.86		
2294	Reformulated Gasoline (nominal 11% MTBE)	2 x 20 mL	1.03				*2.01*	10.97	0.00409	8.29
2295	Reformulated Gasoline (nominal 15% MTBE)	2 x 20 mL	0.99				*2.66*	14.54	0.0308	7.89
2296	Reformulated Gasoline (nominal 13% ETBE)	2 x 20 mL	1.0				*2.06*	13.02	0.0040	8.02
2297	Reformulated Gasoline (nominal 10% Ethanol)	2 x 20 mL	1.04	9.91			*3.50*		0.03037	8.27

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

108.2 - Metal Constituents in Fossil Fuels (liquid forms)

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

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

			Elemental Composition (concentrations are in mass fractions, in mg/kg, unless noted as %)					
SRM	**Description**	**Unit of Issue**	**Arsenic**	**Cobalt**	**Nickel**	**Selenium**	**Sulfur**	**Vanadium**
1634c	Trace Elements in Fuel Oil	100 mL	0.1426	0.1510	17.54	0.1020	(2 %)	28.19
8505	Vanadium in Crude Oil	250 mL						*390**

108.3 - Sulfur, Mercury, and Chlorine in Fuels (liquid and solid forms)

These materials are for analysis of sulfur, mercury, and chlorine in fossil fuels.For further information see: SP 260-84, and SP 260-167

See other related links:

Table 106.3 Mercury in Activated Carbon
Table 108.1 Alcohols and Ethers [Oxygenates] in Gasoline
Table 108.2 Metal Constituents in Fossil Fuels (liquid forms)
Table 108.6 Fossil Fuel Trace Elements (solid forms)
Table 114.2 Lubricating Base Oils

Determination of Sulfur in Biodiesel and Petroleum Diesel by X-ray Fluorescence (XRF) Using the Gravimetric Standard Addition

Concept & Theory:
A Method for the Preparation of NIST Traceable Fossil Fuel Standards with Concentrations Intermediate to SRM Values

Demonstration Videos:
Preparation of Powdered Coal and Coke SRM Blends
Preparation of Middle Distillate SRM Blends

Ir QC Test & Detailed Example:
A Statistic that Identifies Errant Standard Preparation and Instrument Nonlinearity Demonstrated with Mercury Standards Prepared by Blending NIST Fossil Fuel CRMs of Similar Matrices.

Downloadable Spreadsheet:
Software Package To Facilitate the Preparation of Intermediate-Range Fossil Fuel Standards from Certified Reference Materials

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

SRM	Description	Unit of Issue		
1616b	Sulfur in Kerosene (Low Level)	100 mL		
1617a	Sulfur in Kerosine (High Level)	100 mL		
1619b	Sulfur in Residual Fuel Oil (0.7 %)	100 mL		
1620c	Sulfur in Residual Fuel Oil (4 %)	100 mL		
1621e	Sulfur in Residual Fuel Oil (1 %)	100 mL		
1622e	Sulfur in Residual Fuel Oil (2 %)	100 mL		
1623c	Sulfur in Residual Fuel Oil 0.3 %	100 mL		
1624d	Sulfur in Diesel Fuel Oil, 0.4 %	100 mL		
1632d	Trace Elements in Coal, (Bituminous)	50 g		
1635a	Trace Elements in Coal, (Subbitumimous)	50 g		
2294	Reformulated Gasoline (nominal 11 % MTBE)	2 x 20 mL		
2295	Reformulated Gasoline (nominal 15 % MTBE)	2 x 20 mL		

108.3 - Sulfur, Mercury, and Chlorine in Fuels (liquid and solid forms) (Cont.)

SRM	Description	Unit of Issue		
2296	Reformulated Gasoline (nominal 13 % ETBE)	2 x 20 mL		
2297	Reformulated Gasoline (nominal 10 % Ethanol)	2 x 20 mL		
2298	Sulfur in Gasoline (High-Octane)	5 x 20 mL		
2299	Sulfur in Gasoline (Reformulated)	5 x 20 mL		
2682b	Subbituminous Coal (Sulfur, Mercury, and Chlorine)	50 g		
2683c	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g		
2684b	Bituminous Coal (Sulfur and Mercury)	50 g		
2685b	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g		
2693	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g		
2716	Sulfur in Gasoline (<1 mg/kg)	5 ampoules x 20 mL		
2717a	Sulfur in Residual Fuel Oil (3 %)	100 mL		
2718	Green Petroleum Coke	50 g		
2719	Calcined Petroleum Coke	50 g		
2720	Sulfur in Di-n-Butyl Sulfide	5 x 4.5 mL		
2721	Crude Oil (Light -Sour)	5 x 10 mL		
2722	Crude Oil (Heavy Sweet)	5 x 10 mL		
2723a	Sulfur in Diesel Fuel Oil	10 x 10 mL		
2770	Sulfur in Diesel Fuel Oil (40 mg/kg)	10 x 10 mL		
2771	Sulfur in Diesel Fuel Blend Stock	1 bottle x 100 mL		
2773	B100 Biodiesel (Animal-Based)	5 ampoules x 10 mL each		
2775	Foundry Coke	50 g		
2776	Furnace Coke	50 g		

108.3(1) - Crude Oil

SRM	Description	Unit Size	Mercury in µg/kg	Sulfur in %	Water in mg/kg
2721	Crude Oil (Light -Sour)	5 x 10 mL	0.0417	1.5832	*134*
2722	Crude Oil (Heavy Sweet)	5 x 10 mL	0.1292	0.21037	*99*

108.3(2) - Gasoline

SRM	Description	Unit Size	Sulfur in mg/kg		
2294	Reformulated Gasoline (nominal 11 % MTBE)	2 x 20 mL	40.9		
2295	Reformulated Gasoline (nominal 15 % MTBE)	2 x 20 mL	3080		
2296	Reformulated Gasoline (nominal 13 % ETBE)	2 x 20 mL	40.0		
2297	Reformulated Gasoline (nominal 10 % Ethanol)	2 x 20 mL	303.7		
2298	Sulfur in Gasoline (High-Octane)	5 x 20 mL	4.7		
2299	Sulfur in Gasoline (Reformulated)	5 x 20 mL	13.8		
2716	Sulfur in Gasoline (<1 mg/kg)	5 ampoules x 20 mL	0.44		

108.3(3) - Middle Distillates

SRM	Description	Unit Size	Mercury in µg/g	Sulfur in mg/kg	
1616b	Sulfur in Kerosene (Low Level)	100 mL		8.41	
1617a	Sulfur in Kerosine (High Level)	100 mL		1730.7	
1624d	Sulfur in Diesel Fuel Oil, 0.4 %	100 mL		3882	
2723a	Sulfur in Diesel Fuel Oil	10 x 10 mL		10.90	
2770	Sulfur in Diesel Fuel Oil (40 mg/kg)	10 x 10 mL		41.57	
2771	Sulfur in Diesel Fuel Blend Stock	1 bottle x 100 mL		0.102	

108.3(4) - Biodiesel B100

SRM	Description	Unit Size	Sulfur in mg/kg		
2773	B100 Biodiesel (Animal-Based)	5 ampoules x 10 mL each	7.39		

108.3(5) - Di-n-Butyl Sulfide

SRM	Description	Unit Size	Sulfur in %		
2720	Sulfur in Di-n-Butyl Sulfide	5 x 4.5 mL	21.91		

108.3(6) - Residual Fuel Oil

SRM	Description	Unit Size	Heat of Combustion (in MJ/kg)*	Mercury in ng/g	Sulfur in %
1619b	Sulfur in Residual Fuel Oil (0.7 %)	100 mL		3.46	0.6960
1620c	Sulfur in Residual Fuel Oil (4 %)	100 mL	(41.46)		4.561
1621e	Sulfur in Residual Fuel Oil (1 %)	100 mL			0.9480
1622e	Sulfur in Residual Fuel Oil (2 %)	100 mL			2.1468
1623c	Sulfur in Residual Fuel Oil 0.3 %	100 mL			0.3806
2717a	Sulfur in Residual Fuel Oil (3 %)	100 mL	(42.29)		2.9957

108.3(7) - Petroleum Coke

SRM	Description	Unit Size	Aluminum Al in mg/kg	Calcium Ca in mg/kg	Carbon C in %	Cobalt Co in mg/kg	Furnash Ash in %	Heat of Combustion (in MJ/kg)*	Hydrogen H in %	Iron Fe in mg/kg	Nickel Ni in mg/kg	Nitrogen N in %	Silicon Si in mg/kg	Sodium Na in mg/kg	Sulfur in %	Vanadium V in mg/kg	Volatile Matter %
2718	Green Petroleum Coke	50 g	16.5	174	*88.99*	*5.79*	(0.18)	(35.76)	*3.47*	290	139.1	*1.23*	(63.00)	*88.6*	4.7030	302	(10.6)
2719	Calcined Petroleum Coke	50 g	58.9	57.7	*97.06*	*18.6*	(0.12)	(32.90)	*0.16*	201.6	204	*1.17*	(138)	*15.1*	0.8877	58.6	(0.54)

108.3(8) - Subbituminous Coal

SRM	Description	Unit Size	Chlorine in mg/kg	Furnace Ash in %	Heat of Combustion (in MJ/kg)*	Mercury in ug/kg	Sulfur in %
1635a	Trace Elements in Coal, (Subbitumimous)	50 g		(6.29)		83.6	
2682b	Subbituminous Coal (Sulfur, Mercury, and Chlorine)	50 g	*16.1*	*6.32*	*25.66*	108.8	0.4917

108.3(9) - Bituminous Coal

SRM	Description	Unit Size	Chlorine in mg/kg	Furnace Ash in %	Heat of Combustion (in MJ/kg)*	Mercury in ug/kg	Sulfur in %	Volatile Matter %
1632d	Trace Elements in Coal, (Bituminous)	50 g	1142	(7.08)	(32.15)	92.8	1.462	
2683c	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g	*1127*	9.870	(30.24)	90.0	1.955	
2684b	Bituminous Coal (Sulfur and Mercury)	50 g	1142	*10.85*	*28.56*	97.4	3.076	
2685b	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g	517	*15.94*	*26.94*	146.2	4.730	
2692c	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g	*1338*	*7.499*		179.0	1.064	
2693	Bituminous Coal (Sulfur, Mercury, and Chlorine)	50 g	369.6	*9.4*		37.3	0.4571	

108.3(10) - Metallurgical Coke

SRM	Description	Unit Size	Carbon C in %	Furnace Ash in %	Hydrogen H in %	Nitrogen N in %	Sulfur in %	Volatile Matter %
2775	Foundry Coke	50 g	*91.34*	*5.77*	*0.41*	*1.16*	0.5816	*1.31*
2776	Furnace Coke	50 g	*89.15*	*8.06*	*0.26*	*1.21*	0.825	*0.98*

* Gross Calorific Value or HHV (Higher Heating Value)

108.4 - Moisture in Oils and Alcohols (liquid form)

SRM 2890, Water Saturated 1-Octanol, is certified for water content and is intended for use in calibrating instruments and validating the accuracy of analytical methods. Water concentration values, for RMs 8506a, 8509, and 8510 are not certified, but represent the “best estimate” of the moisture content determined by NIST, and are intended for use in developing and validating methods for the determination of moisture in oil and similar matrices.

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

	2721	**2722**	**2890**	**8506a**	**8509**	**8510**
Description >>	Crude Oil (Light -Sour)	Crude Oil (Heavy Sweet)	Water Saturated 1-Octanol	Moisture in Transformer Oil	Moisture in Methanol, 93 mg/kg	Moisture in Methanol, 325 mg/kg
Unit of Issue >>	5 x 10 mL	5 x 10 mL	5 x 2 mL	5 x 9.5mL	set (5)	set (5)
Water Concentration	*134 mg/kg*	*99 mg/kg*	47.3 mg/g	*34.5 mg/kg (Volumetric)* *22.5 mg/kg (Coulometric)*	*93 mg/kg*	*325 mg/kg*

108.5 - Reference Liquids for Evaluating Fuels

SRMs 1815a and 1816a are high purity liquids intended for use in maintaining the integrity of the octane rating of motor and aviation fuels as specified in the ASTM Manual for Rating Motor, Diesel, and Aviation Fuels.

The conversion from SRM 2037 Solvent Red Dye 24 to Solvent Red Dye 26 is provided in the SRM 2037 article (pages 3 & 4) of the June 2005 SRM Spotlight.

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

SRM	**Description**	**Unit of Issue**	**Purity (mass fraction, in %)**			
1815a	n-Heptane (Fuel Rating)	100 mL	99.987			
1816a	Isooctane (Fuel Rating)	100 mL	99.987			
2037	Solvent Red 24 Diesel Fuel Dye	100 mg powder	98.0			

108.6 - Fossil Fuel: Trace Elements (solid forms)

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

	1632d	1633c	1635a	2689	2690	2691	2718	2719
Description >>	Trace Elements in Coal, (Bituminous)	Trace Elements in Coal Fly Ash	Trace Elements in Coal, (Subbitumimous)	Coal Fly Ash	Coal Fly Ash	Coal Fly Ash	Green Petroleum Coke	Calcined Petroleum Coke
Unit of Issue >>	50 g	75 g	50 g	set (3)	set (3)	set (3)	50 g	50 g
Elemental Composition as mass fraction in mg/kg (ppm) unless noted by an asterisk * for %								
Aluminum	*0.912**	13.28	*0.5437**	12.94*	12.35*	9.81*	16.5	58.9
Antimony	0.445	8.56	0.251	(9)	(6)	(3)		
Arsenic	*6.1*	186.2	0.860	(200)	(26)	(30)		
Barium	40.42	0.1126*	0.03578*	(800)	(5800)	(5900)		
Beryllium		(16)		(21)	(8)	(8)		
Boron	*62*		*36.0*					
Bromine		(2.9)	(1)					
Cadmium	*0.08*	0.758	*0.282*					
Calcium	*0.144**	1.365*	*1.087**	2.18*	5.71*	18.45*	174	57.7
Carbon	*76.88*						(89.0*)	(97.1*)
Cerium	*11.7*	(180)	*5.45*					
Cesium	*0.598*	*9.39*	*0.0998*	(11)	(8)	(1)		
Chlorine	1142							
Chromium	*13.7*	258	3.56	(170)	(67)	(68)		
Cobalt	3.424	42.9	2.004	(48)	(19)	(26)	*5.79*	*18.6*
Copper	5.83	173.7	11.42					
Dysprosium	(0.9)	18.70						
Europium	*0.217*	*4.67*	*0.1115*	(3)	(2)	(2)		
Furnace Ash in %			(6.29)					
Gallium		(55)						
Germanium		(13)						
Hafnium	(0.5)	(6.0)	*3.14*	(7)	(8)	(10)		
Holmium		(0.14)						
Hydrogen	5.10*	10.49*	*3.92**				(3.47*)	(0.17*)
Indium		(0.14)						
Iron	0.749*	10.49*	0.2472*	9.32*	3.57*	4.42*	290	201.6
Lanthanum	(6)	*87.0*						
Lead	3.845	95.2	2.85	(52)	(39)	(29)		
Lutetium		*1.32*						
Magnesium	390	0.498*	0.2303*	0.61*	1.53*	3.12*		

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

108.6 - Fossil Fuel: Trace Elements (solid forms) (Cont.)

	1632d	1633c	1635a	2689	2690	2691	2718	2719
Description >>	Trace Elements in Coal, (Bituminous)	Trace Elements in Coal Fly Ash	Trace Elements in Coal, (Subbitumimous)	Coal Fly Ash	Coal Fly Ash	Coal Fly Ash	Green Petroleum Coke	Calcined Petroleum Coke
Unit of Issue >>	50 g	75 g	50 g	set (3)	set (3)	set (3)	50 g	50 g
Elemental Composition as mass fraction in mg/kg (ppm) unless noted by an asterisk * for %								
Magnesium	*390*	0.498*	*0.2303**	0.61*	1.53*	3.12*		
Manganese	13.1	240.2	6.69	(300)	(300)	(200)		
Mercury	0.0928	1.005	0.0836	(0.018)	(0.0005)	0.0578		
Molybdenum			*6.36*					
Neodymium		(87)						
Nickel	(10)	132	5.37	(122)	(46)	(53)	139.1	204
Nitrogen	*1.59**	*0.192*					(1.23*)	(1.17*)
Phosphorus		*0.192**		0.10*	0.52*	0.51*		
Potassium	1094	1.773*	*0.01874**	2.20*	1.04*	0.34*		
Rubidium	7.36	117.42	1.226					
Samarium	(1)	(19)	*0.483*					
Scandium	*2.89*	*37.6*	*1.240*	(32)	(17)	(24)		
Selenium	*1.29*	*13.9*	0.662	(7)	(0.8)	(17)		
Silicon	*1.65**	*21.30**		24.06*	25.85*	16.83*	(63)	(138)
Sodium	296.9	0.1707*	01031*	0.25*	o.24*	1.09*	*88.6*	*15.1*
Strontium	63.5	901	0.0160*	(700)	(2000)	(2700)		
Sulfur	1.462*	*0.118**			0.15*	0.83*	4.7032*	0.8877*
Tantalum		*1.58*						
Terbium		*3.12*						
Thorium	1.428	*23.0*	1.299	(25)	(25)	(26)		
Tin		0.724*						
Titanium	477	0.724*	*0.05240**	0.75*	0.52*	0.90*		
Uranium	0.517	*9.25*	0.4792					
Vanadium	23.74	286.2	13.34				302	58.6
Yttrium		(7.7)						
Zinc	*12.9*	*235*	*7.3*	(240)	(120)	(120)		

108.8 - Biofuels

For related materials see: Table 108.9 Bio Mass Feedstock

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

SRM	Description	Unit of Issue
2377	Fatty Acid Methyl Esters in 2,2,4-Trimethylpentane	5 x 1.2 mL ampoules
2772	B100 Biodiesel (Soy-Based)	5 ampoules x 10 mL each
2773	B100 Biodiesel (Animal-Based)	5 ampoules x 10 mL each

108.9 - Biomass Feedstock

For related materials see: See Table 108.8 Biofuels

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

SRM	Description	Unit Size		
8491	Sugarcane Bagasse Whole Biomass Feedstock	50 g		
8492	Eastern Cottonwood Whole Biomass Feedstock	50 g		
8493	Monterey Pine Whole Biomass Feedstock	50 g		
8494	Wheat Straw Whole Biomass Feedstock	50 g		
8495	Northern Softwood	10 sheets		
8496	Eucalyptus Hardwood	10 sheets		

108.9(1) - Biomass Feedstock

RMs 8491, 8492, 8493, and 8494 are for use in evaluating the composition of lignocellulosic materials.

SRM	Description	Unit Size	95 % Ethanol Extractives	Acetyl	Acid-Insoluble Residue	Acid-Soluble Lignin	Arabinan	Extractives-Free Ash	Galactan	Glucan
8491	Sugarcane Bagasse Whole Biomass Feedstock	50 g	*1.79 %*	*3.19 %*	*20.9 %*	*2.4 %*	*1.49 %*	*3.45 %*	*0.28 %*	*40.5 %*
8492	Eastern Cottonwood Whole Biomass Feedstock	50 g	*1.54 %*	*3.3 %*	*24 %*	*2.2 %*	*0.35 %*	*0.741 %*	*0.55 %*	*44.6 %*
8493	Monterey Pine Whole Biomass Feedstock	50 g	*1.44 %*	*1.4 %*	*25.6 %*	*1.4 %*	*1.09 %*	*0.17 %*	*1.89 %*	*43.7 %*
8494	Wheat Straw Whole Biomass Feedstock	50 g	*2.01 %*	*2.04 %*	*15 %*	*2.7 %*	*2.24 %*	*6.46 %*	*0.62 %*	*33.61 %*

108.9(1) - Biomass Feedstock (Cont.)

RMs 8491, 8492, 8493, and 8494 are for use in evaluating the composition of lignocellulosic materials.

SRM	Description	Unit Size	Mannan	Nitrogen	Structural Sugars	Sucrose	Total Component Closure	Total Lignin	Water Extractives	Whole Ash	Xylan
8491	Sugarcane Bagasse Whole Biomass Feedstock	50 g	*0 %*	*0.21 %*	*65.56 %*	*0.1 %*	*102.4 %*	*24.4 %*	*4.1 %*	*3.84 %*	*22.04 %*
8492	Eastern Cottonwood Whole Biomass Feedstock	50 g	*2.16 %*	*0.17 %*	*61 %*	*0.045 %*	*99.4 %*	*27.2 %*	*2.9 %*	*0.96 %*	*13.39 %*
8493	Monterey Pine Whole Biomass Feedstock	50 g	*10.31 %*	*0.16 %*	*62.8 %*	*0.03 %*	*100.2 %*	*28.2 %*	*3.68 %*	*0.27 %*	*5.94 %*
8494	Wheat Straw Whole Biomass Feedstock	50 g	*0 %*	*0.54 %*	*56.3 %*	*1.35 %*	*100.9 %*	*18.1 %*	*15.1 %*	*9.91 %*	*19.3 %*

108.9(2) - Biomass Feedstock

RM 8495 and 8496 are for use in studies of the properties of fibers and paper sheets. Each RM is characterized for selected pulp characteristics (Lap Sheet, Handsheet, Fiber Analysis, Fines, and Chemical composition, PFI Beating curve and Tappi standard). See Report of Investigation.

SRM	Description	Unit Size			
8495	Northern Softwood	10 sheets			
8496	Eucalyptus Hardwood	10 sheets			

Standard Reference Materials for Engineering Materials

109. Organics

109.1 - Organics

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

SRM	Description	Unit of Issue	dioxins/ furans	elements	fatty acids	matrix	Me-Hg	misc	nitro-PAHs	PAHs	PBDEs	PCBs	pesticides	solution	sugars
869b	Column Selectivity Test Mixture for Liquid Chromatography	5 x 1.1 mL												X	
870	Column Performance Test Mixture of Liquid Chromatography	5 x 1.1 mL						X						X	
1491a	Methyl-Substituted Polycyclic Aromatic Hydrocarbons in Toluene	5 x 1.2 mL								X				X	
1492	Chlorinated Pesticides/Hexane	5 x 1.2 mL											X	X	
1493	PCB Congeners	5 x 1.2 mL										X		X	
1494	Aliphatic Hydrocarbons	5 x 1.2 mL						X						X	
1543	GC/MS System Performance	4 x 1 mL												X	
1580	Organics in Shale Oil	5 x 1.2 mL				X				X					
1582	Petroleum Crude Oil	5 x 1.2 mL				X		X		X					
1584	Priority Pollutant Phenols in Methanol	5 x 1.2 mL						X						X	
1586	Isotope Label Pollutants	6 x 2 mL						X						X	
1588c	Organics in Fish Oil	5 x 1.2mL			X	X					X	X	X		
1596	Dinitropyrene Isomers and 1-Nitropyrene in Methylene Chloride	5 x 1.3 mL							X					X	
1597a	Complex Mixture of Polycyclic Aromatic Hydrocarbons Coal Tar	3 x 1.3 mL				X				X					
1614	Dioxin in Isooctane	6 x 1.2 mL	X											X	
1639	Halocarbons (in Methanol)	5 x 1.2 mL						X						X	
1647e	Priority Pollutant PAHs (in Acetonitrile)	set (5)								X					
1649b	Urban Dust	2 g	X			X		X	X	X		X	X		
1650b	Diesel Particulate Matter	200 mg				X		X	X	X					
1939a	PCBs in River Sediment A	50 g				X						X	X		
1941b	Organics in Marine Sediment	50 g				X		X		X		X	X		
1944	New York/New Jersey Waterway Sediment	50 g	X	X		X		X		X	X	X	X		
1945	Organics in Whale Blubber	2 x 15 g				X					X	X	X		
1946	Lake Superior Fish Tissue	5 x 7-9 g		X	X	X	X	X			X	X	X		
1947	Lake Michigan Fish Tissue	5 x 8 g		X	X	X	X	X			X	X	X		
1953	Organic Contaminants in Non-Fortified Human Milk	5 x 5 mL	X			X		X			X	X	X		
1954	Organic Contaminants in Fortified Human Milk	5 x 5 mL	X			X		X			X	X	X		
1957	Organic Contaminants in Non-Fortified Human Serum	5 x 10 mL				X					X	X	X		
1958	Organic Contaminants in Fortified Human Serum	5 x 10 mL				X					X	X	X		
1974c	Organics in Mussel Tissue, (Mytilus edulis)	5 x 10 g				X				X	X	X	X		
1975	Diesel Particulate Extract	4 x 1.2 mL				X			X	X					
2257	PBDE Congeners in 2,2,4-Trimethylpentane	5 x 1.2 mL									X			X	
2258	BDE 209 in 2,2,4-Trimethylpentane	5 x 1.2 mL									X			X	
2259	PCB Congeners in 2,2,4-Trimethylpentane	5 x 1.2mL										X		X	

109.1 - Organics (Cont.)

SRM	Description	Unit of Issue	dioxins/ furans	elements	fatty acids	matrix	Me-Hg	misc	nitro-PAHs	PAHs	PBDEs	PCBs	pesticides	solution	sugars
2260a	Aromatic Hydrocarbon in Toluene	5 x 1.2 mL								X				X	
2261	Chlorinated Pesticides in Hexane	5 x 1.2 mL											X	X	
2262	Chlorinated Biphenyl Cogeners in Isooctane	5 x 1.2 mL										X		X	
2264	Nitrated Aromatic Hydrocarbons in Methylene Chloride I	5 x 1.2 mL							X					X	
2265	Nitrated Polycyclic Hyrocarbons in Methylene Chloride II	5 x 1.2 mL							X					X	
2266	Hopanes and Steranes in, 2,2,4 Trimethylpentane	5 x 1.2 mL						X						X	
2267	Deuterated Levoglucosan in Ethyl Acetate	5 x 1.2 mL						X						X	
2268	Carbon-13 Labeled Levoglucosan in Ethyl Acetate	5 x 1.2 mL						X						X	
2269	Perdeuterated PAH-I Solution in Hexane/Toluene	5 x 1.2 mL								X				X	
2270	Perdeuterated PAH-II Solution in Hexane/Toluene	5 x 1.2 mL								X				X	
2273	Chlorinated Pesticides (DDTs) and Metabolites in Isooctane	5 x 1.2 mL											X	X	
2274	PCB Congener Solution-II in Isooctane	5 x 1.2 mL										X		X	
2275	Chlorinated Pesticide Solution-II in Isooctane	5 x 1.2 mL											X	X	
2276	Three Planar Polychlorinated Biphenyl (PCB) Congeners in Isooctane	5 x 1.2 mL										X		X	
2377	Fatty Acid Methyl Esters in, 2,2,4-Trimethylpentane	5 x 1.2 mL			X									X	
2585	Organic Contaminants in House Dust	10 g				X				X	X	X	X		
2779	Gulf of Mexico Crude Oil	5 x 1.2 mL				X		X		X					
2786	Fine Particulate Matter (<4 µm)	100 - 140 mg	X	X					X	X	X			X	X
2787	Fine Particulate Matter (<10 µm)	100 - 140 mg	X	X					X	X	X			X	X
2974a	Organics in Freeze-Dried Mussel Tissue (*Mytilus edulis*)	5 g				X	X			X	X	X	X		
2975	Diesel Particulate Matter	1 g				X		X	X	X					
3257	Catechin Calibration Solution	12 x 2 mL						X						X	
3266	Hypericin Calibration Solution	5 x 1.2 mL						X						X	
8466	Y-HCH (Lindane)	100 mg											X		
8467	4,4'-DDE	100 mg											X		
8469	Pesticide, 4,4'-DDT	100 mg											X		

NOTE 1566b and 2976 also have methylmercury values assigned

Also, see page 1 of the Environmental Brochure (NIST SRMs for Environmental Materials) for the listing of the 3000 series calibration solutions and components.

"X" indicates parameter is characterized. See certificate for futher details regarding values.

109.3 - EPA: Organic Compounds Related to Water Analysis (including drinking water)

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 Chemical Science Division (CSD) primarily to support the Chemical Calibration Providers of the Proficiency Testing Program with support by the U.S. Environmental Protection Agency (EPA).

To see related SRMs, go to:

Table 104.3 Stoichiometry (powder form)
Table 104.5 Spectrometry, Single Element Standard Solutions
Table 104.8 Anion Chromatography (solution form)
Table 201.1 pH Calibration (powder form)

Laboratory Accreditation: NVLAP - National Voluntary Laboratory Accreditation Program

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

SRM	Description	Unit of Issue			
3000	Benzene in Methanol	2 x 2.5 mL			
3001	Toluene in Methanol	2 x 2.5 mL			
3002	Ethylbenzene in Methanol	2 x 2.5 mL			
3003	o-Xylene in Methanol	2 x 2.5 mL			
3004	m-Xylene in Methanol	2 x 2.5 mL			
3005	p-Xylene in Methanol	2 x 2.5 mL			
3006	Carbon Tetrachloride in Methanol	2 x 2.5 mL			
3008	Methylene Chloride in Methanol (Nominal Mass Fraction, 0.01 g/g)	2 x 2.5 mL			
3009	1,2-Dichloropropane in Methanol (Nominal Mass Fraction - 0.01 g/g)	2 x 2.5 mL			
3010	Tetrachloroethene (Tetrachloroethylene) in Methanol	2 x 2.5 mL			
3011	1,1,1-Trichloroethane in Methanol (Nominal Mass Fraction, 0.01 g/g)	2 x 2.5 mL			
3012	1,2-Dichloroethane in Methanol (Nominal Mass Fraction, 0.01 g/g)	2 x 2.5 mL			
3014	1,2,3-Trichloropropane in Methanol (Nominal Mass Fraction - 0.01 g/g)	2 x 2.5 mL			
3015	Isopropylbenzene in Methanol	2 x 2.5 mL			
3016	sec-Butylbenzene in Methanol	2 x 2.5 mL			
3064	Endothall in Water	5 x 1.2 mL			
3067	Toxaphene in Methanol	5 x 1.2 mL			
3068	Chlordane in Methanol	5 x 1.2 mL			
3074	Phthalates in Methanol	5 x 1.2 mL			
3075	Aroclor 1016 in Transformer Oil	5 x 1.2 mL			
3076	Aroclor 1232 in Transformer Oil	5 x 1.2 mL			

109.3 - EPA: Organic Compounds Related to Water Analysis (including drinking water) (Cont.)

SRM	Description	Unit of Issue			
3077	Aroclor 1242 in Transformer Oil	5 x 1.2 mL			
3078	Aroclor 1248 in Transformer Oil	5 x 1.2 mL			
3079	Aroclor 1254 in Transformer Oil	5 x 1.2 mL			
3080	Aroclor 1260 in Transformer Oil	5 x 1.2 mL			
3081	Aroclor 1016 in Methanol	5 x 1.2 mL			
3082	Aroclor 1232 in Methanol	5 x 1.2 mL			
3083	Aroclor 1242 in Methanol	5 x 1.2 mL			
3084	Aroclor 1248 in Methanol	5 x 1.2 mL			
3085	Aroclor 1254 in Methanol	5 x 1.2 mL			
3086	Aroclor 1260 in Methanol	5 x 1.2 mL			
3090	Aroclors in Transformer Oil	set (SRMs 3075-3080)			
3091	Aroclors in Methanol	set (SRMs 3081-3086)			
8504	Transformer Oil	100 mL			

109.4 - Crime Scene Investigations

SRM 2285 is intended primarily for use in the calibration of chromatographic instrumentation used for the classification of an ignitable liquid residue. This SRM is a solution of 15 compounds, including even carbon number aliphatic hydrocarbons from hexane to tetracosane, toluene, p-xylene, 2-ethyltoluene, 3-ethyltoluene, and 1,2,4-trimethylbenzene in methylene chloride.

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

SRM	Description	Unit of Issue	Measurand	
2285	Arson Test Mixture in Methylene Chloride	5 x 1.2 mL	15 constituents	
2460	Standard Bullet	each	Cross Correlation Function Mass, Signature Difference	
2461	Standard Cartridge Case	each	Cross Correlation Function Max, Signature Difference	
2905	Trace Particulate Explosive Simulants	4 x 1 g	RDX, HMX, TNT	
2906	Trace Explosives Calibration Solutions	3 sets of 4 ampoules	RDX, PETN, TNT	
2907	Trace Terrorist Explosives Simulants	Set (2)	TATP, PETN (Semtex 1A)	
8107	Additives in Smokeless Powder	5 g	*NG, DPA, NnDPA, EC*	

Standard Reference Materials for Chemical Composition

110. Food and Agriculture

110.1 - Foods and Beverages

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

For Related SRMs see: Table 110.9

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

SRM	Description	Unit of Issue
1544	Fatty Acids/Cholesterol in Frozen Diet Composite	4 x 15 g
1546	Meat Homogenate	4 x 85 g
1548a	Typical Diet	set (2)
1549	Non-Fat Milk Powder	100 g
1566b	Oyster Tissue	25 g
1567a	Wheat Flour	80 g
1568a	Rice Flour	80 g
1570a	Trace Elements in Spinach Leaves	60 g
1577c	Bovine Liver	20 g
1845	Cholesterol in Whole Egg Powder	35 g
1849a	Infant/Adult Nutritional Formula	10 x 10 g
1946	Lake Superior Fish Tissue	5 x 7-9 g
1947	Lake Michigan Fish Tissue	5 x 8 g
2383	Baby Food Composite	4 x 70 g
2384	Baking Chocolate	5 x 91 g
2385	Baking Chocolate	4 x 70 g
2387	Peanut Butter	3 x 170 g
3233	Fortified Breakfast Cereal	2 x 60 g
3234	Soy Flour	50 g
3254	Camellia sinensis (Green Tea) Leaves	5 x 3 g
3255	Camellia sinensis (Green Tea) Extract	5 x 1 g
3276	Carrot Extract in Oil	5 x 1 mL
3278	Tocopherols in Edible Oils	5 x 1 mL
3281	Cranberry (fruit)	5 x 6 g
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL
3287	Blueberry (Fruit)	5 x 5 g

110.1(1) - Foods and Beverages

	1544	1546	1548a	1549	1566b	1567a	1568a	1570a	1577c
Description >>	Fatty Acids/Cholesterol in Frozen Diet Composite	Meat Homogenate	Typical Diet	Non-Fat Milk Powder	Oyster Tissue	Wheat Flour	Rice Flour	Trace Elements in Spinach Leaves	Bovine Liver
Unit Size >>	4x15 g	4x85 g	set (2)	100 g	25 g	80 g	80 g	60 g	20 g
Ash	*1.0*	*3.21*	*4.042*		*3.87*			*14.66*	
Calories (kcal/100 g)	*1221*	*252*	*481*						
Carbohydrate	*16.9*	*1.77*	*58.36*						
Dietary Fiber-Total					*6.5*			*30.5*	
Fat	*3.7*	*21.0*	*19.41*						
Moisture	*73.1*				*4.6*			*3.45*	
Protein	*5.3*	*14.9*	*18.08*		*42.6*			*35.8*	
Solids		*40.5*			*95.4*			*96.55*	
Sucrose		*17.7*							
Sum of Fatty Acids		*19.7*							
Amino Acids		X							
Cholesterol	X	X							
Elements	X	X	X	X	X	X	X	X	X
Fatty Acids	X	X							
Methylmercury					X				
Vitamins		X							

Nutritional Constituent Concentrations are mass fractions (in %)
"X" indicates parameter is characterized. See certificate for futher details regarding certified, reference, or information values.

110.1(2) - Foods and Beverages

	1845	1849a	1946	1947	2383	2384	2385	2387
Description >>	Cholesterol in Whole Egg Powder	Infant/Adult Nutritional Formula	Lake Superior Fish Tissue	Lake Michigan Fish Tissue	Baby Food Composite	Baking Chocolate	Slurried Spinach	Peanut Butter
Unit Size >>	35 g	10 x 10 g	5 x 7-9 g	5 x 8 g	4 x 70 g	5 x 91 g	4 x 70 g	3 x 170 g
Ash		*4.695*	*1.10*	*1.07*	*1.09*	*2.78*	*0.97*	*3.10*
Calories (kcal/100 g)		*520.8*	*159*	*152*	*166.5*	*631.0*	*18.16*	*629*
Carbohydrate		*51.6*	(0.93)	(0.9)	*27.49*		*2.73*	*25.0*
Dietary Fiber-Total						*14.5*	*1.55*	*5.56*
Fat		*30.43*	*10.17*	*10.4*	*4.67*	*51.4*		*51.6*
Moisture			*71.4*					
Protein		*13.72*	*17.8*	*17.0*	*3.89*	*13.18*	*1.42*	*22.2*
Solids		*98.28*	*28.6*	*27.1*	*37.19*	*98.37*	*5.28*	*99.2*
Sum of Fatty Acids		*29.10*	*8.76*	*8.50*			*0.20*	
Acrylamide								X
Aflatoxins								X
Amino Acids		X						
Caffeine						X		
Catechins						X		
Cholesterol	X	X						
Contaminants			X	X				
Elements		X	X	X		X		X
Fatty Acids		X	X	X				X
Methylmercury			X	X				
Nucleotides		X						
Procyanidins						X		
Theobromine						X		
Tocopherols								X
Vitamins		X				X		X

"X" indicates parameter is characterized. See certificate for futher details regarding certified, reference, or information values.

110.1(3) - Foods and Beverages

	3233	3234	3254	3255	3276	3278	3281	3282	3287
Description >>	Fortified Breakfast Cereal	Soy Flour	Camellia sinensis (Green Tea) Leaves	Camellia sinensis (Green Tea) Extract	Carrot Extract in Oil	Tocopherols in Edible Oils	Cranberry (fruit)	Low-Calorie Cranberry Juice Cocktail	Blueberry (Fruit)
Unit Size >>	2 x 60 g	50 g	5 x 3 g	5 x 1 g	5 x 1 mL	5 x 1 mL	5 x 6 g	5 x 1.2 mL	5 x 5 g
Ash	*11.87*	*6.77*							*1.126*
Calories (kcal/100 g)	*362.4*	*377.7*							*392*
Carbohydrate	*77.88*	*37.14*							*91.92*
Dietary Fiber-Total	*12.24*	*18.19*							*18.4*
Fat									*1.40*
Fructose	*0.81*						*4.51*	*2.08*	*30.5*
Glucose	*1.04*						*21.6*	*0.85*	*30.5*
Maltose	*0.46*								
Protein	*7.25*	*53.37*							*3.43*
Solids	*99.09*	*98.91*							*98.59*
Sucrose	*13.42*								
Sum of Fatty Acids	*2.02*	*1.49*							
Total Sugars	*15.8*						*26.2*	*2.86*	*60.4*
Amino Acids	X	X							X
Antioxidant Capacity							X		
Ascorbic Acid								X	
Caffeine			X	X					
Catechins			X	X					
Elements	X	X					X	X	
Fatty Acids		X			X				
Organic Acids							X	X	
Phosphate (PO_4^{3-})								X	
Sulfate								X	
Theobromine			X	X					
Tocopherols					X	X			
Vitamins	X	X							

"X" indicates parameter is characterized. See certificate for futher details regarding certified, reference, or information values.

110.2 - Food Contaminants and Allergens

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

	1566b	1946	1947	1953	1954	2387	3256	8445	8642
Description >>	Oyster Tissue	Lake Superior Fish Tissue	Lake Michigan Fish Tissue	Organic Contaminants in Non-Fortified Human Milk	Organic Contaminants in Fortified Human Milk	Peanut Butter	Green Tea-Containing Solid Oral Dosage Form	Spray-Dried Whole Egg for Allergen Detection	FDA Saxitoxin Dihydrochloride Solution
Unit Size >>	25 g	5 x 7-9 g	5 x 8 g	5 x 5 mL	5 x 5 mL	3 x 170 g	5 x 2.5 g	5 g	10 x 1.2 mL
Acrylamide						X			
Aflatoxin						X			
Amino Acids						X			
Caffeine							X		
Catechins							X		
Elements	X	X	X	X	X	X	X		
Fatty Acids						X			
Methylmercury	X	X	X						
PBB				X	X				
PBDE		X	X	X	X				
PCBs		X	X	X	X				
PCDD and PCDF				X	X				
Pesticides		X	X	X	X				
PFOS		X	X						
Proximate	X	X	X			X		X (protein only)	
Saxitoxin Dihyrochloride									X
Theobromine							X		
Tocopherols						X			
Vitamins						X			

"X" indicates parameter is characterized. See certificate for values.

110.3 - USA/Canada Collaborative Materials (powder form)

These materials, developed by Agriculture Canada in collaboration with NIST, are intended for use in evaluating analytical methods and instruments used for the determination of major, minor, and trace constituent elements, as well as proximates selected fatty acids (where appropriate), calories and vitamins in food/agricultural commodities.

NOTE: These materials are no longer available from NIST.

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

	8412	8413	8414	8415	8418	8432	8433	8436	8437	8438
Description >>	Corn Stalk (Zea mays)	Corn Kernel (Zea mays)	Bovine Muscle Powder (Beef)	Whole Egg Powder	Wheat Gluten	Corn Starch	Corn Bran	Durum Wheat Flour	Hard Red Spring Wheat Flour	Soft Winter Wheat Flour
Unit of Issue >>	34 g	47 g	50 g (2)	35 g	50 g	50 g	50 g	50 g	50 g	50 g
Aluminum		(4)	*1.7*	*540*	*10.8*	*1.9*	*1.01*	11.7	(2.1)	(2.3)
Antimony			(0.01)	(0.002)	(0.01)		(0.004)			
Arsenic			*0.009*	(0.01)	(0.02)		(0.002)	(0.03)		
Barium			(0.05)	(3)	*1.53*		*2.40*	2.11	(0.4)	(1)
Boron			*0.6*	*0.41*	(0.4)		*2.8*		(0.2)	(0.1)
Bromine			*1.1*		(3.6)		*2.3*	6.6		
Cadmium			*0.013*	(0.005)	*0.064*	*0.0003*	*0.012*	0.11	(0.02)	(0.03)
Calcium	*0.216**	*42*	*145*	*0.248**	*369*	*56*	*420*	278	143	240
Cesium			(0.05)							
Chlorine	*0.244**	(450)	*0.188**	*0.508**	*0.362**	*45*	*31*	680	500	640
Chromium			*0.071*	*0.37*	*0.053*	(0.02)	*0.11*	0.023	(0.026)	(0.032)
Cobalt			*0.007*	*0.012*	*0.010*	*0.0012*	*0.006*	0.008		
Copper	*8*	*3.0*	*2.84*	*2.70*	*5.94*	*0.06*	*2.47*	4.30	(2.01)	(1.2)
Fluorine	(0.65)	(0.24)	(0.22)		(0.43)	(0.02)		(0.1)	(0.02)	(0.04)
Iodine			*0.035*	*1.97*	*0.060*		*0.026*	0.006		
Iron	*139*	(23)	*71.2*	*112*	*54.3*	(5)	*14.8*	41.5	31	(29)
Lead			*0.38*	*0.061*	*0.10*	(0.007)	*0.140*	0.023		
Magnesium	*0.160**	*0.0990**	*960*	*305*	*510*	*31*	*818*	0.107*	365	214
Manganese	15	4.0	*0.37*	*1.78*	*14.3*	*0.10*	*2.55*	16.0	4.50	5.4
Mercury			*0.005*	*0.004*	*0.0019*	*0.0011*	*0.003*	0.0004	(0.004)	(0.002)

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

110.3 - USA/Canada Collaborative Materials (powder form) (Cont.)

NOTE: These materials are no longer available from NIST.

	8412	8413	8414	8415	8418	8432	8433	8436	8437	8438
Description >>	Corn Stalk (Zea mays)	Corn Kernel (Zea mays)	Bovine Muscle Powder (Beef)	Whole Egg Powder	Wheat Gluten	Corn Starch	Corn Bran	Durum Wheat Flour	Hard Red Spring Wheat Flour	Soft Winter Wheat Flour
Unit of Issue >>	34 g	47 g	50 g (2)	35 g	50 g	50 g	50 g	50 g	50 g	50 g
Molybdenum			*0.08*	*0.247*	*0.76*	*0.02*	*0.252*	0.70	(0.55)	(0.29)
Nickel			*0.05*		*0.13*	*0.02*	*0.158*	0.17	(0.2)	
Nitrogen	(6970)	(13750)	*13.75**	*6.30**	*14.64**	*680*	*0.882**	2.709*	2.690*	1.756*
Phosphorus			*0.836**	*1.001**	*0.219 **	*178*	*171*	0.290*	0.137*	0.108
Potassium	*1.735**	*0.357**	*1.517**	*0.319**	*472*	*45*	*566*	0.318*	0.115*	0.148
Rubidium			*28.7*		(0.4)		*0.5*	2.0		
Selenium	(0.016)	(0.004)	*0.076*	*1.39*	*2.58*	(0.0009)	*0.045*	1.23	0.56	0.076
Sodium	(28)		*0.210**	*0.377**	*0.142**	*119*	*430*	16.0	(7)	(7)
Strontium	*12*		*0.052*	*5.63*	*1.71*	(0.18)	*4.62*	1.19	(4)	
Sulfur			*0.795**	*0.512**	*0.845**	(200)	*860*	0.193*	0.183*	0.126*
Titanium					(2)			(5)		
Tungsten						(0.001)			(0.01)	
Vanadium			(0.005)	*0.459*	(0.04)		*0.005*	0.021	(0.02)	(0.03)
Zinc	*32*	*15.7*	*142*	*67.5*	*53.8*	*0.22*	*18.6*	22.2	10.6	(5.8)

110.4 - Agricultural Materials (powder form)

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

	1515	1547	1570a	1573a	1575a	2695	8412	8413
Description >>	Apple Leaves	Peach Leaves	Trace Elements in Spinach Leaves	Tomato Leaves	Trace Elements in Pine Needles	Fluoride in Vegetation	Corn Stalk (Zea mays)	Corn Kernel (Zea mays)
Unit Size >>	50 g	50 g	60 g	50 g	50 g	2 x 25 g (1 ea conc)	34 g	47 g
Elemental Composition as mass fraction in mg/kg (ppm) unless noted by an * asterisk for %.								
Aluminum	286	249	310	598	580			(4)
Antimony	(0.013)	(0.02)		0.063				
Arsenic	0.038	0.060	0.068	0.112	*0.039*			
Barium	49	124		(63)	6.0			
Boron	27	29	37.6	33.3	9.6			
Bromine	(1.8)	(11)		(1300)				
Cadmium	(0.013)	(0.026)	2.89	1.52	0.233			
Calcium	1.526*	1.56*	1.527*	5.05*	0.25*		*0.216**	*42*
Cerium	(3)	(10)		(2)	(0.11)			
Cesium				(53)	*0.283*			
Chlorine	579	360		(6600)	421		*0.244**	(450)
Chromium	(0.3)	(1)		1.99	(0.3-0.5)			
Cobalt	(0.09)	(0.07)	0.39	0.57	*0.061*			
Copper	5.64	3.7	12.2	4.70	2.8		*8*	3.0
Europium	(0.2)	(0.17)	*0.0055*					
Fluorine						64 / 277	(0.65)	(0.24)
Gadolinium	(3)	(1)		(0.17)				
Gold	(0.001)							
Hydrogen				(5.2*)				
Iodine	(0.3)	(0.3)		(0.85)				
Iron	(83)	(218)		368	46		*139*	(23)
Lanthanum	(20)	(9)		(2.3)				
Lead	0.470	0.87	(0.20)		*0.167*			
Magnesium	0.271*	0.432*	(0.89*)	(1.2*)	*0.106**		*0.160**	*0.0990**
Manganese	54	98	75.9		*488*		*15*	*4.0*
Mercury	0.044	0.031	0.030	0.034	0.0399			
Molybdenum	0.094	0.060		(0.46)				
Neodymium	(17)	(7)						

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

110.4 - Agricultural Materials (powder form) (Cont.)

	1515	1547	1570a	1573a	1575a	2695	8412	8413
Description >>	Apple Leaves	Peach Leaves	Trace Elements in Spinach Leaves	Tomato Leaves	Tomato Leaves	Fluoride in Vegetation	Corn Stalk (Zea mays)	Corn Kernel (Zea mays)
Unit Size >>	50 g	50 g	60 g	50 g	50 g	2 x 25 g (1 ea conc)	34 g	47 g
Elemental Composition as mass fraction in mg/kg (ppm) unless noted by an * asterisk for %.								
Nickel	0.91	0.69	2.14	1.59	*1.47*			
Nitrogen	2.25*	2.94*	*6.06**	3.03*			(6970)	(13750)
Phosphorus	0.159*	0.137*	0.518*	0.216*	0.107*			
Potassium	1.61*	2.43*	2.903*	2.70*	0.417*		*1.735**	*0.357**
Rubidium	10.2	19.7	*12.7*	14.89	16.5			
Samarium	(3)	(1)		(0.19)				
Scandium	(0.03)	(0.04)	*0.0055*	(0.1)	*0.0101*			
Selenium	0.050	0.120	0.117	0.054	*0.099*		(0.016)	(0.004)
Sodium	24.4	24	1.818*	136	*63*		(28)	
Strontium	25	53	55.6	(85)			*12*	
Sulfur	(0.18*)	(0.2*)	(0.46*)	(0.96*)				
Terbium	(0.4)	(0.1)						
Thorium	(0.03)	(0.05)	0.048	(0.12)				
Tin	(< 0.2)	(< 0.2)						
Tungsten	(0.007)							
Uranium	(0.006)	(0.015)	*0.155*	(35)				
Vanadium	0.26	0.37	0.57	0.835				
Ytterbium	(0.3)	(0.02)						
Zinc	12.5	17.9	82	30.9	38		*32*	*15.7*

110.5 - Fertilizers (powder form)

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

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

	120c	193	194	200b	694	695
Description >>	Phosphate Rock (Florida)	Potassium Nitrate	Ammonium Dihydrogen Phosphate	Potassium Dihydrogen Phosphate, (KH_2PO_4)	Phosphate Rock, Western	Trace Elements in Multi-Nutrient Fertilizer
Unit Size >>	90 g	90 g	90 g	90 g	90 g	70 g
(Concentrations are in mass fractions, in mg/kg, unless noted by an asterisk for %)						
Al_2O_3					1.8	
Cr_2O_3					(0.10)	
Fe_2O_3					0.79	
K_2O	0.147				0.51	
Na_2O					0.86	
P_2O_5	33.34				30.2	
SiO_2					11.2	
TiO_2					(0.11)	
V_2O_5					0.31	
Aluminum						*0.61*
Arsenic						200
Boron						*0.111*
Cadmium						16.9
Cadmium oxide					0.015	
Calcium						2.26
Calcium oxide	48.02				43.6	
Chlorine						(4.6*)
Chromium						244
Cobalt						65.3
Copper						1225
Fluorine					3.2	
Iron (total)						3.99

110.5 - Fertilizers (powder form) (Cont.)

	120c	193	194	200b	694	695
Description >>	Phosphate Rock (Florida)	Potassium Nitrate	Ammonium Dihydrogen Phosphate	Potassium Dihydrogen Phosphate, (KH_2PO_4)	Phosphate Rock, Western	Trace Elements in Multi-Nutrient Fertilizer
Unit Size >>	90 g	90 g	90 g	90 g	90 g	70 g
(Concentrations are in mass fractions, in mg/kg, unless noted by an asterisk for %)						
Lead						273
Magnesium						1.79
Magnesium oxide					0.33	
Manganese						0.305
Manganese oxide					0.0116	
Mercury						1.955
Molybdenum						20.0
Nickel						135
Nitrogen		13.85	12.15			*13.9*
Phosphorus			26.92	22.769		*7.2*
Potassium		38.66		28.735		11.65
Selenium						*2.1*
Sodium						0.405
Tin						
Titanium						(310)
Tungsten						
Uranium					0.01414	
Vanadium						122
Zinc						0.325

110.6 - Wheat Hardness (kernel form)

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

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

SRM	Description	Unit of Issue	Unit Size	Unit Size
8441a	Wheat Hardness	set (50)	*Soft-1 through Soft-5: 5 x 5 pouches (20g/pouch)*	*Hard-1 through Hard-5: 5 x 5 pouches (20g/pouch)*

110.9 - Dietary Supplement Materials (includes nutraceuticals and herbs)

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

Organic Constituent Concentrations are in mg/g and Elements are in µg/g (also known as mg/kg) unless otherwise noted

SRM	Description	Unit Size	Antioxidant Capacity	Alkaloids	Amino Acids	Anions	Caffeine	Calories	Carotenoids	Catechins	Elements
3246	*Ginkgo biloba* (Leaves)	5 x 3 g									X
3247	*Ginkgo biloba* Extract	5 x 1 g									X
3248	Ginkgo-Containing Tablets	5 x 1 g									X
3249	Ginkgo Dietary Supplement Suite	2 each: SRMs 3246-3248									X
3250	*Serenoa repens* (Fruit)	5 x 6 g									
3251	*Serenoa repens* Extract	5 x 1 mL									
3254	*Camellia sinensis* (Green Tea) Leaves	5 x 3 g			X		X			X	
3255	*Camellia sinensis* (Green Tea) Extract	5 x 1 g			X		X			X	
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g			X		X			X	
3257	Catechin Calibration Solution	12 x 2 mL								X	
3258	Bitter Orange (Fruit)	5 x 5 g		X							X
3259	Bitter Orange Extract	5 x 1.2 g		X							X
3260	Bitter Orange-Containing Solid Oral Dosage Form	5 x 2.5 g		X			X				X
3261	Bitter Orange Dietary Supplemental Suite	2 each: SRMs 3258-3260		X			X				X
3266	Hypericin Calibration Solution	5 x 1.2 mL									
3274	Botanical Oils Containing Omega-3 and Omega-6 FattyAcids	4 x 1.2 mL									
3275	Omega-3 and Omega-6 Fatty Acids in Fish Oil	2 x 1.2 ml									
3280	Multivitamin/Multielement Tablets	5 x 30 tablets							X		X
3281	Cranberry (Fruit)	5 x 6 g	X			X					X
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL				X					X
3283	Cranberry Extract	5 x 2.5 g	X			X					
3284	Cranberry-Containing Solid, Oral Dosage Form	5 x 2.5 g	X			X					
3285	Mixed Berry-Containing Solid Oral Dosage Form	5 x 2.5 g	X			X					
3286	Organic Acids Calibration Standard	5 x 2 mL									
3291	Bilberry Extract	5 x 1 g	X			X					

"X" indicates parameter is characterized. See certificate for futher details regarding certified, reference, or information values.values.

110.9 - Dietary Supplement Materials (includes nutraceuticals and herbs) (Cont.)

Organic Constituent Concentrations are in mg/g and Elements are in µg/g (also known as mg/kg) unless otherwise noted

SRM	Description	Unit Size	Ephedrine Alkatoids	Fatty Acids	Flavonoid Aglycones	Hypericin	Organic Acids	Proximates	Sugars	Terpene Lactones (Ginkgolides)	Theobromine	Vitamins
3246	Ginkgo biloba (Leaves)	5 X 3 g			X					X		
3247	Ginkgo biloba Extract	5 x 1 g			X					X		
3248	Ginkgo-Containing Tablets	5 x 1 g			X					X		
3249	Ginkgo Dietary Supplement Suite	2 each:SRMs 3246-3248			X					X		
3250	Serenoa repens (Fruit)	5 x 6 g										
3251	Serenoa repens Extract	5 x 1 mL										
3254	Camellia sinensis (Green Tea) Leaves	5 x 3 g									X	
3255	Camellia sinensis (Green Tea) Extract	5 x 1 g									X	
3256	Green Tea-Containing Solid Oral Dosage Form	5 x 2.5 g									X	
3257	Catechin Calibration Solution	12 x 2 mL										
3258	Bitter Orange (Fruit)	5 x 5 g										
3259	Bitter Orange Extract	5 x 1.2 g										
3260	Bitter Orange-Containing Solid Oral Dosage Form	5 x 2.5 g										
3261	Bitter Orange Dietary Supplemental Suite	2 each SRMs 3258-3260										
3266	Hypericin Calibration Solution	5 x 1.2 mL				X						
3274	Botanical Oils Containing Omega-3 and Omega-6 FattyAcids	4 x 1.2 mL		4 levels								
3275	Omega-3 and Omega-6 Fatty Acids in Fish Oil	2 x 1.2 ml		3 levels								
3280	Multivitamin/Multielement Tablets	5 x 30 tablets										X
3281	Cranberry (Fruit)	5 x 6 g					X		X			
3282	Low-Calorie Cranberry Juice Cocktail	5 x 1.2 mL					X		X			
3283	Cranberry Extract	5 x 2.5 g					X					
3284	Cranberry-Containing Solid, Oral Dosage Form	5 x 2.5 g					X					
3285	Mixed Berry-Containing Solid Oral Dosage Form	5 x 2.5 g					X					
3286	Organic Acids Calibration Standard	5 x 2 mL					X					
3291	Bilberry Extract	5 x 1 g					X					

"X" indicates parameter is characterized. See certificate for futher details regarding certified, reference, or information values.values.

Standard Reference Materials for Chemical Composition

111. Geological Materials and Ores

111.2 - Ores (powder form)

This table is provided in 3 parts to facilitate viewing and printing of data.

111.2(1) - Ores (powder form)
111.2(2) - Ores (powder form)
111.2(3) - Ores (powder form) Phosphate Rocks and Bauxites

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

SRM	Description	Unit Size			
25d	Manganese Ore	60 g			
69b	Bauxite (Arkansas)	60 g			
79a	Fluorspar, Customs Grade	120 g			
113b	Zinc Concentrate	100 g			
120c	Phosphate Rock (Florida)	90 g			
180	Fluorspar, High Grade	120 g			
181	Lithium Ore (Spodumene)	45 g			
182	Lithium Ore (Petalite)	45 g			
183	Lithium Ore (Lepidolite)	45 g			
277	Tungsten Concentrate	100 g			
330a	Copper Ore Mill Heads	90 g			
331a	Copper Ore Mill Tails	40 g			
333a	Molybdenum Sulfide Concentrate	60 g			
423	Molybdenum Oxide Concentrate	60 g			
600	Bauxite, Australian-Darling Range	90 g			
670	Rutile Ore	90 g			
690	Iron Ore Canada	100 g			
691	Iron Oxide, Reduced	100 g			
692	Iron Ore, Labrador	100 g			
693	Iron Ore, Nimba	100 g			
694	Phosphate Rock, Western	90 g			
696	Bauxite, Surinam	60 g			
697	Bauxite, Dominican	60 g			
698	Bauxite, Jamaican	60 g			
699	Alumina (Reduction Grade)	60 g			
886	Gold, Ore Refractory	200 g			
1835	Borate Ore	60 g			
2430	Scheelite Ore	100 g			

111.2(1) - Ores (powder form)

	25d	79a	113b	180	181	182	183	277	330a	331a	333a	423
Description >>	Manganese Ore	Fluorspar, Customs Grade	Zinc Concentrate	Fluorspar, High Grade	Lithium Ore (Spodumene)	Lithium Ore (Petalite)	Lithium Ore (Lepidolite)	Tungsten Concentrate	Copper Ore Mill Heads	Copper Ore Mill Tails	Molybdenum Sulfide Concentrate	Molybdenum Oxide Concentrate
Unit Size >>	60 g	120 g	100 g	120 g	45 g	45 g	45 g	100 g	90 g	40 g	60 g	60 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)												
Aluminum									7.053	*7.92*		
Aluminum oxide	*5.33*											
Antimony											(0.001)	(0.0024)
Arsenic											(0.015)	
Barium									0.156			
Barium oxide	(0.21)											
Bismuth											(0.003)	(0.006)
Cadmium			0.7804						*3.391**	(0.1)		
Calcium			0.8196					(0.37)	0.323	*1.552*	(0.12)	
Calcium fluoride		97.39		98.80								
Calcium oxide	(0.052)											
Carbon										*565**		(0.025)
Cerium									*22.32**	*9.6**		
Chromium									*77.0**	13.9*	(0.005)	(0.0034)
Cobalt									*4.542**	12.6*		
Copper			0.2953						0.845	789*	0.0600	0.0640
Gallium									*17.4**	*16.3**		
Gold										*0.121**		
Iron			2.077					(7.4)	*1.06*	*4.207*	*1.022*	*1.708*
Iron oxide	*3.91*											
Lead			2.731					(0.07)	(27*)	(6)	*0.0111*	0.0433
Lithium									*22.19**			
Lithium oxide					6.39	4.34	4.12					
Magnesium			0.4460						0.868	*1.623*	(0.02)	(0.10)
Manganese	51.78							(10.0)		497*	(0.002)	(0.009)
Mercury			(0.55*)							0.00184*		
Moisture	(1)											
Molybdenum								(0.06)	(4.5*)	*3.2**	54.86	58.68
Nickel									*28.95**	*8.1**		
Niobium								(1.00)	(5.7*)			
Oxygen, available	*14.283*							(21.4)				

111.2(1) - Ores (powder form)

	25d	79a	113b	180	181	182	183	277	330a	331a	333a	423
Description >>	Manganese Ore	Fluorspar, Customs Grade	Zinc Concentrate	Fluorspar, High Grade	Lithium Ore (Spodumene)	Lithium Ore (Petalite)	Lithium Ore (Lepidolite)	Tungsten Concentrate	Copper Ore Mill Heads	Copper Ore Mill Tails	Molybdenum Sulfide Concentrate	Molybdenum Oxide Concentrate
Unit Size >>	60 g	120 g	100 g	120 g	45 g	45 g	45 g	100 g	90 g	40 g	60 g	60 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)												
Phosphorus								(0.03)	(326*)	(550)		
Phosphorus pentoxide	0.251											
Potassium									5.47	0.967	(0.06)	
Potassium oxide	*0.928*											
Rhenium											*0.035*	(0.004)
Scandium									*5.693**	*11.4**		
Silicon								(0.85)	*33.4*			
Silicon dioxide	2.54											
Silver			0.04607								(0.0013)	(0.0029)
Sodium									0.657	*3.15*	(0.01)	(0.2)
Strontium									*218.1**			
Sulfur			30.032					(0.25)		*870**	(37.7)	(0.063)
Tantalum								(.20)				
Thorium									(7.6*)			
Tin								(.54)				
Titanium								(2.2)	(1223*)	*0.228*		
Titanium dioxide	*0.136*											
Tungsten trioxide								67.4				
Vanadium									(43*)	*121**	(0.0014)	(0.0023)
Yttrium									*20.01**			
Zinc			56.49						*94.9**	71.8*	(0.002)	(0.017)
Zirconium									*80.5**			

111.2(2) - Ores (powder form)

	670	690	691	692	693	886	1835	2430
Description >>	Rutile Ore	Iron Ore Canada	Iron Oxide, Reduced	Iron Ore, Labrador	Iron Ore, Nimba	Gold, Ore Refractory	Borate Ore	Scheelite Ore
Unit Size >>	90 g	100 g	100 g	100 g	100 g	200 g	60 g	100 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)								
Aluminum								(0.4)
Aluminum oxide		0.18	1.22	1.41	1.04		3.474	
Antimony								(<0.01)
Arsenic			(14*)					0.002
Barium oxide							0.0497	
Bismuth								0.078
Boron oxide							18.739	
Cadmium			(<5*)					
Calcium oxide		0.20	0.63	0.023	0.016		21.622	
Carbon			0.12			(5.7)		
Chromium			(0.03)					
Chromium oxide	0.23							
Cobalt			0.030					
Copper			0.032					(0.01)
Fluorine							0.348	
Gold						8.25*		
Iron		66.85	90.8	59.58	65.11			(1.0)
Iron oxide	0.86						1.141	
Lead			(<20*)					
Loss on Ignition							25.724	
Magnesium								(0.5)
Magnesium oxide		0.18	0.52	0.035	0.013		3.411	
Manganese								(0.12)
Manganese oxide		0.23	0.043	0.46	0.091		0.0333	
Molybdenum			(<20*)					0.22
Nickel			(0.3)					
Nitrogen			(50*)					
Phosphorus		0.011	0.006	0.039	0.056			0.017
Potassium			(0.06)				1.261	(0.16)
Potassium oxide		0.0030		0.039	0.0028			
Silicon dioxide	0.51	3.71	3.7	10.14	3.87		18.408	

111.2(2) - Ores (powder form) (Cont.)

	670	690	691	692	693	886	1835	2430
Description >>	Rutile Ore	Iron Ore Canada	Iron Oxide, Reduced	Iron Ore, Labrador	Iron Ore, Nimba	Gold, Ore Refractory	Borate Ore	Scheelite Ore
Unit Size >>	90 g	100 g	100 g	100 g	100 g	200 g	60 g	100 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)								
Sodium								(0.02)
Sodium oxide		0.003	0.186	0.008	0.0028		3.484	
Strontium oxide							0.9418	
Sulfur		0.003	0.008	0.005	0.005	1.466		0.26
Sulfur trioxide							1.477	
Tantalum								(<0.01)
Tin			(<10*)					
Titanium dioxide	96.16	0.022	0.27	0.045	0.035		0.1332	
Tungsten trioxide								70.26
Vanadium			(135*)					
Vanadium pentoxide	0.66							
Zinc			(40*)					
Zirconium dioxide	0.84							

111.2(3) - Ores (powder form) Phosphate Rocks and Bauxites

	69b	120c	600	694	696	697	698	699
Description >>	Bauxite (Arkansas)	Phosphate Rock (Florida)	Bauxite, Australian-Darling Range	Phosphate Rock, Western	Bauxite, Surinam	Bauxite, Dominican	Bauxite, Jamaican	Alumina (Reduction Grade)
Unit Size >>	60 g	90 g	90 g	90 g	60 g	60 g	60 g	60 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)								
Aluminum oxide	48.8	1.30	40.0	1.8	54.5	45.8	48.2	
Barium oxide	(0.008)				(0.004)	(0.015)	(0.008)	
Beryllium								2.81*
Cadmium oxide		*0.0010*		0.015				
Calcium oxide	0.13	*48.02*	0.22	43.6	0.018	0.71	0.62	0.036
Carbon dioxide		3.27						
Cerium	(0.024)				(0.0041)	(0.069)	(0.030)	
Chromium oxide	0.011		0.024	(0.10)	0.047	0.100	0.080	0.0002
Cobalt	(0.0001)				(0.00009)	(0.0013)	(0.0045)	

111.2(3) - Ores (powder form) Phosphate Rocks and Bauxites (Cont.)

	69b	120c	600	694	696	697	698	699
Description >>	Bauxite (Arkansas)	Phosphate Rock (Florida)	Bauxite, Australian-Darling Range	Phosphate Rock, Western	Bauxite, Surinam	Bauxite, Dominican	Bauxite, Jamaican	Alumina (Reduction Grade)
Unit Size >>	60 g	90 g	90 g	90 g	60 g	60 g	60 g	60 g
(Concentrations are in mass fractions, in %, unless noted by an asterik for mg/kg)								
Fluorine		3.82		3.2				
Gallium oxide								0.010
Iron oxide	7.14	1.08	17.0	0.79	8.70	20.0	19.6	0.013
Lithium oxide								0.002
Loss on Ignition	27.2		20.5		29.9	22.1	27.3	0.69
Magnesium oxide	0.085	*0.32*	0.05	0.33	0.012	0.18	0.058	0.0006
Manganese oxide	0.110	0.027	0.013	0.0116	0.004	0.41	0.38	0.0005
Phosphorus pentoxide	0.118	*33.34*	0.039	30.2	0.050	0.97	0.37	0.0002
Potassium oxide	0.068	0.147	0.23	0.51	0.009	0.062	0.010	(0.005)
Silicon dioxide	13.43	5.5	20.3	11.2	3.79	6.81	0.69	0.0120
Sodium oxide	(0.025)	0.52	0.022	0.86	(0.007)	(0.036)	(0.015)	0.59
Sulfur trioxide	0.551		0.155		0.150	0.0770	0.143	
Titanium dioxide	1.90	0.103	1.31	(0.11)	2.64	2.52	2.38	(0.001)
Uranium				0.01414				
Uranium oxide (U_3O_8)		0.0135						
Vanadium pentoxide	0.028	0.016	0.060	0.31	0.072	0.063	0.064	0.0005
Zinc oxide	0.0035		0.003	(0.19)	0.0014	0.037	0.029	0.013
Zirconium dioxide	0.29		0.060		0.14	0.065	0.061	(0.0002)

111.3 - Ore Bioleaching Substrate (powder form)

This RM is for use as a bioleaching substrate and for testing bioleaching rates. The material consists of pyrite from New Mexico. Thiobacillus ferrooxidans was used in the determinations.

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

SRM	Description	Unit Size	Bioleaching Rate			
8455	Pyrite Ore	100 g	*12.4*			

111.4 - Clays (powder form)

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

	97b	98b	679			
Description >>	Flint Clay	Plastic Clay	Brick Clay			
Unit of Issue >>	60 g	60 g	75 g			
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)						
Aluminum	20.76	14.30	11.01			
Antimony	(2.2)*	(1.6)*				
Barium	(0.018)	(0.07)	0.0432			
Calcium	0.0249	0.0759	0.1628			
Cerium			(105)*			
Cesium	(3.4)*	(16.5)*	(9.6)*			
Chromium	227*	119*	109.7*			
Cobalt	(3.8)*	(16.3)*	(26)*			
Europium	(0.84)*	(1.3)*	(1.9)*			
Hafnium	(13)*	(7.2)*	(4.6)*			
Iron	0.831	1.18	9.05			
Lithium	550*	215*	71.7*			
Loss on Ignition	13.3	7.5				
Magnesium	0.113	0.358	0.7552			
Manganese	47*	116*	(1730)*			
Phosphorus	(0.02)	(0.03)	(0.075)			
Potassium	0.513	2.81	2.433			
Rubidium	(33)*	(180)*	(190)*			
Scandium	(22)*	(22)*	(22.5)*			
Silicon	19.81	26.65	24.34			
Sodium	0.0492	0.1496	0.1304			
Strontium	84*	189*	73.4*			
Thorium	(36)*	(21)*	(14)*			
Titanium	1.43	0.809	0.577			
Zinc	(87)*	(110)*	(150)*			
Zirconium	(0.05)	(0.022)				

111.5 - Rock and Minerals (powder form)

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

	1d	70a	81a	88b	99b	165a	278	607	688	1413
Description >>	Limestone, Argillaceous	Feldspar, Potash	Glass Sand	Dolomitic Limestone	Soda Feldspar	Glass Sand (Low Iron)	Obsidian Rock	Potassium Feldspar	Basalt Rock	Glass Sand (High Alumina)
Unit of Issue >>	70 g	40 g	75 g	75 g	40 g	75 g	35 g	5 g	60 g	75 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)										
Al_2O_3	0.526	17.9	0.66	0.336		0.059	14.15		17.36	9.90
Cr_2O_3	*0.0012*		46*			(1*)	(6.1*)		332*	
Fe_2O_3**	0.3191	0.075	0.082	0.277		0.012	2.04		10.35	0.24
K_2O	0.1358	11.8		0.1030			4.16		0.187	3.94
Na_2O	0.0109	2.55		0.0290			4.84		2.15	1.75
P_2O_5	0.0413			0.0044			0.036		0.134	
Rb_2O	(Rb 6)*	0.06					127.5*	523.96*	1.91*	
SiO_2	4.080	67.12		1.13			73.05		48.4	82.77
TiO_2	*0.0306*	0.01	0.12	(0.016)		0.011	0.245		1.17	0.11
$^{87}Sr/^{86}Sr$								1.20039		
Aluminum					10.36					
Barium					1409*					
Barium oxide	*0.0033*	0.02					(1140*)			0.12
Beryllium	(0.1)*				(2.8*)					
Cadmium	(0.3)*									
Calcium					*1.18**					
Calcium oxide	52.85	0.11		29.95			0.983		(12.17)	0.74
Carbon	*11.50*									
Cerium	(4)*									
Cesium	(0.4)*				(2.5*)					
Chlorine	(130)*									
Copper							5.9*			
Dysprosium	(0.6)*									
Erbium	(0.4)*									
Europium	(0.1)*									
FeO**							1.36		7.64	
Fluorine	(160)*									
Gadolinium	(0.5)*									
Gallium	(1)*				(15*)					
Holmium	(0.1)*									

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

111.5 - Rock and Minerals (powder form) (Cont.)

	1d	70a	81a	88b	99b	165a	278	607	688	1413
Description >>	Limestone, Argillaceous	Feldspar, Potash	Glass Sand	Dolomitic Limestone	Soda Feldspar	Glass Sand (Low Iron)	Obsidian Rock	Potassium Feldspar	Basalt Rock	Glass Sand (High Alumina)
Unit of Issue >>	70 g	40 g	75 g	75 g	40 g	75 g	35 g	5 g	60 g	75 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)										
Iron					278.7*					
Lanthanum	(4)*				(1.9*)					
Lead					71.2*		16.4*			
Lithium					(7.9*)					
Loss on Ignition	*41.57*	0.40		(46.98)						
Magnesium oxide	0.301			21.03			(0.23)		(8.4)	0.06
Manganese	0.0209			0.0160	*17.47**		0.052		0.167	
Neodymium	(3)*									
Nickel	(4)*						3.6*			
Niobium	(0.7)*									
Phosphorus					*44**					
Potassium					3.09					
Praseodymium	(0.6)*									
Rubidium					72.6*					
Samarium	(0.5)*									
Silicon					*32.07*					
Sodium					5.25					
Strontium					444*					
Strontium oxide	0.0303			0.0076			63.5*	65.485*	169.2*	
Sulfur	0.1028									
Terbium	(0.09)*									
Thorium	(0.5)*						12.4*			
Tin	(1)*									
Titanium							0.54*			
Uranium	(1)*						4.58*			
Vanadium	(10)*									
Ytterbium	(0.3)*									
Yttrium	(5)*				(1.6*)					
Zinc					(2.6*)					
Zinc oxide	0.0022									
Zirconium dioxide			0.034			0.006				

**Refer to certificate to ascertain if the value reported represents total iron or species-specific iron.

111.6 - Refractories (powder form)

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

	76a	77a	78a	154c***	198	199
Description >>	Burnt Refractory (Al_2O_3-40%)	Burnt Refractory (Al_2O_3-60%)	Burnt Refractory (Al_2O_3-70%)	Titanium Dioxide	Silica Brick	Silica Brick
Unit of Issue >>	75 g	75 g	75 g	90 g	45 g	45 g
(mass fraction, in %)						
Al_2O_3	38.7	60.2	71.7		0.16	0.48
Calcium oxide	0.22	0.05	0.11		2.71	2.41
Fe_2O_3**	1.60	1.00	1.2		0.66	0.74
Lithium oxide	0.042	0.025	0.12		0.001	0.002
Loss on Ignition	(0.34)	(0.22)	(0.42)		0.21	0.17
Magnesium oxide	0.52	0.38	0.70		0.07	0.13
Manganese oxide					0.008	0.007
Phosphorus pentoxide	0.120	0.092	1.3		0.022	0.015
Potassium oxide	1.33	0.090	1.22		0.017	0.094
Silicon dioxide	54.9	35.0	19.4			
Sodium oxide	0.07	0.037	0.078		0.012	0.015
Strontium oxide	0.037	0.009	0.25			
Titanium dioxide	2.03	2.66	3.22	99.591	0.02	0.06

** Refer to certificate to ascertain if the value reported represents total iron or species-specific iron.

*** Information values are provided for an additional 71 elements

111.7 - Soils, Sediments, and Sludges (powder form)

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

	1646a	1944	2586**	2587**	2701**	2702*	2703	2709a**	2710a**	2711a**	2780	2781**	2782**	8704
Description >>	Estuarine Sediment	New York/ New Jersey Waterway Sediment	Trace Elements in Soil (contains lead from paint)	Trace Elements in Soil (contains lead from paint)	Hexavalent Chromium in Contaminated Soil (High Level)	Inorganics in Marine Sediment	Sediment for Solid Sampling (Small, Sample) Analytical Techniques	San Joaquin Soil	Montana I Soil	Montana II Soil	Hard Rock Mine Waste	Domestic Sludge	Industrial Sludge	Buffalo River Sediment
Unit of Issue >>	70 g	50 g	55 g	55 g	75 g	50 g	5 g	50 g	50 g	50 g	50 g	40 g	70 g	50 g
(Concentrations are in mass fractions, in mg/kg, unless noted as %)														
Aluminum	2.297 %	5.33%	*6.652%*	*5.86 %*	*5.05 %*	8.41 %	8.33 %	7.37 %	5.95 %	6.72 %	8.87 %	1.6 %	1.37 %	6.10 %
Antimony	(0.3)	4.6				5.60	5.62	1.55	52.5	23.8	(160)		(2.0)	3.07
Arsenic	6.23	18.9	8.7	13.7		45.3	45.5	*10.5*	0.154%	107	48.8	7.82	166	(17)
Barium	(210)		*413*	*568*		397.4	416	979	792	730	*993*		*254*	*413*
Beryllium	(< 1)	*1.6*	(1.4)	(9.2)		(3.0)								
Boron								(74)	(20)	(50)				
Bromine		86												
Cadmium	0.148	8.8	2.71	1.92		0.817	0.811	0.371	12.3	54.1	12.10	12.78	4.17	2.94
Calcium	0.519 %	*1.0 %*	*2.218 %*	*0.927 %*	*7.47 %*	*0.343 %*	*0.31%*	1.91 %	0.964 %	2.42 %	0.195 %	*3.9 %*	*0.67 %*	*2.641 %*
Carbon (organic)						(3.27 %)								
Carbon (total)						(3.36 %)							(2.1 %)	3.351 %
Cerium	(34)	(65)	*58*	(57)		123.4	125.5	*42*	(60)	(70)	(64)		1240	*66.5*
Cesium		3.0				(7.1)	*7.7*	*5.0*	*8.25*	*6.7*	(13)			*5.83*
Chlorine		*1.4 %*												
Chromium	40.9	266	301	92	4.26 %	352		130	*23*	52.3	(44)	202	109	*121.9*
Cobalt	(5)	14	(35)	(14)		27.76	27.70	12	5.99	9.89	(2.2)		66.3	*13.57*
Copper	10.01	*380*	(81)	(160)		*117.7*	*120*	*33.9*	0.342%	140	*215.5*	627.4	2594	
Dysprosium			(5.4)					(3)	(3)	(5)				
Erbium			(3.3)											
Europium		(1.3)	(1.5)					*0.83*	*0.82*	*1.1*			(0.34)	*1.31*
Gadolinium			(5.8)					*3.0*	*3.0*	(5)				
Gallium	(5)		(14)	(13)		*24.3*					(26)		*35*	

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

111.7 - Soils, Sediments, and Sludges (powder form) (Cont.)

	1646a	1944	2586**	2587**	2701**	2702*	2703	2709a**	2710a**	2711a**	2780	2781**	2782**	8704
Description >>	Estuarine Sediment	New York/ New Jersey Waterway Sediment	Trace Elements in Soil (contains lead from paint)	Trace Elements in Soil (contains lead from paint)	Hexavalent Chromium in Contaminated Soil (High Level)	Inorganics in Marine Sediment	Sediment for Solid Sampling (Small, Sample) Analytical Techniques	San Joaquin Soil	Montana I Soil	Montana II Soil	Hard Rock Mine Waste	Domestic Sludge	Industrial Sludge	Buffalo River Sediment
Unit of Issue >>	70 g	50 g	55 g	55 g	75 g	50 g	5 g	50 g	50 g	50 g	50 g	40 g	70 g	50 g
(Concentrations are in mass fractions, in mg/kg, unless noted as %)														
Gold		(0.10)							(0.2)		(0.18)		(2.2)	
Hafnium						(12.6)	*11.8*	(4)	(7)	*9.2*	(4.4)		(0.77)	*8.4*
Hexavalent Cr					551.2									
Holmium			(1.1)								(0.84)			
Indium									(7)	(1)			*238*	
Iron (total)	2.008 %	3.53 %	*5.161 %*	*2.813 %*	23.73 %	7.91 %	7.38 %	3.36 %	4.32 %	2.82 %	2.784 %	*2.8 %*	*26.9 %*	*3.97 %*
Lanthanum	(17)	(39)	*29.7*	(29)		73.5	75.9	*21.7*	30.6	*38*	(38)		58.1	
Lead	11.7	330	432	3242		132.8	130	17.3	0.552%	0.140 %	0.577 %	202.1	574	*150*
Lithium	(18)		(25)	(32)		(78.2)					(18)		(5.0)	
Lutetium								(0.3)	0.31	(0.5)				
Magnesium	0.388 %	(1.0 %)	*1.707 %*	*0.669 %*	*7.47 %*	*0.990 %*	(1.0 %)	1.46 %	0.734 %	1.07 %	0.533 %	*0.59 %*	*0.26 %*	*1.200 %*
Manganese	234.5	505	*1000*	*651*	0.2137 %	1757	1734	529	0.214 %	675	*462*		(300)	*544*
Mercury	(0.04)	*3.4*	*0.367*	*0.290*		0.4474	0.474	*0.9*	9.88	7.42	0.710	3.64	1.10	
Molybdenum	(1.8)					*10.8*	(11)*				(11)	46.7	10.07	
Neodymium	(15)		*26.4*	(25)		(56)	(72)	(17)	*22*	*29*	(28)			
Nickel	(23)	76.1	(75)	(36)		75.4	(75)*	*85*	*8*	21.7	(12)	80.2	154.1	*42.9*
Niobium			(6)	(14)		(63)	(63)*				(18)			
Nitrogen												4.78 %		
Phosphorus	0.027 %		*1001*	*970*		0.1552 %	(0.16 %)*	0.0688 %	0.105 %	842	*427*	*2.42 %*	*0.50 %*	
Potassium	0.864 %	*1.6 %*	*0.976 %*	*1.583 %*	*0.174 %*	2.054 %	2.08 %	2.11 %	2.17 %	2.53 %	3.38 %	*0.49 %*	*0.32 %*	*2.001 %*
Praseodymium			(7.3)											
Rubidium	(38)	*75*				127.7	130	*99*	*117*	*120*	(175)		(23)	
Samarium			(6.1)			(10.8)	*10.8*	(4)	*4*	5.93			(1.3)	
Scandium	(5)	*10.2*	(24)	(11)		25.9	25.95	*11.1*	*9.9*	8.5	(23)		(3.4)	*11.26*
Selenium	0.193	*1.4*	(0.6)			4.95	(4.9)*	(1.5)	(1)	(2)	(5)	16.0	0.44	

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

111.7 - Soils, Sediments, and Sludges (powder form) (Cont.)

	1646a	1944	2586**	2587**	2701**	2702*	2703	2709a**	2710a**	2711a**	2780	2781**	2782**	8704
Description >>	Estuarine Sediment	New York/ New Jersey Waterway Sediment	Trace Elements in Soil (contains lead from paint)	Trace Elements in Soil (contains lead from paint)	Hexavalent Chromium in Contaminated Soil (High Level)	Inorganics in Marine Sediment	Sediment for Solid Sampling (Small, Sample) Analytical Techniques	San Joaquin Soil	Montana I Soil	Montana II Soil	Hard Rock Mine Waste	Domestic Sludge	Industrial Sludge	Buffalo River Sediment
Unit of Issue >>	70 g	50 g	55 g	55 g	75 g	50 g	5 g	50 g	50 g	50 g	50 g	40 g	70 g	50 g
(Concentrations are in mass fractions, in mg/kg, unless noted as %)														
Silicon	40.0 %	*31 %*	*29.15 %*	*33.13 %*	*4.17 %*			30.3 %	31.1 %	31.4 %	(31 %)	*(5.1 %)*	(20.3 %)	
Silver	(<0.3)	*6.4*				*0.622*	*0.59*		(40)	(6)	(27)	*98*	*30.6*	
Sodium	0.741 %	*1.9 %*	*0.468 %*	*1.127 %*	*0.255 %*	0.681 %	0.693 %	1.22 %	0.894 %	1.20 %	0.221 %	*0.21 %*	*1.30 %*	*0.553 %*
Strontium	(68)		*84.1*	*126*		119.7	118	239	255	242	*217*			
Sulfur	0.352 %					(1.5 %)					1.263 %		(0.2 %)	
Tantalum								(0.7)	(0.9)	(1)			(0.73)	
Tellurium											(5)			
Terbium			(0.9)					(0.5)	(0.5)	(0.8)	(0.58)		(0.48)	
Thallium	(< 0.5)	*0.59*				0.8267	(0.83)*	*0.58*	*1.52*	(3)	(5)			
Thorium	(5.8)	(13)	(7)	(7.5)		20.51	20.22	*10.9*	*18.1*	*15*	(12)		(2.4)	*9.07*
Thulium			(0.5)				(32)*				(0.4)			
Tin		*42*				*31.6*								
Titanium	0.456 %	*4300*	*0.605 %*	*3920*	*0.547 %*	0.884 %	0.880 %	0.336 %	0.311 %	0.317 %	*0.699 %*	*0.32 %*	*880*	*0.457 %*
Tungsten						(6.2)	*6.4*		(190)		(24)			
Uranium	(2.0)	(3.1)				(10.4)		*3.15*	9.11	3.01	(4)		8.3	*3.09*
Vanadium	44.84	*100*	(160)	(78)	*0.236 %*	357.6	360	110	*82*	80.7	*268*		*80*	*94.6*
Ytterbium			*2.64*	(1.6)				(2)	(2)	(3)			(0.74)	
Yttrium			(21)	(15)									(10)	
Zinc	48.9	656	*352*	*335.8*		485.3	480	*103*	0.418%	414	0.257 %	1273	1254	*408*
Zirconium								195	(200)		(176)			

* Determination made in parent material (SRM 2702)

** These SRMs also have noncertified leach data. See certificate for details and leach methods used.

Standard Reference Materials for Chemical Composition

112. Ceramics and Glasses

112.1 - Carbides and Nitrides (powder form)

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

	112b	276b	8983			
Description >>	Silicon Carbide	Tungsten Carbide	Silicon Nitride Powder			
Unit of Issue >>	80 g	75 g	4.5 g			
Composition (mass fraction, in %)						
Aluminum	0.44					
Calcium	0.04					
Free carbon	0.26	(0.04)				
Iron	0.13					
Nitrogen		(0.01)	*39.23*			
Oxygen		(0.08)	*1.20*			
Silicon carbide	97.37					
Total C	29.43	6.10	*0.107*			

112.2 - Cemented Carbides (powder form)

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

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

	887	888	889		
Description >>	Cemented Carbide (W-83,Co-10)	Cemented Carbide (W-64,Co-25,Ta-5)	Cemented Carbide (W-75,Co-9,Ta-5,Ti-4)		
Unit of Issue >>	100 g	100 g	100 g		
Carbon	(5.5)	(4.6)	(6.0)		
Cobalt	10.35	24.7	9.50		
Tantalum		4.77	4.60		
Titanium			4.03		

112.3 - Glasses (powder and solid forms)

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

	81a	89	92	93a	165a	620	621
Description >>	Glass Sand	Glass, Lead Barium	Soda-Lime Glass Powder	Borosilicate Glass	Glass Sand (Low Iron)	Soda Lime, Flat	Soda-Lime Container
Unit Size >>	75 g	45 g	45 g	wafer	75 g	set (3)	set (3)
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)							
Al_2O_3	0.66	0.18		2.28	0.059	1.80	2.76
As_2O_3		0.03				0.056	0.030
As_2O_5		0.36					
B_2O_3			0.70	12.56			
Cr_2O_3	46*				(1*)		
Fe_2O_3	0.082	0.049		0.028	0.012	0.043	0.040
K_2O		8.40	(0.6)	0.014		0.41	2.01
Li_2O							
Mn_2O_3							
Na_2O		5.70	(13.1)	3.98		14.39	12.74
P_2O_5		0.23					
SiO_2		65.35	(75.0)	80.8		72.08	71.13
SO_3		0.03				0.28	0.13
TiO_2	0.12	0.01		0.014	0.011	0.018	0.014
ZrO_2	0.034	0.005		0.042	0.006		0.007
Barium oxide		1.40					0.12
Cadmium oxide							
Calcium oxide		0.21	(8.3)	0.01		7.11	10.71
Chlorine		0.05		0.060			
Chromium							
Component							
Fluorine							
Iron							
Iron oxide				0.016			
Lead oxide		17.50					
Loss on Ignition		0.32	(0.42)				
Magnesium oxide		0.03	(0.1)	0.005		3.69	0.27
Manganese oxide		0.088					
Strontium oxide							
Zinc oxide			(0.2)				

112.3 - Glasses (powder and solid forms) (Cont.)

	1411	1412	1413	1830	1831	1834	2696
Description >>	Soft Borosilicate Glass	Multicomponent Glass	Glass Sand (High Alumina)	Soda Lime Float Glass	Soda Lime Sheet Glass	Fused Ore (Glass)	Silica Fume
Unit Size >>	set (10)	set (8)	75 g	set (3)	set (3)	disk	70 g
(Concentrations are in mass fractions, in %, unless noted by an asterisk for mg/kg)							
Al_2O_3	5.68	7.52	9.90	0.12	1.21	Al 20.71	0.2080
As_2O_3							
As_2O_5							
B_2O_3	10.94	4.53				B (1.1)	
Cr_2O_3							*2.11*
Fe_2O_3	0.050	(0.031)	0.24	0.121	0.087		*0.055*
K_2O	2.97	4.14	3.94	0.04	0.33	K 0.42	0.652
Li_2O		(4.50)				Li (4.6)	
Mn_2O_3							0.032
Na_2O	10.14	4.69	1.75	13.75	13.32	Na (0.14)	*0.129*
P_2O_5						P 0.152	*0.0863*
SiO_2	58.04	42.38	82.77	73.07	73.08	Si 20.19	95.61
SO_3				0.26	0.25		
TiO_2	0.02			0.011	0.019	Ti 1.11	
ZrO_2						Zr (0.047)	
Barium oxide	5.00	4.67	0.12			Ba 0.062	
Cadmium oxide		4.38					
Calcium oxide	2.18	4.53	0.74	8.56	8.20	Ca 0.095	0.426
Chlorine							
Chromium						(0.02)	
Component							
Fluorine							
Iron						0.32	
Iron oxide				0.032	0.025		
Lead oxide		4.40					
Loss on Ignition							(2.11)
Magnesium oxide	0.33	(4.69)	0.06	3.90	3.51	Mg 0.088	0.235
Manganese oxide							
Strontium oxide	0.09	4.55				Sr 0.153	
Zinc oxide	3.85	4.48					0.051

112.4 - Trace Elements (wafer form)

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

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

	610	611	612	613	614	615	616	617
Description >>	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass
Unit of Issue >>	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers
Element (in mg/kg) Wafer Thickness (in mm) 3 and 1								
Antimony	415.3	415.3	34.9	34.9	(106)	(106)	*0.078*	*0.078*
Arsenic	340	340	37.4	37.4				
Barium	453	453	38.6	38.6				
Boron	(351)	(351)	(32)	(32)	*130*	*1.30*	*0.20*	*0.20*
Cadmium	244	244	29.9	29.9	(0.55)	(0.55)		
Cerium			(39)	(39)				
Chromium	415	415	*35.0*	*35.0*				
Cobalt	(390)	(390)	35.5	35.5	*0.73*	*0.73*		
Copper	*444*	*444*	*37.7*	*37.7*	1.37	1.37	*0.80*	*0.80*
Dysprosium			(35)	(35)				
Erbium			(39)	(39)				
Europium			(36)	(36)	*0.99*	*0.99*		
Gadolinium			(39)	(39)				
Gallium					(1.3)	(1.3)	*0.23*	*0.23*
Gold	(25)	(25)	(5)	(5)	(0.5)	(0.5)	*0.18*	*0.18*
Iron	458	458	51	51	*13.3*	*13.3*	*11*	*11*
Lanthanum			(36)	(36)	*0.83*	*0.83*	*0.034*	*0.034*
Lead	426	426	38.57	38.57	2.32	2.32	1.85	1.85
Lithium	(488)	(488)	(40)	(40)				
Manganese	457	457	37.7	37.7				
Neodymium			(36)	(36)				
Nickel	458.7	458.7	38.8	38.8	(0.95)	(0.95)		

112.4 - Trace Elements (wafer form)

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

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

	610	611	612	613	614	615	616	617
Description >>	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass	Trace Elements in Glass
Unit of Issue >>	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers	4 wafers
Element (in mg/kg) Wafer Thickness (in mm) 3 and 1								
Potassium	(461)	(461)	(64)	(64)	30	30	29	29
Rubidium	425.7	425.7	31.4	31.4	0.855	0.855	*0.100*	*0.100*
Samarium			(39)	(39)				
Scandium					*0.59*	*0.59*	*0.026*	*0.026*
Selenium	115.2	115.2	16.1	16.1				
Silver	268	268	22.0	22.0	0.42	0.42		
Strontium	515.5	515.5	78.4	78.4	45.8	45.8	41.72	41.72
Thallium	*61.8*	*61.8*	*15.7*	*15.7*	*0.269*	*0.269*	*0.0082*	*0.0082*
Thorium	457.2	457.2	37.79	37.79	0.748	0.748	0.0252	0.0252
Titanium	(437)	(437)	50.1	*50.1*	*3.1*	*3.1*	2.5	2.5
Uranium	461.5	461.5	37.38	37.38	0.823	0.823	0.0721	0.0721
Ytterbium			(42)	(42)				
Zinc	(433)	(433)						

In addition to the elements listed above, the glass SRMs contain the following 25 elements: As, Be, Bi, Cs, Cl, F, Ge, Hf, Hg, Li, Lu, Mg, Nb, P, Pr, Se, S, Te, Tb, Tm, Sn, W, V, Y, and Zr.

Standard Reference Materials for Chemical Composition

113. Cement

113.1 - Cements and Related materials (powder form)

These portland (1880b, 1881a, 1884b, 1885a, 1886a, 1887a, 1888b, and 1889a) and calcium aluminate (1882a and 1883a) cement SRMs are for x-ray spectroscopic and chemical analysis of cements and related materials. [Also see Table 301.2 Cement Turbidimetry and Fineness, Table 113.2 Portland Cement Clinkers, and Table 201.1(3) Viscosity] SRM 2696 Silica Fume is a cement additive. Each unit of SRM 2696 consists of one bottle.

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

	633a	634a	1880b	1881a	1882a	1883a	1884b	1885a	1886a	1887a	1888b	1889a	2696
Description >>	Portland Cement	Portland Cement	Portland Cement	Portland Cement	Calcium Aluminate Cement	Calcium Aluminate Cement	Portland Cement	Portland Cement	Portland Cement (White Portland Cement with Low Iron)	Portland Cement	Portland Cement	Portland Cement (Blended with Limestone)	Silica Fume
Unit Size >>	4 x 5 g	100 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	5 x 4.5 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	70 g
Component (mass fraction, in %; unless otherwise noted with *µg/g or **ng/g)													
Al_2O_3	2.911	5.015	5.183	7.060	39.14	70.04	4.851	4.026	3.875	6.202	4.277	3.89	0.2080
Cr_2O_3	*0.0124*	*0.0114*	*0.01927*	0.0588	*0.113*	*0.006*	0.00791	0.0195	0.0024	*0.009*	*0.01253*	*0.0072*	
Fe_2O_3	3.738	3.362	3.681	3.09	14.67	0.078	2.937	1.929	0.152	2.861	3.062	1.937	*0.055*
K_2O	0.391	0.3572	0.646	1.228	0.051	0.014	0.957	0.206	0.093	1.100	0.658	0.605	0.655
Loss on Ignition at 950° C	*2.460*	*1.66*	*1.666*	(1.59)	(0.20)	(0.35)	(1.448)	(1.68)	(1.56)	(1.43)	(2.039)	(3.28)	*2.11****
Mn_2O_3	0.1176	0.0229	0.1981	0.1042	0.060	(0.003)	0.0750	0.0478	0.0073	0.1186	0.0652	0.2588	0.0299
Na_2O	0.203	*0.0842*	0.0914	0.199	0.021	0.30	0.278	1.068	0.021	0.4778	0.1364	0.195	*0.129*
P_2O_5	0.14263	0.1767	0.2443	0.1459	*00.70*	(0.003)	0.0965	0.1220	0.022	0.306	0.07307	0.110	*0.0863*
SiO_2	22.38	20.493	20.42	22.26	4.01	0.24	19.30	20.909	22.38	18.637	20.42	20.66	95.61
TiO_2	0.2157	0.2463	0.236	0.3663	1.786	*0.020*	0.2651	0.195	0.084	0.2658	0.2316	0.227	
Barium Oxide	*0.256*												
Calcium oxide	64.129	65.07	64.16	57.58	39.29	29.52	61.31	62.39	67.87	60.90	63.13	65.34	0.426
Chlorine	*0.087*		0.01830	*0.013*			*0.0065*	*0.0040*	*0.0042*	*0.0104*	0.0143		
Fluoride	*0.038*		*0.0539*				*0.0394*				*0.048*		
Free CaO	*1.60*		*1.567*	(0.29)			*0.418*	(2.05)	(2.16)	(0.53)	*1.42*	(0.58)	
Insoluble Residue	*0.23*		0.487	(5.2)			*0.159*	(0.22)	(0.23)	(0.13)	*0.32*	(0.66)	
LOI 220 °C to 550 °C	*0.381*						*0.261*				*0.616*		
LOI 45 °C to 220 °C	*0.264*						*0.590*				*0.573*		
LOI 550 °C to 950 °C	*1.805*						*0.597*				*0.850*		
Magnesium oxide	1.1532	1.0057	1.176	2.981	0.51	0.19	4.74	4.033	1.932	2.835	3.562	0.814	0.235

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

113.1 - Cements and Related materials (powder form) (Cont.)

	633a	634a	1880b	1881a	1882a	1883a	1884b	1885a	1886a	1887a	1888b	1889a	2696
Description >>	Portland Cement	Portland Cement	Portland Cement	Portland Cement	Calcium Aluminate Cement	Calcium Aluminate Cement	Portland Cement	Portland Cement	Portland Cement (White Portland Cement with Low Iron)	Portland Cement	Portland Cement	Portland Cement (Blended with Limestone)	Silica Fume
Unit Size >>	4 x 5 g	100 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	5 x 4.5 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	4 x 5 g	70 g
Component (mass fraction, in %; unless otherwise noted with *µg/g or **ng/g)													
Mercury	24.70**												
Strontium oxide	0.0507	*0.0735*	*0.0272*	0.036	*0.024*	*0.019*	0.0258	0.638	*0.018*	0.322	0.1009	0.042	
Sulfide Sulfur	*0.049*		*0.0131*	(0.035)			*0.0072*				*0.015*		
Sulfur trioxide	2.178	2.780	2.710	3.366			4.034	2.830	2.086	4.622	2.634	2.69	
Total	(100.41)		(100.49)	(100.18)	(99.95)	(100.78)	(100.54)	(100.18)	(100.12)	(100.21)	(100.42)	(100.09)*	
Zinc oxide	0.123	*0.0222*	*0.01054*	0.0489	*0.004*		*0.0042*	*0.0029*	(0.001)	0.0667	*0.01253*	0.0048	0.051

***Loss on Ignition at 750 ºC

113.2 - Portland Cement Clinkers (solid form)

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

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

	2686a	2687	2688			
Description >>	Portland Cement Clinker	Portland Cement Clinker	Portland Cement Clinker			
Unit Size >>	4 x 7 g	3 x 10 g	3 x 10 g			
Component (mass fraction, in %)						
Alite (C_3S)	63.35	71.24	64.95			
Alkali Sulfates	0.87					
Aluminate (C_3A)	2.46	11.82	4.99			
Aluminum oxide	(3.70)	(5.53)	(4.90)			
Aphthitalite	*0.74*					
Arcanite	*0.27*	0.92				
Belite (C_2S)	18.68	12.57	17.45			
Calcium oxide	(64.09)	(67.20)	(66.50)			
Ferrite (C_2AF)	10.76	2.81	12.20			
Free CaO		(2.2)	(0.2)			
Iron oxide	(3.65)	(1.98)	(4.07)			
Loss on Ignition at 1000 ºC	(0.51)	(0.17)	(0.21)			
Magnesium oxide	(4.81)	(1.48)	(0.98)			
Manganese trioxide	(0.13)	(0.04)	(0.03)			
Periclase	3.40					
Phosphorus pentoxide	(0.07)	(0.29)	(0.08)			
Potassium oxide	(0.49)	(0.72)	(0.35)			
Silicon dioxide	(21.71)	(21.43)	(22.68)			
Sodium oxide	(0.20)	(0.14)	(0.11)			
Strontium oxide	(0.04)	(0.11)	(0.13)			
Sulfur trioxide	(0.56)	(0.83)	(0.31)			
Titanium dioxide	(0.22)	(0.27)	(0.24)			
Total	**(100.18)**	**(100.20)**	**(100.60)**			

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

Standard Reference Materials for Chemical Composition

114. Engine Wear Materials

114.1 - Metallo-Organic Compounds (solid form)

These SRMs are for preparing solutions in oils of known and reproducible concentrations of metals. Each SRM unit consists of 5g of material.

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

			Elemental Composition (mass fraction, in % unless otherwise noted with *µg/g)												
SRM	**Description**	**Unit of Issue**	**Aluminum**	**Barium**	**Cadmium**	**Chromium**	**Copper**	**Iron**	**Nickel**	**Silicon**	**Silver**	**Sodium**	**Tin**	**Vanadium**	**Zinc**
1051b	Barium Cyclohexanebutyrate (Metallo-Organic)	5 g		28.7											
1052b	Bis(1-phenyl-1,3-butanediono) oxovanadium(IV)	5 g												13.01	
1053a	Cadmium Cyclohexanebutyrate (Metallo-Organic)	5 g			24.8										
1057b	Tin (Metallo-Organic)	5 g											22.95		
1065b	Nickel (Metallo-Organic)	5 g							13.89						
1066a	Silicon (Metallo-Organic)	5 g								14.14					
1069b	Sodium (Metallo-Organic)	5 g										12.0			
1075a	Aluminum (Metallo-Organic)	5 g	8.07												
1077a	Silver (Metallo-Organic)	5 g									42.60				
1078b	Chromium (Metallo-Organic)	5 g				9.6									
1079b	Iron (Metallo-Organic)	5 g						10.45							
1080a	Copper (Metallo-Organic)	5 g					16.37								

114.2 - Lubricating Oils

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

	1083	1085b	1818a	1819a	1848
Description >>	Wear Metals (Base Oil)	Wear Metals in Lubricating Oil	Chlorine in Lub. Base Oil	Sulfur in Lub. Base Oil	Lubricating Oil Additive Package
Unit Size >>	150 mL	set (5)	set (5)	set (5)	100 g

114.2(1) - Metals in Lubricating Oil

	1083	1085b	1848		
Description >>	Wear Metals (Base Oil)	Wear Metals in Lubricating Oil	Lubricating Oil Additive Package		
Unit Size >>	150 mL	set (5)	100 g		
Aluminum	(<0.5)	*300.4*			
Arsenic		*51.3*			
Barium		(314)			
Boron		(300)	0.137*		
Cadmium	(<0.04)	302.9			
Calcium		(298)	0.359*		
Chlorine	(<1.7)	*57.6*	927		
Chromium	(<0.02)	302.9			
Cobalt	(<0.01)				
Copper	(<0.5)	295.6			
Hydrogen			*12.3**		
Iron	(<1)	*301.2*			
Lead	(<0.04)	*297.7*			
Magnesium	(<0.1)	297.3	0.821*		
Manganese	(0.005)	(289)			
Molybdenum	(<0.01)	(296)			
Nickel	(<0.4)	295.9			
Nitrogen			*0.57**		
Phosphorus		*299.9*	0.788*		
Silicon	(<1)	*300.2*	*50*		

114.2(1) - Metals in Lubricating Oil

	1083	1085b	1848		
Description >>	Wear Metals (Base Oil)	Wear Metals in Lubricating Oil	Lubricating Oil Additive Package		
Unit Size >>	150 mL	set (5)	100 g		
Silver	(<0.05)	304.6			
Sodium	(<0.06)	305.2			
Sulfur	(980)		2.3270*		
Tin	(<0.4)	(294)			
Titanium	(<5)	*301.1*			
Vanadium	(<0.3)	297.8			
Zinc	(<0.08)	296.8	0.873*		

114.2(2) - Sulfur and Chlorine in Lubricating Base Oil

	1818a	1819a			
Description >>	Chlorine in Lub. Base Oil	Sulfur in Lub. Base Oil			
Unit Size >>	set (5)	set (5)			
II	60.0	741.1			
III	78.2	4022			
Iodine	31.6	423.5			
IV	154.4	4689			
Vanadium	234.0	6135			

114.3 - Catalyst Characterization Material (liquid form)

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

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

SRM	Description	Unit of Issue			
8590	High Sulfur Gas Oil Feed	946 mL			

Standard Reference Materials for Engineering Materials

115. Forensics

115.1 - Forensics

These SRMs and RMs are for calibrating and verifying the accuracy of methods used in a variety of forensic related applications.
Please click the desired links below to view related SRMs and RMs.

NIST SRMs Supporting Metrology and Traceability for the Forensic Science Community

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

Standard Reference Materials for Physical Properties

201. Ion Activity

201.1 - pH Calibration (powder form)

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

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

SRM	Description	Unit Size	pH(s) Values at 25 °C		
185h	Potassium Hydrogen Phthalate, pH Standard	60 G	4.008		
186g	pH Standards, (set of 186-I-g + 186-II-g)	set	(see text above)		
187e	Sodium Tetraborate (Borax), pH	30 g	9.186		
188	Potassium Hydrogen Tartrate, pH	60 g	3.557		
189c	Potassium Tetroxalate Dihydrate pH Standard	65 g	1.677		
191d	pH Standards, (set of 191d-I + 191d-II)	1 bottle x 25 g; 1 bottle x 30 g	10.014		
2193a	Calcium Carbonate pH Standard	30 g	12.469		

201.2 - Biological Buffer Systems (powder form)

These SRMs are used to calibrate clinical instruments (e.g., blood pH measurements), in the physiologically important range of pH 7 to 8. They are based on a biological buffer system for clinical pH measurements and are each certified for use as an admixture only. The pH(s) values for the buffer solutions are certified at 0.05 molal and 0.08 molal with respect to the free acid and the sodium salt admixture as a function of temperature. The certified temperature range is from 0 °C to 50 °C.

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

			pH(s) Values (at 37 °C)				
SRM	Description	Unit Size	0.05 molal	0.08 molal			
2181	HEPES Free Acid	60 g	7.364	7.373			
2182	NaHEPESate	60 g					
2183	MOPSO Free Acid	50 g	6.699	6.694			
2184	NaMOPSOate	50 g					

201.3 - pD Calibration (powder form)

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

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

SRM	Description	Unit of Issue	pD(s) Values (at 25 °C)
2185	Pot. Hydrogen Phthalate	60 g	4.518
2186-I	Potassium Dihydrogen Phosphate	30 g	7.428
2186-II	Disodium Hydrogen Phosphate	30 g	7.428
2191a	Sodium Bicarbonate	30 g	10.732
2192a	Sodium Carbonate	30 g	10.732

201.4 - Ion-Selective Electrode Calibration (powder form)

These SRMs are certified for the calibration of ion-selective electrodes and have conventional ionic activities based on the Stokes-Robinson hydration theory for ionic strengths greater than 0.1mol/L.

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

SRM	Description	Unit of Issue	Certified Component
2201	Sodium Chloride (Ion-Selective)	125 g	pNa, pCl
2202	Potassium Chloride (Ion-Selective Electrodes)	160 g	pK, pCl
2203	Potassium Fluoride (Ion-Selective Electrodes)	125 g	pF

201.5 - Electrolytic Conductivity (liquid form)

These SRMs are for calibrating and standardizing conductivity cells and meters used in water purity determinations and in clinical applications. SRM 3190 is an aqueous solution of hydrochloric acid; SRMs 3191 through 3193 are solutions of high purity potassium chloride in deionized water in equilibrium with atmospheric carbon dioxide. SRMs 3198 and 3199 are solutions of potassium chloride in a mixture of n-propanol and deionized water.

Conductivity SRMs 3194 (10000 µS/cm), 3195 (100000 µS/cm), and 3196 (20000 µS/cm) have been replaced by their own molality-based NIST traceable primary reference materials at conductivity levels of 1409.33 µS/cm, 108621 µS/cm, and 12825.7 µS/cm, respectively by starting with any issuance of SRM 999 Potassium Chloride.

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

SRM	Description	Unit of Issue	Nominal Conductivity (µS/cm)
3190	Aqueous Electrolytic Conductivity (25 µS/cm)	500 mL	25
3191	Aqueous Electrolytic Conductivity, (100 µS/cm)	500 mL	100
3192	Aqueous Electrolytic Conductivity (500 µS/cm)	8x50 mL	500
3193	Aqueous Electrolytic Conductivity (1000 µS/cm)	8x50 mL	1000
3198	Aqueous Electrolytic Conductivity (5 µS/cm)	500 mL	5
3199	Aqueous Electrolytic Conductivity (15 µS/cm)	500 mL	15

Standard Reference Materials for Physical Properties

202. Polymeric Properties

202.1 - Polymers (liquid, pellet, and powder forms)

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

For further information see: SP 260-42, SP 260-61, SP 260-144 , SP 260-147 and SP 260-152

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

SRM	Description	Unit Size		
705a	Polystyrene	5 g		
706a	Polystyrene	18 g		
1473b	Low Density Polyethylene Resin	60 g		
1474a	Polyethylene Resin	60 g		
1475a	Polyethylene, Linear	50 g		
1476a	Branched Polyethylene Resin	12 g		
1478	Polystyrene, Narrow Mol. Wt.	2 g		
1479	Polystyrene, Narrow Mol. Wt.	2 g		
1482a	Polyethylene, 14 K Molecular Weight	0.3 g		
1483a	Polyethylene, Linear	0.3 g		
1484a	Polyethylene, Linear	0.3 g		
1487	Poly (methyl methacrylate)	2 g		
1488	Poly (methyl methacrylate)	2 g		
1489	Poly (methyl methacrylate)	2 g		
1496	Polyethylene Gas Pipe Resin	0.9 kg		
2490	Non-Newtonian Polymer Solution for Rheological Measurements	100 mL		
2491	Non-Newtonian Polymer Melt for Rheology	100 mL		
2492	Bingham Paste Mixture for Rheological Measurements	kit for two batches		
2881	Polystyrene Absolute Molecular Mass Distribution Standard	0.3 g		
2885	Polyethylene (6280 g/mol)	0.3 g		
2886	Polyethylene (87000 g/mol)	0.3 g		
2887	Polyethylene (196,400 g/mol)	0.3 g		
8395	Tissue Engineering Reference, Scaffold	1 scaffold		
8396	Tissue Engineering Reference, Scaffold	1 scaffold		
8397	Tissue Engineering Reference, Scaffold	1 scaffold		
8456	Ultra High Molecular Weight Polyethylene	each		
8457	Ultra High Molecular Weight Polyethylene	10 cubes x 0.5 cm		

202.1(1) - Polymers

SRM	Description	Unit Size		
705a	Polystyrene	5 g		
706a	Polystyrene	18 g		
1473b	Low Density Polyethylene Resin	60 g		
1474a	Polyethylene Resin	60 g		
1475a	Polyethylene, Linear	50 g		
1476a	Branched Polyethylene Resin	12 g		
1478	Polystyrene, Narrow Mol. Wt.	2 g		
1479	Polystyrene, Narrow Mol. Wt.	2 g		
1482a	Polyethylene, 14 K Molecular Weight	0.3 g		
1483a	Polyethylene, Linear	0.3 g		
1484a	Polyethylene, Linear	0.3 g		
1487	Poly (methyl methacrylate)	2 g		
1488	Poly (methyl methacrylate)	2 g		
1489	Poly (methyl methacrylate)	2 g		
2492	Bingham Paste Mixture for Rheological Measurements	kit for two batches		
2881	Polystyrene Absolute Molecular Mass Distribution Standard	0.3 g		
2885	Polyethylene (6280 g/mol)	0.3 g		
2886	Polyethylene (87,000 g/mol)	0.3 g		
2887	Polyethylene (196,400 g/mol)	0.3 g		

202.1(2) - Melt Flow Rate

SRM	Description	Unit Size		
1473b	Low Density Polyethylene Resin	60 g		
1474a	Polyethylene Resin	60 g		
1496	Polyethylene Gas Pipe Resin	0.9 kg		

202.1(3) - Viscosity

SRM	Description	Unit Size		
2490	Non-Newtonian Polymer Solution for Rheological Measurements	100 mL		
2491	Non-Newtonian Polymer Melt for Rheology	100 mL		
2492	Bingham Paste Mixture for Rheological Measurements	kit for two batches		

202.1(4) - Biomaterials

SRM	Description	Unit Size	Properties	Purity/Constituent (mass fraction in %)
8395	Tissue Engineering Reference, Scaffold	1 scaffold		*200*
8396	Tissue Engineering Reference, Scaffold	1 scaffold		*300*
8397	Tissue Engineering Reference, Scaffold	1 scaffold		*450*
8456	Ultra High Molecular Weight Polyethylene	each	*- Young Modulus* *- Yield Strength* *- Ultimate Tensile Strength* *- Elongation*	
8457	Ultra High Molecular Weight Polyethylene	10 cubes x 0.5 cm	*- Young Modulus* *- Yield Strength* *- Ultimate Tensile Strength* *- Elongation*	

Standard Reference Materials for Physical Properties

203. Thermodynamic Properties

203.1 - Combustion Calorimetry (powder form)

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

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

SRM	Description	Unit of Issue	Heat of Combustion (in MJ/kg)*
39j	Benzoic Acid (Calorimetric Standard)	30 g	26.434
1656	Thianthrene Combustion Calorimetry	30 g	33.480
1657	Synthetic Refuse-Derived Fuel	100 g	13.87**
2151	Nicotinic Acid (Combustion Calorimetric Standard)	25 g	22.184
2152	Urea (Combustion Calorimetric Standard)	25 g	10.536

* 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).

203.2 - Solution Calorimetry

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

SRM	Description	Unit of Issue	Heat of Solution (in MJ/kg) Absorbed
1655	Potassium Chloride, KCl (cr) for Solution Calorimetry	30 g	0.235

203.5 - Differential Scanning Calorimetry and Differential Thermal Analysis

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

Enthalpy and Temperature of Fusion
Enthalpy and Heat Capacity
Thermal Analysis Purity Set

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

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

SRM	Description	Unit Size	Enthalpy of Fusion (J/g)	Melting Temperature (K)
2225	Mercury (Differential Scanning Calorimeters)	2.5 g	11.469	234.30
2232	Indium DSC Calibration Standard - Temperature and Enthalpy of Fusion	1 g	28.51	156.5985 °C
2234	Gallium for Thermal Analysis	approximately 2 g	80.097	302.9146
2235	Bismuth for Thermal Analysis	1.5 g	53.146	544.556

203.5(2) - Enthalpy and Heat Capacity

SRM	Description	Unit Size	Molecular Weight (in g/mol)	Temperature Range (in K)
705a	Polystyrene	5 g	170,900	10 to 350
720	Sapphire Heat Capacity	15 g		10 to 2250
781d2	Molybdenum (Heat Capacity)	10 cm		273.15 to 2800

203.5(3) - Thermal Analysis Purity Set

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

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

* Certified for four levels of p-ABA (in mol %).

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

These SRMs are for use in preparing defining fixed points of the International Temperature Scale of 1990, ITS-90.
For further information see SP 260-138

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

SRM	Description	Unit Size	Temperature (in °C)
740a	Zinc (Freezing Point)	200 g	419.527
741a	Tin (Freezing Point)	200 g	231.928
1745	Indium (Freezing Point)	200 g	156.5985
1746	Silver (Freezing Point)	300 g	961.78
1751	Gallium Melting-Point	200 g	29.7646

203.9 - Defining Fixed Point Cells, International Temperature Scale of 1990, ITS-90

These SRM fixed point devices are for use in the realization of the International Temperature Scale of 1990, ITS-90.

For further information see SP 260-127

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

SRM	Description	Unit Size	Temperature (in °C)
1747	Tin Freezing Point Cell	each	231.928
1748	Zinc Freezing Point Cell	each	419.527

203.10 - Reference Points (solid forms)

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

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

SRM	Description	Unit of Issue	Temperature (in °C)
45d	Cu Freezing Point	450 g	1084.8
49e	Lead Freezing Point	600 g	327.45
742	Alumina (Reference Point)	10 g	2052

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

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

For further information see SP 260-87 and SP 260-101

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

SRM	Description	Unit of Issue	Temperature (in °C)
1968	Gallium Melting Point	each	29.7646
1969	Rubidium Triple Point	each	39.3
1970	Succinonitrile Triple Point	each	58.0642
1971	Indium Freezing-Point	each	156.598
1972	1,3-Dioxolan-2-one Triple Point	60 g	36.3143

203.13 - Thermocouple Materials

For further information see SP 260-56, SP 260-134 and SP 260-139

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

SRM	Description	Unit of Issue	Temperature Range (°C)
1749	Gold vs. Platinum Thermocouple Thermometer	each	197 to 1767
1750	Standard Platinum Resistance Thermometer	each	0 to 1000
1967	Pt Thermocouple Wire	1 m	13.8033 K to 429.7485 (K)

203.15 - Thermal Conductivity of Iron (rod form)

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

SRM	Description	Unit Size	Conductivity at 293 K ($W \bullet m^{-1} \bullet k^{-1}$)	Temperature Range (K)
8420	Iron Electrolytic	0.64 D x 5.0	*77.9*	*2 to 1000*

203.16 - Thermal Expansion of Metal, Glass (rod form)

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

SRM	Description	Unit Size	Temperature Range (K)
731I1	Borosilicate Glass - Thermal Expansion	5 cm	80 to 680
731I2	Borosilicate Glass - Thermal Expansion	10 cm	80 to 680
731I3	Borosilicate Glass - Thermal Expansion	15 cm	80 to 680
738	Stainless Steel - Thermal Expansion	51 x 6.4 mm	293 to 780

203.17 - Thermal Resistance and Thermal Conductivity Properties of Glass, Silica, and Polystyrene (solid forms)

For further information see SP 260-130

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

SRM	Description	Unit of Issue	Temperature Range (K)	Thermal Resistance at 293 K ($m^2 \cdot K \cdot W^{-1}$)
1449	Thermal Resistance - Fumed Silica Board	each	297.1	1.2
1450d	Thermal Conductivity, Fibrous Glass Board	each	280 to 340	0.78*
1452	Thermal Resistance - Fibrous Glass Blanket for High Precision Measurements	each	297.1	0.6
1453	Thermal Resistance Expanded Polystyrene Board	each	285 to 310	0.4
1459	Thermal Resistance - Fumed Silica Board	each	297.1	1.2

*SRM 1450d is certified for thermal conductivity between 280 K to 340 K. Thermal resistance at 293 K is listed here to facilitate comparisons to related materials.

203.18 - Thermoelectric Materials

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

SRM	Description	Unit Size	Seebeck Coefficient Range
3451	Low Temperature Seebeck Coefficient Standard	bar	-20.83 µV/K to -208.17 µV/K

Standard Reference Materials for Physical Properties

204. Optical Properties

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

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

SRM 2009a Didymium Wavelength: SRM 2009a is now being supported by Calibration Service (Service No. 38061S). Also, SRM 2065 is a possible alternative. Click here for further information: http://ts.nist.gov/MeasurementServices/Calibrations/opticalproperties.cfm#38061S

SRM 2034 Holmium Oxide Solution Wavelength from 240 nm to 650 nm has been discontinued. For an approach using commercial CRMs and intrinsic properties to meet traceability needs formerly provided by this SRM, see Intrinsic Wavelength Standard Absorption Bands in Holmium Oxide Solution for UV/visible Molecular Absorption Spectrophotometry, JPCRD, Vol 34, No. 1, 2005.

The series number associated with SRM 2034 is the last two digits of the year of issue. All series of SRM 2034 are functionally equivalent; however, minor editorial changes in the certificate are incorporated from year to year. Thus, the latest certificate is always considered applicable to units of all prior series with the single exception of the series-specific expiration date. The expiration policy on SRM 2034 is that the unit expires on December 31 of the tenth year following its production. Thus, a Series 04 unit is certified through December 31, 2014.

The conversion from SRM 2037 Solvent Red Dye 24 to Solvent Red Dye 26 is provided in the SRM 2037 article (pages 3 & 4) of the June SRM 2005 Spotlight.

For further information see:

SP 260-51 - Glass Filters as a Standard Reference Material for Spectrophotometry Selection, Preparation, Certification, Use SRM 930 (November 1975).
SP 260-54 - Certification and Use of Acidic Potassium Dichromate Solutions as an Ultraviolet Absorbance Standard SRM 935 (August 1977).
SP 260-68 - Metal-On- Quartz Filters as a Standard Reference Material for Spectrophotometry SRM 2031 (April 1980).
SP 260-102 - Holmium Oxide Solution Wavelength Standard from 240 650 nm, SRM 2034 (July 1986).
SP 260-116 - Glass Filters as a Standard Reference Material for Spectrophotometry Selection, Preparation, Certification and Use of SRM 930 and SRM 1930 (March 1994).
SP 260-128 - Transmission Filters With Measured Optical Density at 1064 nm Wavelength--SRMs 2046, 2047, 2048, 2049, 2050, and 2051 (1998).

Also see: Table 204.2 - Other Optical Properties Standards

Notice regarding Letter Circular LC-1017: Users who need Letter Circular LC-1017 by Kasson Gibson et al. on spectrophotometric practices can find it reproduced in SP 260-116 as Appendix 3. SP 260-116 is available as a PDF from the link above. Appendix 3 starts on page 112 of the 200-page PDF file.

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

SRM	Description	Unit Size	Wavelength Range (in nm)			
931g	Liquid Absorbance Filters, UV-VIS	set (12)	302 to 678			
935a	Potassium Dichromate, UV Absorbance Standard	15 g	235 to 350			
1921b	IR Transmission Wavelength (Polystyrene Film)	1 card	3 µm to 18 µm			
1935a	Potassium Dichromate Solution/UV Absorbance Standard	set (10)	235, 247, 313, 350			
2031a	Metal-on-Quartz Filters	set (3)	250 to 635			
2035a	Near Infrared Wavelength/Wavenumber	each	975 to 1946			
2036	Near-IR Wavelength/Wavenumber Reflection	each	975 to 1946			
2037	Solvent Red 24 Diesel Fuel Dye	100 mg powder				

204.2 - Optical Properties

See also: Table 204.1 - Molecular Transmittance/Absorbance

For wavelength reference SRMs see:
Table 207.4 Optoelectronics (solid forms)

Molecular Luminescence (solid form) - This SRM is for use in the evaluation of methods and the calibration of fluorescence spectrometers. Issued in 1 g units, SRM 936 consists of solid quinine sulfate dihydrate. It is certified for the relative molecular emission spectrum, E (λ), in radiometric units for a solution of 1.28 x 10^{-6} mol/L quinine sulfate dihydrate in 0.105 mol/L perchloric acid using an excitation wavelength of 347.5 nm. The values of the molecular emission spectrum are certified at 5 nm wavelength intervals from 375 nm to 675 nm. The user must prepare the solution and transfer it to a cuvette of known pathlength. A detailed discussion of this SRM is given in Special Publication 260-64.

For further information see SP 260-64

Specular Spectral Reflectance - These SRMs are for calibrating the reflectance scale of integrating sphere reflectometers used to evaluate materials for solar energy collectors and to calibrate reflectometers used in evaluating the appearance of polished metals and metal-plated objects.

SRMs 2011, 2013, 2015, 2017 and 2021 are now being supported by Calibration Service (Service No. 38060S). Check here for further information:
http://ts.nist.gov/MeasurementServices/Calibrations/opticalproperties.cfm#38061S

For further information see SP 260-79 and SP 260-75

Infrared Reflectance (solid form)

Optical Rotation (powder form) - SRM 17f is intended for calibrating or checking polarimetric apparatus. In aqueous solution, the optical rotation of SRM 17e is value assigned at four wavelengths. Please note: Unlike SRM 917b, SRM 917c (current lot) is characterized for purity only. For optical rotation see SRM 17f Sucrose.

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

Liquid Refractive Index -Mineral Oil - SRM 1922 is intended for use as a calibration material for refractometers, specifically for the refractive index range applicable to solutions of sugar and water. SRM 1922 is a mineral oil characterized for refractive index in the visible light range, and consists of one bottle of approximately 30 mL of liquid. Certified values of refractive index were conducted on a precision goniometer using the classical method of minimum deviation.

Certified values are given for the refractive indices at six wavelengths, at 20 °C, and for the change in n with respect to temperature, dn/dT valid over the temperature range from 15 °C to 35 °C.

The refractive index corresponds to approximately 71.6 on the Brix scale.

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

SRM	Description	Unit Size			
17f	Sucrose Optical Rotation	60 g			
1010a	Microcopy Resolution Test Charts	set (5)			

204.2 - Optical Properties (Cont.)

SRM	Description	Unit Size			
1922	Liquid Refractive Index - Mineral Oil	30 mL			
1932	Fluorescein Solution	3 x 2 mL			
2036	Near-IR Wavelength/Wavenumber Reflection	each			
2241	Relative Intensity Correction Standard for Raman Spectroscopy: 785 nm Excitation	each			
2242	Relative Intensity Correction Standard for Raman Spectroscopy: 532 nm Excitation	each			
2243	Relative Intensity Correction Standard for Raman Spectroscopy: 488 nm and 514.5 nm Excitation	each			
2244	Relative Intensity Correction Standard for Raman Spectroscopy: 1064 nm Excitation	each			
2245	Relative Intensity Correction Standard for Raman Spectroscopy: 633 nm Excitation	each			
2246	Relative Intensity Correction Standard for Raman Spectroscopy: 830 nm Excitation	each			
2940	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Orange Emission 412 nm	each (12.5 x 12.5 x 45) mm			
2941	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Green Emission 427 nm	each (12.5 x 12.5 x 45) mm			
2942	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Ultraviolet Emission 310.0 nm	each (12.5 x 12.5 x 45) mm			
2943	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Blue Emission	each (12.5 x 12.5 x 45) mm			
2944	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Red Emission	510.0 nm			

204.2(1) - Fluorescence and Raman Spectroscopy

SRM	Description	Unit Size	Wavelength Range (nm)		
1932	Fluorescein Solution	3 x 2 mL	488 to 491		
2241	Relative Intensity Correction Standard for Raman Spectroscopy: 785 nm Excitation	each	785		
2242	Relative Intensity Correction Standard for Raman Spectroscopy: 532 nm Excitation	each	532		
2243	Relative Intensity Correction Standard for Raman Spectroscopy: 488 nm and 514.5 nm Excitation	each	488 and 514.5		
2244	Relative Intensity Correction Standard for Raman Spectroscopy: 1064 nm Excitation	each	1064		
2245	Relative Intensity Correction Standard for Raman Spectroscopy: 633 nm Excitation	each	632.8		
2246	Relative Intensity Correction Standard for Raman Spectroscopy: 830 nm Excitation	each	830		
2940	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Orange Emission 412 nm	each(12.5 x 12.5 x 45)mm	500 to 800		
2941	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Green Emission 427 nm	each(12.5 x 12.5 x 45)mm	450 to 650		
2942	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Ultraviolet Emission 310.0 nm	each(12.5 x 12.5 x 45)mm	320 to 430		
2943	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Blue Emission	each(12.5 x 12.5 x 45)mm	350 to 640		
2944	Relative Intensity Correction Standard for Fluorescence Spectroscopy: Red Emission	510.0 nm	530 to 830		

204.2(3) - Infrared Reflectance (solid form)

			Infrared Reflectance (solid form)			
SRM	Description	Unit Size	Wavelength Range (nm)			
2036	Near-IR Wavelength/Wavenumber Reflection	each	975 to 1946			

204.2(4) - Optical Rotation (powder form)

Optical Rotation (powder form) - SRM 17f is intended for calibrating or checking polarimetric apparatus. In aqueous solution, the optical rotation of SRM 17f is value assigned at four wavelengths. Please note: Unlike SRM 917b, SRM 917c (current lot) is characterized for purity only. For optical rotation see SRM 17f Sucrose.

			Optical Rotation (in mrad) 3/4 Aqueous Solution Wavelength (100 mm cell)			
SRM	**Description**	**Unit Size**	**546.2271 nm**	**589.4400 nm**	**632.9914 nm**	**882.60 nm**
17f	Sucrose Optical Rotation	60 g	*355.68*	*302.03*	*259.51*	*129.41*

204.2(5) - Optical Rotation

			Optical Rotation (in mrad) Aqueous Solution Wavelength (200 mm cell)			
SRM	**Description**	**Unit Size**	**546.2271 nm**	**589.4400 nm**	**632.9914 nm**	**882.60 nm**
17f	Sucrose Optical Rotation	60 g	*711.36*	*604.06*	*519.02*	*258.81*

204.2(6) - Photography (chart form)

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

For further information see SP 260-135

Technical Contact: maria.nadal@nist.gov

SRM	**Description**	**Unit Size**				
1010a	Microcopy Resolution Test Charts	set (5)				

204.2(7) - Liquid Refractive Index - Mineral Oil

Liquid Refractive Index - Mineral Oil - SRM 1922 is intended for use as a calibration material for refractometers, specifically for the refractive index range applicable to solutions of sugar and water. SRM 1922 is a mineral oil characterized for refractive index in the visible light range, and consists of one bottle of approximately 30 mL of liquid. Certified values of refractive index were conducted on a precision goniometer using the classical method of minimum deviation.

Certified values are given for the refractive indices at six wavelengths, at 20 °C, and for the change in n with respect to temperature, dn/dT valid over the temperature range from 15 °C to 35 °C.

The refractive index corresponds to approximately 71.6 on the Brix scale.

SRM	Description	Unit Size	*n* (at 20 °C)	dn/dT $°C^{-1}$	Wavelength (nm)	
1922	Liquid Refractive Index - Mineral Oil	30 mL	$1.47685 \pm 2x10^{-5}$ $1.47583 \pm 3x10^{-5}$ $1.47373 \pm 2x10^{-5}$ $1.47149 \pm 2x10^{-5}$ $1.46744 \pm 2x10^{-5}$ $1.46945 \pm 6x10^{-5}$	$-3.74x10^{-4} \pm 3x10^{-6}$ $-3.74x10^{-4} \pm 3x10^{-6}$ $-3.74x10^{-4} \pm 3x10^{-6}$ $-3.74x10^{-4} \pm 3x10^{-6}$ $-3.74x10^{-4} \pm 3x10^{-6}$ $-3.74x10^{-4} \pm 3x10^{-6}$	467.8 480.0 508.6 546.1 643.8 589.3	

204.10 - Optical Properties-Notes

SRM 930e: This SRM is for the verification of the transmittance and absorbance scales of visible absorption spectrometers. It differs from the prior series, SRM 930d, only with respect to tightened optical polishing tolerances. SRM 930e has been polished to a parallelism of 20 arc seconds or better, to reduce the optical deviation (relative to SRM 930d) and improve performance in instruments where wavelength dispersion occurs after the light has passed through the filter. SRM 930e consists of three individual Schott NG-type glass filters in separate metal cuvette-style holders and an empty filter holder. The nominal percent transmittances of the three filters are 10%, 20%, and 30%. The three filters are individually certified for transmittance at five wavelengths in the visible spectrum: 440.0 nm, 465.0 nm, 546.1 nm, 590.0 nm, and 635.0 nm. The optical transmittance neutrality of SRM 930e is sufficient for the filters to be used to accurately verify absorption spectrometers with maximum spectral bandpasses ranging from 2.2 nm to 6.5 nm for the five wavelengths at which the transmittances are certified. When SRM 930e is used in combination with SRM 1930, a 6-point stepwise verification of the transmittance scale is possible over the transmittance range from 1% to 50%. A detailed discussion of this SRM and SRM 1930 is given in Special Publication 260-116. (See NOTE.)

SRM 931g: This SRM is for the verification of the absorbance scales of ultraviolet and visible absorption spectrometers having narrow spectral bandpasses. SRM 931g consists of three sets of four solutions in sealed 10 mL ampoules. The four solutions include a blank solution and three concentrations of an empirical inorganic solution prepared from high purity cobalt and nickel metals dissolved in a mixture of nitric and perchloric acids. The user must transfer the blank and standard solutions to cuvettes of known pathlength. The spectrum has absorption maxima at 302 nm, 395 nm, and 512 nm, and a plateau in the region of 678 nm at which the absorbances are certified. The nominal absorbances of the three empirical inorganic solution standards are 0.3, 0.6, and 0.9, respectively, at wavelengths 302 nm, 395 nm, and 512 nm. At wavelength 678 nm, the nominal absorbances of the three solutions are 0.1, 0.2, and 0.3, respectively. The liquid filters may be used to verify absorption spectrometers with maximum spectral bandpasses ranging from 1.5 nm to 8.5 nm for the four wavelengths at which the absorbances are certified.

SRM 935a: This SRM is for the verification of the absorbance scales of ultraviolet absorption spectrometers having spectral bandpasses not exceeding 2 nm. Issued in 15 g units, SRM 935a consists of crystalline potassium dichromate of established purity. Solutions of ten known concentrations of this SRM in 0.001 N perchloric acid (between 20 mg/kg and 200 mg/kg) are certified for their specific absorbances under well-defined conditions. The user must prepare the liquid solutions from SRM 935a and then transfer them to cuvettes of known pathlength. The certified specific absorbances for the solutions prepared may be converted to their corresponding reference absorbance values using Beer's Law. Acidic SRM 935a solutions may be prepared anywhere within the concentra tion range of 20 mg/kg to 200 mg/kg to provide a standard with the desired absorbance at a specified wavelength. The spectrum has absorption maxima at 257 nm and 350 nm, and absorption minima at 235 nm and 313 nm at which the specific absorbance values are certified.
A detailed discussion of this SRM is given in Special Publication 260-54.

SRM 1921b: This SRM is for use in the calibration of the wavelength scale of spectrometers in the infrared (IR) spectral region from 3.2 mm to 18 mm (555 cm-1 to 3125 cm-1). SRM 1921a consists of three cards made of a matte finish polystyrene film, approximately 38 mm thick with a 25-mm diameter clear aperture and centered 38 mm from the bottom of a cardboard holder 5 cm ´ 11 cm ´ 2 mm in size. The certified wavelength values, corresponding peak wavenumber values for thirteen absorption peak positions in the 3 mm to 18 mm range, and a spectrum marked with arrows identifying the certified peaks, are provided with each unit. A detailed discussion of this SRM is given in Special Publication 260-122.

SRM 2031a: This SRM is for the verification of the transmittance and absorbance scales of ultraviolet and visible absorption spectrometers. SRM 2031a consists of three individual non-fluorescent, fused silica filters in separate metal cuvette-style holders and an empty filter holder. The nominal transmittances of the three filters are 10%, 30%, and 90%. The quartz base plates of the 10% and 30% filters carry different thicknesses of semi-transparent chromium metal that are optically contacted to quartz cover plates. The nominal 90% filter is a single clear quartz plate. The three filters are individually certified for transmittances at ten wavelengths in the ultraviolet and visible spectral regions: 250.0 nm, 280.0 nm, 340 nm, 360.0 nm, 400.0 nm, 465.0 nm, 500.0 nm, 546.1 nm, 590.0 nm, and 635.0 nm. The optical transmittance neutrality of SRM 2031 is such that wider spectral bandpasses can be used. Consequently, it is the only transmittance SRM that is suitable for use with those absorption spectrometers with large spectral bandpasses (up to 10 nm). A detailed discussion of this SRM is given in Special Publication 260-68. CAUTION: Because the 10% and 30% chromium-coated filters attenuate incident radiation by reflection to a large extent, SRM 2031a may possibly generate interreflections between optical surfaces in the sample compartment of some absorption spectrometers. Such interreflections may affect the accuracy of the transmittance measurement. Consequently, when contemplating the purchase of SRM 2031a, the user should contact the instrument manufacturer to verify that metal-on-quartz filters are compatible with the spectrometer.

NOTE: A recertification service for units of this SRM whose certification has expired, is available directly from the NIST Chemical Science Division.
Contact the Division for details: Phone: (301) 975-4115; Fax: (301) 977-0587.

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

Standard Reference Materials for Physical Properties

205. Radioactivity

205.1 - Radiation Dosimetry (wire form)

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

“Radionuclide Calibration Services”
“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”

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

SRM	Description	Unit of Issue	Cobalt Composition (mass fraction, in %)	NRC License or Equivalent Required
953	Neutron Density Monitor Wire	1 m	0.116	--

If no “X”, then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

205.3 - Special Nuclear Materials

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

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

205.4 - Radioactive Solutions

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

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

"Radionuclide Calibration Services"
"Radioactive SRM Purchasing Instructions & License Certification Form"
"Radioactive SRMs-General Info"

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

SRM	Description	Unit of Issue	Chemical Form	Reference Time (month/year)	Approx.Massic Activity (Bq/g)	Decay Modes	NRC License or Equivalent Required*
4222C	Carbon-14 Hexadecane Radioactivity Standard Solution	5 mL	n-hexadecane	09/90	50 000	β -	--
4226D	Nickel-63 Radioactivity Standard Solution	5 mL	$NiCl_2$	11/09	85 000	β-	X
4233E	Cesium-137 Radioactivity Standard Solution	5 mL	CsCl	09/05	300 000	β -,γ	X
4239	Strontium-90 Radioactivity Standard Solution	5 mL	$SrCl_2$	12/06	32 000	β -	X
4251C	Barium-133 Radioactivity Standard Solution	5 mL	$BaCl_2$	09/93	500 000	EC	X
4274	Holmium-166m Gamma-ray Emission Rate Standard Solution	5 mL	$HoCl_3$	02/06	20 000	γ	X
4288B	Technetium-99 Radioactivity Standard Solution	5 mL	$KTcO_4$	05/08	30 000	β –	--
4320A	Curium-244 Radioactivity Standard Solution	5 mL	$Cm(NO_3)_3$	02/96	35	α	X
4321C	Natural Uranium Radioactivity Standard Solution	5 mL	$UO_2(NO_3)_2$	01/92	250	α	X
4322C	Americium-241 Radioactivity Standard Solution	5 mL	$Am(NO_3)_3$	05/07	100	α	X
4323B	Plutonium-238 Radioactivity Standard Solution	5 mL	$Pu(NO_3)_6$	11/99	40	α	X
4324B	Uranium-232 Radioactivity Standard Solution	5 mL	$UO_2(NO_3)_2$	7/2002	30	α	X
4326	Polonium-209 Radioactivity Standard Solution	5 mL	$PoCl_4$	03/94	85	α, EC	X
4328C	Thorium-229 Radioactivity Standard Solution	5 mL	$Th(NO_3)_4$	12/07	35	α	X
4329	Curium-243 Radioactivity Standard Solution	5 mL	$Cm(NO_3)_3$	06/84	70	α	X
4330C	Plutonium-239 Radioactivity Standard Solution	3 mL	$Pu(NO_3)_6$	05/09	40	α	X
4332E	Americium-243 Radioactivity Standard Solution	5 mL	$Am(NO_3)_3$	10/08	40	α	X
4334I	Plutonium-242 Radioactivity Standard Solution	5 mL	$Pu(NO_3)_6$	01/10	25	α	X
4337	Lead-210 Radioactivity Standard Solution	5 mL	$Pb(NO_3)_2$	06/06	9 000	β -	X
4338A	Plutonium-240 Radioactivity Standard Solution	5 mL	$Pu(NO_3)_6$	05/96	40	α	X
4339b	Radium-228 Radioactivity Standard Solution	5 mL	$Ra(NO_3)_2$	10/10	200	α, EC	X
4340B	Plutonium-241 Radioactivity Standard Solution	5 mL	$Pu(NO_3)_6$	06/07	250	β -	X
4341	Neptunium-237 Radioactivity Standard Solution	5 mL	$Np(NO_3)_5$	03/94	100	α	X

205.4 - Radioactive Solutions

SRM	Description	Unit of Issue	Chemical Form	Reference Time (month/year)	Approx.Massic Activity (Bq/g)	Decay Modes	NRC License or Equivalent Required*
4342A	Thorium-230 Radioactivity Standard Solution	5 mL	$Th(NO_3)_4$	04/07	40	α	X
4361C	Hydrogen-3 Water Radioactivity Standard	500 mL	H_2O	09/98	2	β -	--
4370C	Europium-152 Radioactivity Standard Solution	5 mL	$EuCl_3$	02/87	90 000	β -,EC,γ	X
4915F	Cobalt-60 Radioactivity Standard Solution	5 mL	$CoCl_2$	11/05	60 000	β -,γ	X
4919I	Strontium-90 Radioactivity Standard Solution	5 mL	$SrCl_2$	12/06	4 200	β -	X
4926E	Hydrogen-3 Water Radioactivity Standard	20 mL	H_2O	09/98	5 000	β -	--
4927F	Hydrogen-3 Water Radioactivity Standard	5 mL	H_2O	09/98	600 000	β -	--
4929F	Iron-55 Radioactivity Standard Solution	5 mL	$FeCl_3$	11/05	59 000	EC, β -	--
4943	Chlorine-36 Radioactivity Standard Solution	3 mL	NaCl	12/84	10 000	β -	--
4947C	Hydrogen-3 Toluene Radioactivity Standard Solution	4 mL	H_2O	03/87	300 000	β -	--
4949C	Iodine-129 Radioactivity Standard Solution	5 mL	NaI	03/93	3 500	β -	X
4965	Radium-226 Radioactivity Standard Solution	5 mL	RaC_{l2}	09/91	30	α, γ	X
4966A	Radium-226 Radioactivity Standard Solution	5 mL	$RaCl_2$	01/07	290	α, γ	X
4967A	Radium-226 Radioactivity Standard Solution	5 mL	$RaCl_2$	09/03	2 500	α, γ	X
4969	Radium-226 Radioactivity Standard Solution	5 mL	$RaCl_2$	09/98	3	α, γ	X

*If no "X", then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

205.5 - Radiopharmaceuticals (solution and gaseous forms)

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

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

“Radionuclide Calibration Services”
“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”

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

SRM	Description	Unit of Issue	Approx Activity per gram(MBq · g -1)	Half Life (days)	Month Produced **	NRC License or Equivalent Required*
4401L	Iodine-131 Radioactivity Standard Solution	5 mL	25	8.0	Jan	X
4401H* **	Iodine-131 Radioactivity Standard Solution	5 mL	1 GBq/g	8.0	Jan	X
4404L	Thallium-201 Radioactivity Standard Solution	5 mL	7	3.0	June	X
4404H* **	Thallium-201 Radioactivity Standard Solution	5 mL	80	3.0	June	X
4407L	Iodine-125 Radioactivity Standard Solution	5 mL	3	59.4	Dec	X
4407H* **	Iodine-125 Radioactivity Standard Solution	5 mL	150	59.4	Dec	X
4410H	Technetium-99m Radioactivity Standard Solution	5 mL	1.5 $GBq{\cdot}g^{-1}$	0.3	May	X
4412L	Molybdenum-99 Radioactivity Standard Solution	5 mL	25	2.74	Feb	X
4412H* **	Molybdenum-99 Radioactivity Standard Solution	5 mL	890	2.74	Feb	X
4415L	Xenon-133 Radioactivity Standard Gas	Ampoule	150	5.243	Sept	X
4415H* **	Xenon-133 Radioactivity Standard Gas	Ampoule	12 $GBq{\cdot}g^{-1}$	5.243	Sept	X
4416L	Gallium-67 Radioactivity Standard Solution	5 mL	8	3.3	April	X
4416H* **	Gallium-67 Radioactivity Standard Solution	5 mL	90	3.3	April	X
4417L	Indium-111 Radioactivity Standard Solution	5 mL	4	2.8	Aug	X
4417H* **	Indium-111 Radioactivity Standard Solution	5 mL	60	2.8	Aug	X
4427L	Yttrium-90 Radioactivity Standard Solution	5 mL	5	64.0 h	Oct	X
4427H* **	Yttrium-90 Radioactivity Standard Solution	5 mL	55	64.0 h	Oct	X

* If no “X” then license is not required unless the institution possesses a specific license that covers the listed radionuclide.
** Orders for these radionuclides must be received by the 3rd day of the month in which the distribution is scheduled. (See SRM Users' Information section for scheduling updates). For further information contact NIST Radioactivity Group at radsrm@nist.gov
*** Only available to members of NRMAP, Inc. For information on membership: NRMAP/NIST Program

205.7 - Carbon-14 Dating (solid form)

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

“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”
“Radionuclide Calibration Services”

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

SRM	Description	Unit of Issue	NRC License or Equivalent Required*	Reference Time
4990C	Oxalic Acid Powder	8 x 28 g	--	1980

*If no “X”, then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

205.10 - Radon Emanation (encapsulated solution form)

These SRMs are intended for the calibration of radon-222 measuring instruments.

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

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

“Radionuclide Calibration Services”
“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”

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

SRM	Description	Unit of Issue	Nominal Total Radium 226 Activity (Bq)	NRC License or Equivalent Required*	Reference Time (month/year)
4971	Radon-222 Emanation Standard	0.2 mL	5	X	9/03
4972	Radon-222 Emanation Standard	0.2 mL	50	X	9/03
4973	Radon-222 Emanation Standard	0.2 mL	500	X	9/03
4974	Radon-222 Emanation Standard	0.2 mL	5 000	X	5/05

*If no “X”, then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

205.11 - Radioactive Natural-Matrix Materials (powder form)

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

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

“Radionuclide Calibration Services”
“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”

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

	4350B	4351	4352	4353A	4354	4355	4356	4357	4359
Description >>	River Sediment (Radioactivity)	Human Lung Powder	Human Liver Powder	Rocky Flats Soil Number 2	Lake Sediment Powder	Peruvian Soil Powder	Ashed Bone (Radioactivity)	Ocean Sediment Powder	Seaweed Radionuclide Standard
Unit Size >>	85 g	45 g	45 g	90 g	25 g	75 g	15 g	85 g	300 g
Massic Activity (mBq/g)									
NRC License or Equivalent Required*	--	--	--	X	--	--	--	--	--
Ref. Date	9-Sep-81	1200 EST 1-Oct-82	1-Jun-82	1-Apr-98	14-Feb-86	1-June-82	1200 EST 31-Dec-95	16-Feb-94	1-Jan-02
Americium-241 (^{241}Am)	0.15		0.15		1.1	0.004	0.0432		
Antimony-125 (^{125}Sb)					<0.14				
Cesium-137 (^{137}Cs)	29.0			21.6	59.2	0.33		12.7	0.933
Cobalt-60 (^{60}Co)	4.64				320	<0.016			
Curium-243,244 (^{243}Cm + ^{244}Cm)							0.12		
Europium-152 (^{152}Eu)	30.5					<0.23			
Europium-154 (^{154}Eu)	3.78					<0.2			
Europium-155 (^{155}Eu)						<0.2			
Lead-210 (^{210}Pb)				58.0					21.0
Plutonium-238 (^{238}Pu)	0.013		0.055	0.278	0.26		0.86	2.29	0.00606
Plutonium-239 (^{239}Pu)									0.0840
Plutonium-239,240 (^{239}Pu + ^{240}Pu)	0.508	1.1	2.06	16.8	4.00	0.0075	1.26	10.4	0.1296
Polonium-210 (^{210}Po)									20.6
Potassium-40 (^{40}K)								225	734
Radium-226 (^{226}Ra)	35.8			74.9			14.5	12.7	

- Certified values are normal font
- Reference values are italicized
- Values in parentheses are for information only

205.11 - Radioactive Natural Matrix Materials (powder form)

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

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

“Radionuclide Calibration Services”
“Radioactive SRM Purchasing Instructions & License Certification Form”
“Radioactive SRMs-General Info”

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

	4350B	4351	4352	4353A	4354	4355	4356	4357	4359
Description >>	River Sediment (Radioactivity)	Human Lung Powder	Human Liver Powder	Rocky Flats Soil Number 2	Lake Sediment Powder	Peruvian Soil Powder	Ashed Bone (Radioactivity)	Ocean Sediment Powder	Seaweed Radionuclide Standard
Unit Size >>	85 g	45 g	45 g	90 g	25 g	75 g	15 g	85 g	300 g
Massic Activity (mBq/g)									
NRC License or Equivalent Required*	--	--	--	X	--	--	--	--	--
Ref. Date	9-Sep-81	1200 EST 1-Oct-82	1-Jun-82	1-Apr-98	14-Feb-86	1-June-82	1200 EST 31-Dec-95	16-Feb-94	1-Jan-02
Radium-228 (^{228}Ra)								13.3	4.32
Strontium-90 (^{90}Sr)				10.5	1090		42.6	4.4	
Thorium-228 (^{228}Th)					28.6	42.2		12.1	
Thorium-230 (^{230}Th)						39.7	0.52	12.0	
Thorium-232 (^{232}Th)		0.21			26.8	43.0	0.98	13.0	2.40
Uranium-234 (^{234}U)		0.100		40.4			0.64		9.5
Uranium-235 (^{235}U)				1.88	0.75				0.400
Uranium-238 (^{238}U)		0.101		39.6	17.4		0.63		8.67

*If no “X”, then license is not required unless the institution possesses a specific license that covers the listed radionuclide.

Standard Reference Materials for Physical Properties

206. Electrical Properties

206.1 - Electrical Resistivity and Conductivity of Iron (rod form)

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

SRM	Description	Unit Size	Resistivity at 293 K (μΩ · cm)	Temperature Range (K)
8420	Iron Electrolytic	0.64 D x 5.0	*10.1*	*2 to 1000*

206.2 - Electrical Resistivity and Conductivity of Silicon (block and wafer forms)

SRMs 2541 through 2547 consist of single wafers intended for use as reference standards for sheet resistance and resistivity measurements utilizing the four-point probe method. SRMs 2541, 2542, and 2543 are made of Czochralski-grown, boron-doped silicon with (100) crystallographic orientation; SRMs 2546 and 2547 are float zone (111) orientation and phosphorus-doped by the neutron transmutation doping process.

SRM 2524 Optical Fiber Chromatic Dispersion Standard has been discontinued. Special-test chromatic-dispersion measurements can be arranged, for interested customers. Contact Tasshi Dennis at tasshi@boulder.nist.gov.

SRM 2525 Optical Retardance Standard has been discontinued. Special-test optical-retardance measurements can be arranged, for interested customers. Contact Paul Williams at pwilliams@boulder.nist.gov.

For further information see SP260-131

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

SRM	Description	Unit Size	Resistivity (Ω · cm)			
2541	Silicon Resistivity	each	0.01			
2543	Silicon Resistivity	each	1			
2546	Silicon Resistivity	each	100			

206.4 - Superconducting Critical Current (wire form)

This SRM is for checking the performance of measurement systems used in superconductor technology. It consists of 2.2 m of a multifilamentary niobium titanium, copper-stabilized superconducting wire wound in a single layer onto a spool with a core diameter of 8.7 cm.

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

SRM	Description	Unit of Issue	Critical Current (A)	Magnetic Field (T)
1457	Superconducting Nb-Ti Wire	each	293.30, 187.38, 124.72, 69.72	2.000, 4.000, 6.000, 8.000

206.5 - On-Wafer Calibration Artifacts

RM 8130 is an on-wafer calibration artifact for microwave scattering parameters.

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

SRM	Description	Unit Size	
8130	Coplanar Waveguide Calibration Set	each	

Standard Reference Materials for Physical Properties

207. Metrology

207.1 - Scanning Electron Microscope (SEM)

These SRMs and RM are for calibrating the magnification scale and evaluating the performance of scanning electron microscopes. SRM 484g can be used to calibrate the magnification scale of an SEM from 1000 to 20,000 X. SRM 2069b consists of graphitized rayon fibers with smooth and uniform edges on a 12.5 mm diameter SEM specimen mount with a 3 mm peg.

SRM 2800 is used in calibrating magnification and consists of a pattern of parallel lines whose nominal distances from the centerline range from ± 1µm to ± 5mm. Certified values are given for the center-to-center distance of each line from the centerline; the linewidths are not certified.

RM 8091 is used in checking the sharpness performance of scanning electron microscopes.

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

SRM	Description	Unit Size	Spacings
2800	Microscope Magnification Standard	each	1 µm to 5 mm
8090	SEM Magnification RM	each	
8091	Scanning Electron Microscope Sharpness Standard	each	
8820	Scanning Electron Microscope Scale Calibration Artifact	1 chip	
9951	Aluminum Wafer Drop-In Sample Holder (6 in)	each	
9952	Aluminum Wafer Drop-In Sample Holder (8 in)	each	

207.2 - Optical Microscope Linewidth Measurement (photomask)

SRM 2059 is a chrome-on-quartz photomask intended primarily for use in calibrating optical microscopes used to make dimensional measurements on antireflecting chromium integrated circuit photomasks, and supersedes SRM 473 Optical Microscope Linewidth Standard.

For further information see SP 260-129, SP 260-119, SP 260-117 and 260-114

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

SRM	Description	Unit of Issue	Linewidth (µm)	Pitch (µm)
2059	Photomask Linewidth Calibration Standard	each	0.25 to 32.0	0.5 to 250

207.3 - Depth Profiling (wafer form)

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

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

SRM	Description	Unit Size	Chromium	Nickel	Value
2133	Phosphorus Implant in Si Depth Profile	each			31P: 0.04927 µg/cm^2 (9.25 × 1014 atoms/cm^2)
2134	Arsenic in Silicon	each			75As: 0.09120 µg/cm^2 (7.330 × 1014 atoms/cm^2)
2135c	Ni-Cr Thin Film Depth Profile	each	41.3 µg/cm^2	49.4 µg/cm^2	
2137	B Implant in Si Depth Profile	each			10B: 0.01692 µg/cm^2 (1.018 × 1015 atoms/cm^2)

207.4 - Optoelectronics (solid forms)

These SRMs are intended for calibrating equipment (tunable diode lasers, video microscopes, optical spectrum analyzers, etc.) and measurement systems used in optoelectronics manufacturing and in the testing of optoelectronics components (lasers and detectors, optical fiber and fiber components, etc.). SRMs 2514, 2515, 2517a and 2519a are fiber-connected molecular gas absorption cells with lines in the 1510 to 1630 nm region; SRMs 2518 and 2538 are devices with stable and known polarization mode dispersion-2518 simulates mode-coupled differential group delay (DGD) typical of optical fiber, whereas 2538 is a non-mode-coupled device exhibiting relatively wavelength-independent DGD typically found in components; SRM 2520 is an optical fiber specimen with a known cladding diameter value; SRM 2522 is a steel wire, with a known diameter, like those used to size bores in fiber connector ferrules.

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

SRM	Description	Unit Size
2514	Wavelength Calibration Reference for 1560 nm to 1595 nm (Carbon Monoxide C-12/O-16)	each
2515	Wavelength Calibration Reference for 1595 nm to 1630 nm (Carbon Monoxide C-13/O-16)	each
2517a	High Resolution Wavelength Calibration Reference for 1510-1540 nm Acetylene 12C2H2	each
2518	Polarization Mode Dispersion	each
2519a	High Resolution Wavelength Calibration Reference for 1530-1565 nm Hydrogen Cyanide	each
2520	Optical Fiber Diameter	each
2522	Pin Gage for Optical Fiber Ferrul	each
2523	Optical Fiber Ferrule Geometry	each
2538	Polarization-Mode Dispersion (Non-Mode-Coupled)	each

207.5 - Nonmagnetic Coating Thickness (plate form)

These SRMs are suitable for calibrating instruments used in the measurement of organics and nonmagnetic inorganic coatings over steel. They consist of fine grained copper of varying thicknesses electrodeposited onto low carbon steel substrates having the properties of AISI 1010 steel. These uniform coatings are then overplated with a thin protective layer of chromium and the total coating thickness is then certified. The thickness range covered is between 6 µm and 2000 µm. Each unit is also supplied with a blank substrate. NOTE: Based on the stability of the coating, wear is the primary factor in determining if a copper on steel SRM needs reverification. If excessive wear is suspected, contact the NIST Thin Film and Nanostructure Processing Group at: Phone: (301) 975-6400; Fax: (301) 926-7679 or e-mail: coating.thickness@nist.gov

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

			Coating Thickness, nominal	
SRM	Description	Unit Size	(m)	(mils)
1358b	Coating Thickness Standard, (Nonmagnetic Coating on Steel)	set (4)	20, 80, 255, 1000	0.8, 3.1, 9.8, 39
1359b	Coating Thickness Standard (Nonmagnetic Coating on Steel)	set (4)	48, 140, 505, 800	2.0, 5.5, 20, 32
1361b	Coating Thickness Standard (Nonmagnetic Coating on Steel	set (4)	6, 12, 25, 48	0.2, 0.5, 1.0, 2.0
1362b	Coating Thickness Standard (Nonmagnetic Coating on Steel	set (4)	40, 80, 140, 205	1.6, 3.1, 5.5, 7.9
1363b	Coating Thickness Standard (Nonmagnetic Coating on Steel)	set (4)	255, 385, 505, 635	9.8, 16, 20, 26
1364b	Coating Thickness Standard (Nonmagnetic Coating on Steel	set (4)	800, 1000, 1525, 1935	32, 39, 59, 79

207.6 - Solder Thickness (plate form)

This SRM is for calibrating x-ray fluorescence equipment. Each unit, which consists of a 1.5 cm x 1.5 cm plate of an electroplated tin-lead alloy coating on a copper substrate, is individually certified for composition and mass per unit area.

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

SRM	Description	Unit of Issue	Coating Mass/Area, nominal (mg/cm^2)	Coating Thickness, estimated (m)	Composition
2321	Sn-Pb Alloy Coating	each	6.8	295, 7.5	Sn: 60 Pb: 40

207.9 - Microscale Dimensional Measurement Standards

SRM 2800 is intended primarily for use in calibrating the magnification or scale of microscopes used to make dimensional measurements. These microscopes include optical and scanning electron microscopes, imaging in either transmission or reflection modes, and scanning probe microscopes.

SRM 5000 is intended primarily for calibrating optical microscopes used to make overlay measurements. It is also useful in calibrating other types of instruments capable of making overlay measurements, such as scanning electron microscopes or atomic force microscopes, provided that they have an appropriate level of magnification and have the proper sample-holding capabilities.

SRM	Description	Unit Size			
2800	Microscope Magnification Standard	each			
5000	Overlay Wafer Standard	each			
5001	Two-Dimensional Grid Photomask, Std	each			
8820	Scanning Electron Microscope Scale Calibration Artifact	1 chip			

Standard Reference Materials for Physical Properties

208. Liquids and Glasses

208.1 - Chemical Resistance [Durability] of Glass (solid form)

These SRMs are for checking test methods and calibrating equipment used to determine the resistance of glass containers to chemical attack. The values given represent the volume of 0.02 N sulfuric acid used to titrate to the methyl red end point of the alkaline extract from a crushed sample of glass after exposure to high purity water at 121° C.

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

SRM	Description	Unit of Issue	mL of N/50 H2 SO4
622	Soda-Lime Silica (Durability)	2.2 kg	7.67
623	Borosilicate (Durability)	2.2 kg	0.34

208.2 - Electrical Properties of Dielectrics

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

SRM 774 is a lead-silica glass block that is intended to validate methods used to determine the low-frequency dielectric constant and ac loss characteristics of insulating materials per ASTM D 150. Certified values of dielectric constant and dissipation factor are specified at frequencies between 0.06 to 10 kHz.

SRM 2870 is a cross-linked polystyrene puck that is intended to validate techniques used to measure the high-frequency relative permittivity and loss tangent of insulating materials. Certified values for relative permittivity and loss tangent are specified at 10 GHz, including supplemental data between 1 and 25 GHz.

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

SRM	Description	Unit of Issue	Geometry and Unit Size	Parameter(s)
624	Lead-Silica, for dc resistivity	200 g	Block 5 cm square 2.5 cm thick	DC Volume Resistivity
774	Lead-Silica (Dielectric Constant)	block	Block	Dielectric
2870	Relative Permittivity and Loss Tangent, 1422 Cross-Linked Polystyrene	circular-cylindrical puck	Circular-Cylindrical Puck 60 mm diameter 10 mm thick	Relative Permittivity Loss Tangent

208.3 - Viscosity of Glass (bar form)

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

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

	717a				
Description >>	Hi Boron Glass Viscosity				
Unit of Issue >>	450 g				
Log 10 [Viscosity (Pa · s)]	1 at 1555.4 °C 2 at 1256.5 °C 3 at 1065.1 °C 4 at 932.1 °C (5) at 834 °C (6) at 758 °C (7) at 697 °C (7) at 697 °C (8) at 647 °C (9) at 606 °C (10) at 570 °C (11) at 540 °C				

208.4 - Glass Liquidus Temperature (solid form)

This SRM is for checking test methods and for calibrating equipment used to determine the liquidus temperature of glass by the gradient furnace methods per ASTM C 829.

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

SRM	Description	Unit Size	Method	Temperature (C)	
773	Soda-Lime-Silica (Glass Liquidus)	7-2.5 cm^2 x 0.6cm, ~65g	A (boat) B (perforated plate)	988 991	
1416	Aluminosilicate Glass for Liquidus Temperature	250 g		1147	

208.5 - Viscosity Fixpoints (solid forms)

These SRMs are for the calibration of equipment for the determination of the softening, annealing, and strain points of glass. SRM 709 is also used to measure relative stress optical coefficient. [Also see table 208.6].

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

SRM	Description	Unit Size	Annealing Point (°C)	Softening Point (°C)	Strain Point (°C)
709	Extra Dense Lead Glass	500 g	328	384	311
714	Alumina Glass Anneal Pt	225 g	710	908	622
717a	Hi Boron Glass Viscosity	450 g	(513)	(719)	(470)

208.6 - Relative Stress Optical Coefficient (bar form)

This SRM is for calibrating instruments used to measure the relative stress optical coefficient of glass.

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

SRM	Description	Unit Size	Relative Stress Optical Coefficient (C) at λ=546.1 nm (Value x 10^{-12} m^2/N)
709	Extra Dense Lead Glass	4 x 4 x 5 cm Block	C = 1.359

208.8 - Density (liquid form)

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

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

SRM	Description	Unit Size	Density (kg/m^3)
211d	Toluene Liquid Density	4x5 mL	871.476 ± 0.025
2214	Isooctane Liquid Density	4x5 mL	695.969 ± 0.035

Standard Reference Materials for Physical Properties

209. X-Ray Diffraction

209.1 - X-Ray Diffraction (powder and solid forms)

SRMs 656, 676a, 674b, 1878a and 1879a consist of high phase purity materials for use in the quantitative analysis of samples by the internal standard method. SRM 656 consists of 2 silicon nitride powders, one high in α phase powder, the other high in β phase powder. SRMs 640d, 660b, 675, and 1976a consist of materials with select crystallographic and microstructure properties used in the evaluation of diffraction equipment for the following variables; 1) d-spacing or line position, 2) line or instrument intensity, and 3) instrumental or sample contributions to the shape of reflection profiles. SRM 1976a, a sintered alumina plate, is also certified with respect to lattice parameters as well as 13 relative intensity values from 22° to 155° 2q (Cu Ka).
SRM 1990 is certified for lattice parameter. SRM 1994 is certified for miss orientation of the crystal axis relative to the surface normal.

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

SRM	Description	Unit Size	XRD Application
640d	Silicon Powder Line Position + Line Shape Std for Powder Dif	7.5 g	Line Position Line Shape
656	Silicon Nitride Powders for Quantitative Analysis	2 x 10 g	Quantitative Analysis
660b	Line Position and Line Shape, Std for Powder Diffraction	6 g	Line Position Line Shape
674b	X-Ray Powder Diffraction Intensity Set (Quantitative Powder Diffraction Standard)	10.00 g (powder)	Quantitative Analysis
675	Line Position, Mica (XRD)	7.5 g	Line Position - Low 2θ
676a	Alumina Powder for Quantitative Analysis by X-ray Diffraction	20 g	Quantitative Analysis
1878a	Respirable Alpha Quartz	5 g	Quantitative Analysis
1879a	Respirable Cristobalite	5 g	Quantitative Analysis
1976b	Instrument Response Std for, X-Ray Powder Diffraction	1 disc	
1990	Lattice Parameter/Single, Crystal (Ruby Spheres)	3 spheres	Quantitative Analysis
1994	Standard Silicon Single Crystal Wafer for Crystalline Orientation	100-mm wafer	Crystalline Orientation
1995	Standard Sapphire Single Crystal Wafer for Crystalline Orientation	50-mm wafer	Crystalline Orientation
2000	Calibration Standard for High-Resolution X-Ray Diffraction	1 block	Line Position
2012	Calibration Standard for High Resolution X Ray Diffraction	wafer	Line Position

Standard Reference Materials for Engineering Materials

301. Sizing

301.1 - Particle Size (powder and solid forms)

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

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

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

SRMs 1690, 1691, 1692, 1963 and 1964 are commercially manufactured monodisperse latex particles in a water suspension. SRMs 1960 and 1961 are monodisperse latex particles in a water suspension produced by the National Aeronautics and Space Administration (NASA). SRM 1965 consists of two different groupings of the SRM 1960 particles mounted on a microscope slide.

RMs 8011, 8012 and 8013 are gold nanoparticles in water.

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

SRM	Description	Unit Size	Particle Diameter Distribution
659	Particle Size Distribution Standard for Sedigraph Calibration	set (5)	0.2 to 10 µm
1003c	Glass Beads - Particle Size Distribution	28 g	20 to 45 µm (635 to 325 mesh)
1004b	Glass Beads - Particle Size Distribution	43 g	40 to 150 µm (270 to 120 mesh)
1017b	Glass (Particle Size)	70 g	100 to 400 µm (140 to 45 mesh)
1018b	Glass (Particle Size)	87 g	220 to 750 µm (60 to 25 mesh)
1019b	Glass (Particle Size)	200 g	750 to 2450 µm (20 to 10 mesh)
1021	Glass (Particle Size)	4 g	2 to 12 µm
1690	Polystyrene Spheres (1 µm Diameter Particle Size)	5 mL	0.895 µm
1691	Polystyrene Spheres (0.3 µm Diameter Particle Size)	5 mL	0.269 µm
1961	Polystyrene Spheres (30 µm Diameter Particle Size)	5 mL	29.64 µm
1963a	Nominal 100 nm Diameter Polystyrene Spheres	5 mL	0.1018 µm
1964	Nominal 60 nm Diameter Polystyrene Spheres	5 mL	0.06039 µm
1965	Polystyrene Spheres (on Slide) (10 µm Particle Size)	slide	9.94 µm (hexagonal array) 9.89 µm (unordered clusters)
1978	Zirconium Oxide (Particle Size)	5 g	0.33 to 2.19 µm
1982	Zirconia Thermal Spray Powder	10 g	10 to 150 µm
1984	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Acicular)	14 g	9 to 30 µm
1985	Thermal Spray Powder - Particle Size Distribution Tungsten Carbide/Cobalt (Spheroidal)	14 g	18 to 55 µm

301.1 - Particle Size (powder and solid forms) (Cont.)

SRM	Description	Unit Size	Particle Diameter Distribution
8010	Sand for Sand Sieve Analysis	3 x 150 g	*A (30 to 100 mesh)* *C (70 to 200 mesh)* *D (100 to 325 mesh)*
8011	Gold Nanoparticles, Nominal 10 nm Diameter	two 5 mL ampoules	*10 nm*
8012	Gold Nanoparticles, Nominal 30 nm Diameter	two 5 mL ampoules	*30 nm*
8013	Gold Nanoparticles, Nominal 60 nm Diameter	two 5 mL ampoules	*60 nm*
8988	Titanium Dioxide Powder - Particle Size Distribution	6 g	*0.1 to 0.5 µm*

301.2 - Cement and Coal Fly Ash Fineness

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

SRM 114q is for calibrating the Blaine fineness meter according to the latest issue of ASTM C204, to calibrate the Wagner turbidimeter according to ASTM C115, to determine sieve residue according to ASTM C430, and to verify procedure for particle size distribution by a laser diffraction method (no-standard method available). Each set consists of 20 sealed vials, each containing approximately 5g of cement.

For further information see SP 260-161 SP 260-166

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

SRM	Description	Unit of Issue	Properties	Value
46h	Portland Cement Fineness Std	10 x 5 g	Sieve Residue (45 µm residue) (No. 325)	7.43 %
114q	Portland Cement Fineness Std	set (20)	Residue on 45 µm (No. 325) sieve Specific Surface area (Wagner turbidimeter) Specific Surface area (Blaine Air Permeability Apparatus) Particle Size Distribution	0.79 % 2183 $cm^2 g^{-1}$ 3818 $cm^2 g^{-1}$ 1-128 µm
2689	Coal Fly Ash	set (3)	Sieve Residue (45 µm residue) (No. 325)	*12.8 %*
2690	Coal Fly Ash	set (3)	Sieve Residue (45 µm residue) (No. 325)	*8.0 %*
2691	Coal Fly Ash	set (3)	Sieve Residue (45 µm residue) (No. 325)	*10.5 %*

301.3 - Electrophoretic Mobility, E (suspension form)

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

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

SRM	Description	Unit Size	Property Certified
1980	Positive Electrophoretic Mobility	500 mg/L	$+\mu_E$, 2.53 µm • cm/V • s

301.4 - Surface Area of Powders and Mercury Porosimetry Standards

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

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

SRM	Description	Unit Size
1898	Titanium Dioxide Nanomaterial	15 g
1900	Specific Surface Area Standard	4 g
1917	Mercury Porosimetry Standard	10 g
1918	Mercury Porosimeter Intrusion Standard	12 g
2206	Controlled Pore Glass - BET Specific Surface Area (300nm)	5 g
2207	Controlled Pore Glass - BET Specific Surface Area (18nm)	5 g
2696	Silica Fume	70 g

301.5 - Particle Count Materials (powder and suspension forms)

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

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

SRM	Description	Unit Size	Particle Concentration
2806a	Medium Test Dust (MTD) in Hydraulic Fluid	2x400 mL	
8631a	Medium Test Dust (MTD)	20 g	*4 µm to 40 µm*
8632	Ultra Fine Test Dust	20 g	*1 µm to 20 µm*

Standard Reference Materials for Engineering Materials

302. Surface Finish

302.1 - Microindentation Hardness (block form)

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

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

SRM	Description	Unit of Issue	Hardness, nominal (kgf/mm^2)	Load (Newtons)
1893	Copper Microhardness Test Block (Knoop)	each	125	0.245, 0.490, 0.981
1894a	Microhardness Cu-Vickers	each	125	0.245, 0.490, 0.981
1895	Nickel Microhardness Test Block (Knoop)	each	600	0.245, 0.490, 0.981
1896b	Microhardness Ni-Vickers	each	600	0.245, 0.490, 0.981
1905	Microhardness, Ni-Knoop	each	600	2.943
1906	Microhardness, Ni-Knoop	each	600	4.905
1907	Microhardness, Ni-Knoop	each	600	9.81
1908	Vickers Microhardness of Nickel	each	600	2.943
1909	Vickers Microhardness of Nickel	each	600	9.81
2798a	Vickers Microhardness of Nickel	each	600	4.905
2828	Knoop Microhardness of Steel	1 block	800	4.90
2829	Vickers Microhardness of Steel	1 block	800	4.90
2830	Microhardness, Ceramic-Knoop	each	1500	19.6
2831	Vickers Hardness, Ceramics and Hardmetals	each	1530	9.8

302.2 - Abrasive Wear (block form)

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

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

SRM	Description	Unit Size		
1857	Tool Steel for Abrasive Wear	2 blocks		

302.4 - Surface Roughness (block form)

These SRMs are for calibrating stylus instruments that measure surface roughness. These electroless-nickel coated steel blocks have a sinusoidal roughness profile machined on the top surface.

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

SRM	Description	Unit of Issue	Roughness, Ra (µm)	Wavelength, D (µm)
2071b	Sinusoidal Roughness	each	0.3	100
2072	Sinusodial Roughness	each		
2073a	Sinusoidal Roughness	each	3	100
2074	Sinusoidal Roughness	each	1	40
2075	Sinusoidal Roughness	each	1	800

302.5 - Rockwell Hardness (block form)

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

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

SRM	Description	Unit of Issue	Nominal Hardness			
2810	Rockwell C Hardness, Low Range	each	25 HRC			
2811	Rockwell C Hardness, Mid Range	each	45 HRC			
2812	Rockwell C Hardness, High Range	each	63 HRC			
2816	Rockwell Hardness 15N Scale Low Range (Nominal 72 HR 15N)	1 block	72 HR15N			
2817	Rockwell Hardness 15N Scale Mid Range (Nominal 83 HR 15N)	1 block	83 HR15N			
2818	Rockwell Hardness 15N Scale,High Range (Nominal 91 HR 15N)	1 block	91 HR15N			
2819	Rockwell Hardness 30N Scale Low Range (Nominal 45 HR30N)	1 block	45 HR30N			
2820	Rockwell Hardness 30N Scale Mid Range (Nominal 64 HR30N)	1 block	64 HR30N			
2821	Rockwell Hardness 15N Scale High Range (Nominal 79 HR30N)	1 block	79 HR30N			

Standard Reference Materials for Engineering Materials

303. Nondestructive Evaluation

303.2 - Artificial Flaw for Eddy Current NDE

RM 8458 provides a flaw of known size and geometry that closely resembles an actual fatigue crack. It is intended to produce a response suitable for calibrating eddy current nondestructive evaluation (NDE) systems. The flaw size is 3.0 mm ± 0.1 mm long by 1.0 mm deep in a 7 cm x 7 cm x 2 cm block of 7075-T651 aluminum alloy, heat treated to the T6 temper.

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

SRM	Description	Unit Size	
8458	Artificial Flaw for Eddy Current	each	

Standard Reference Materials for Engineering Materials

305. Fire Research

305.1 - Surface Flammability (sheet form)

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

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

SRM	Description	Unit Size	Certification
1002d	Hard Board (Surface Flammability)	set (4)	Flame Spread Index, I = 203 Heat Evolution Factor, Q = 42.0

305.2 - Smoke Density Chamber (sheet form)

These SRM are certified for maximum specific optical density and for performing operational checks of smoke density chambersin accordance with NFPA 258.

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

SRM	Description	Unit Size	Maximum Specific Optical Density
1007b	Smoke Density Chamber Standard	set (3)	DM (corr.) = 421 to 493

305.3 - Smoke Toxicity (granular and sheet forms)

SRM 1048 is for checking the operation of the Cup Furnace Smoke Toxicity Method under two observation periods. It consists of eight sheets, 16 cm x 16 cm x 0.76 cm each, of acrylonitrile-butadiene-styrene copolymer. SRM 1049 is for checking the operation of the University of Pittsburgh I Smoke Toxicity Method. It consists of 150 g of Nylon 6/6 granules which is enough to determine the LC50 value four times.

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

SRM	Description	Unit of Issue	Combustion Mode	Observation Time	Values LC50	Values N-Gas
1048	Smoke Toxicity (Cup Furnace)	8 sheets	Flaming (ABS Sheets) Nonflaming	WE* WE & PE** WE* WE & PE**	27 25 58 53	1.4 1.5 1.2 1.4
1049	Smoke Toxicity (University of Pittsburgh)	150 g	(Nylon 6/6)	30 min. exposure 10 min. post-exposure		

*WE = within 30 min.
**WE & PE = 30 min + 14 d.

305.4 - Flooring Radiant Panel (sheet form)

This SRM consists of three sheets of kraft paperboard. It is for checking the operation of flooring radiant panel test apparatus used to measure critical radiant flux as per ASTM E 648.

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

SRM	Description	Unit Size	Critical Radiant Flux
1012	Flooring Radiant Panel	set (3)	0.36 W/cm^2

305.5 - Standard Cigarettes for Ignition Strength and Ignition Resistance Testing

SRM 1082 is intended for use by test laboratories to assess and control their testing of cigarette ignition in accordance with ASTM Standard Methods E 2187-04 (or ASTM E 2187-02b). SRM 1196 is intended for use by test laboratories to test mattresses, upholstered furniture and its components, and thermal insulation for resistance to cigarette ignition in accordance with 16 CFR 1632, 16 CFR 1634 (proposed) and 16 CFR 1209. SRM 1202 is used in conjunction with SRM 1196 to evaluate upholstery for their tendency to support smoldering combustion.

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

SRM	Description	Unit Size	Measurand
1082	Cigarette Ignition Strength Standard	1 carton (200 cigarettes)	Ignition Strength 12.6 %
1196	Standard Cigarette for Ignition Resistance Testing	2 cartons(400 cigarettes)	Ignition Strength 90.0 %
1202	Fabric Smoldering Ignition Testing Materials	1 box	Mass Loss 16 %

Standard Reference Materials for Engineering Materials

309. Miscellaneous Performance Engineering Materials

309.1 - Impact Standards: Charpy V-Notch and Izod Impact Specimens

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

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

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

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

SRM 2115 is a NIST Izod specimen. Each SRM consists of a set of specimens needed to perform one evaluation. This SRM complies with ASTM Standard E23 dimensional requirements for the Izod (Cantilever Beam) impact specimen, Type D, geometry.

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

			Energy Range		
SRM	**Description**	**Unit of Issue**	**(J)**		
2092	Low-Energy Charpy V-Notch Impact Specimen (NIST-Verification)	set	13 to 20		
2093	Low Energy Charpy V-Notch Impact Specimen (Self- Verification)	5 bars			
2096	High-Energy Charpy V-Notch Impact Specimen (NIST-Verification)	set	88 to 133		
2097	High Energy Charpy V Notch Impact Specimen (Self-Verification)	5 bars			
2098	Super High-Energy Charpy V-Notch Impact Specimen (NIST-Verification)	set	176 to 244		
2112	Dynamic Impact Force Verific Specimens (Nominal 24kN)	set of four			
2113	Dynamic Impact Force Verific, Specimens (Nominal 33kN)	set of four			
2115	Low Energy Izod Impact Specimen (NIST-Verification)	set	13 to 25		

309.4 - Tape Adhesion Testing (sheet form)

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

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

SRM	**Description**	**Unit of Issue**			
1810a	Linerboard	50 each			

309.5 - Bleached Kraft Pulps (sheet form)

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

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

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

SRM	Description	Unit Size		
8495	Northern Softwood	10 sheets		
8496	Eucalyptus Hardwood	10 sheets		

309.6 - Secondary Ferrite Standards

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

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

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

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

309.7 - Fracture Toughness of Ceramics

SRM 2100 Fracture Toughness of Ceramic is intended for verification of fracture toughness testing procedures and may be used in conjunction with ASTM Standard Test Method ASTM C1421-99 “Standard Test Methods for Fracture Toughness of Advanced Ceramics.”

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

The certified fracture toughness is 4.57 M Pa • $m^{1/2}$ ± 0.23 M Pa • $m^{1/2}$

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

SRM	Description	Unit Size	
2100	Fracture Toughness of Ceramic	5 bars	

309.8 - Magnetic Moment

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

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

SRM	Description	Unit Size	Certified Value
762	Magnetic Moment Standard Nickel Disk	6 mm dia	54.78 A•M^2/kg±0.15 A•m^2/kg (54.78 emu/g ± 0.15 emu/g)
764a	Magnetic Susceptibility Standard - Platinum Cylinder	3 mm dia. x 3.42 L	1.268×10^{-8} m^3/kg ± 0.004×10^{-8} m^3/kg (1.009×10^{-6} emu/g/0e ± 0.003×10^{-6} emu/g.0e)
772a	Nickel Sphere for Magnetic Moment	each	3.47 mA•m^2 ± 0.01 mA•m^2 (3.47 emu ± 0.01 emu)
2853	Magnetic Moment Standard - Yttrium Iron Garnet Sphere	each	27.6 A•m^2 /kg ± 0.1 A•m^2/kg (27.6 emu/g ± 0.1 emu/g)

309.10 - Healthcare Equipment Standards

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

SRM	Description	Unit Size
2087	Dimensional Standard for Medical Computed Tomography	each

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