

# INDEX

- ABRADABILITY INDEX 20  
 ABS RESIN 28  
 ACID BASE ACCOUNTING 2  
 AEROSOLS 43  
 AIR PARTICULATE 2  
 ALUMINA REFRACTORIES 29  
 ASH 9, 10, 13, 31  
 ATTRITION INDEX 2  
 AUTOMOBILE CATALYST 15
- BASIC SLAG 36  
 BLAINE 5  
 BLAST FURNACE SLAG 37  
 BORON CARBIDE 42  
 BORON NITRIDE 34  
 BRINELL 22  
 BURNT REFRACTORIES 30
- CALCIUM ALUMINATE 2  
 CALCIUM CARBONATE 2  
 CARBIDE 34, 42  
 CASTING POWDER 2, 11  
 CEMENT 3, 4, 5  
 CEMENT SIEVING 5  
 CENOSPHERE 6  
 CHARPY IMPACT 22  
 CHROMIUM CARBIDE 42  
 CLINKER 5  
 COAL 6, 7, 8, 9  
 COAL ASH 9, 10  
 COAL FLY ASH 10  
 COAL WASTE ROCK 10  
 COAL-TAR PITCH 11  
 COKE 12, 13  
 COKE ASH 13  
 CONTINUOUS CASTING POWDER 11  
 CONVERTER SLAG 38  
 COVER POWDER 11  
 Cr-Mg REFRACTOIREIS 30
- DRY ANALYSIS 9  
 DUST 13, 14
- ELECTRIC FURNACE SLAG 38  
 ELECTRODE CARBON 15  
 ELECTROLYTIC MANGANESE 23  
 EXHAUST CATALYST 15
- FERROALLOY SLAG 36  
 FERROBORON 15  
 FERROCHROMIUM 15  
 FERROMANGANESE 16  
 FERROMOLYBDENUM 16  
 FERRONICKEL 17  
 FERRONIUBIUM 17  
 FERROPHOSPHORUS 17  
 FERROSILICOALUMINUM 18  
 FERROSILICOCHROMIUM 18  
 FERROSILICON 18, 19  
 FERROSILICOTITANIUM 18  
 FERROTITANIUM 17  
 FERROTUNGSTEN 18  
 FERROVANADIUM 18  
 FILTER MEDIA 2  
 FINENESS 5  
 FIRECLAY REFRACTORIES 30  
 FLUE DUST 14  
 FLUORINE SLAG 38
- FLUX 20  
 FLY ASH 10, 11  
 FOUNDRY SAND 32  
 FURNACE DUST 14  
 FURNACE SLAG 38  
 FUSIBILITY OF COAL 8  
 FUSIBILITY OF COAL ASH 9
- GLASS 20, 21  
 GLASS SAND 21  
 GRAVEL 21
- HARDGROVE GRINDABILITY INDEX 22  
 HARDNESS 22, 42  
 HEXAVALENT CHROMIUM 20
- IMPACT 22  
 INCINERATED WASTE 22  
 INDOOR DUST 14  
 INDUSTRIAL FLY ASH 11  
 IRON MAKING SLAG 36, 40  
 IRON OXIDE 25  
 IZOD 22
- LAYER THICKNESS 23  
 LEAD PAINT 23  
 LEEB 22
- MAGNESIA REFRACTORIES 31  
 MAGNETIC CENOSPHERE 6  
 MANGANESE 23  
 MANGANESE SLAG 38  
 MASS VOLUME 26  
 MELTING POINT 23
- NANOSCALE 23  
 NICKEL OXIDE 25  
 NITRIDE 34, 43
- OXIDE 24, 25, 26
- PAPER 26  
 PARTICLE DENSITY 27  
 PARTICLE SIZE 26, 27  
 pH 27  
 PHOSPHATE SLAG 39  
 PLASTER 27  
 PLASTIC 27  
 PLATINUM GROUP 15  
 POLYETHYLENE 28  
 POLYVINYL CHLORIDE 28  
 POROUS MATERIALS 27, 28
- RED SLURRY 41  
 REFRACTORIES 29, 30, 31  
 REFRACTORY 31  
 RICE STRAW ASH 31  
 ROAD DUST 14  
 ROCKWELL 22  
 RoHS/WEEE 28
- SAND 21, 32  
 SAND FOR SLIDING GATES 32  
 SHORE 22  
 SIEVING 5  
 SILICA BRICK 32  
 SILICA POWDER 32  
 SILICATE 33  
 SILICEOUS MATERIAL 32  
 SILICOALUMINUM 34  
 SILICOBARIUM 34  
 SILICOCALCIUM 35  
 SILICOCHROMIUM 35  
 SILICOMANGANESE 35  
 SILICON CARBIDE 33, 34, 42  
 SILICON CARBIDE REFRACTORY 31  
 SILICON METAL 33  
 SILICON NITRIDE 34  
 SILICON OXIDE 25  
 SILICOZIRCONIUM 36  
 SIZE DISTRIBUTION 27  
 SLAG 36, 37, 38, 39, 40  
 SLUDGE 40  
 SLURRY 41  
 SODA ASH 41  
 STEEL MAKING SLAG 36  
 SURFACE AREA 27, 28, 42  
 SYNTHETIC SILICATE 33
- TENSILE CREEP 42  
 TENSILE STRENGTH 42  
 THERMOSTIL 31  
 TIN SLAG 39  
 TITANIUM DIOXIDE 26  
 TITANIUM SLAG 39  
 TUNDISH SLAG 40  
 TUNGSTEN CARBIDE 42
- URANIUM 21  
 URBAN AEROSOLS 43  
 URBAN PARTICULATE MATTER 43
- VACUUM SLAG 40  
 VANADIUM NITROGEN ALLOY 43  
 VANADIUM PENTOXIDE 26  
 VANADIUM SLAG 40  
 VICKERS 22
- WASTE 22  
 WELDING FLUX 20
- YTTRIUM 43
- ZINC OXIDE 26  
 ZIRCON CONCENTRATE 43  
 ZIRCON REFRACTORIES 31  
 ZIRCON SAND 32  
 ZIRCONIA 43  
 ZIRCONIUM OXIDE 43

**CRM ACID BASE ACCOUNTING**

certified values		informational values listed in mass %																	100 g units	
Number	Total S%	Al	Ba	C	CO <sub>2</sub>	CO <sub>3</sub>	Ca	Fe	K	Mg	Mn	Na	P	S as SO <sub>4</sub>	Si	Ti	LOI	LOM	Total	
CAN NBM-1	0.28	7.86	0.117	0.79	.	0.50	2.30	4.09	2.36	1.39	0.046	2.70	0.10	0.02	28.47	0.335	3.45	0.32	98.38	
CAN KZK-1	0.80	7.37	0.27	0.95	3.37	4.22	1.80	3.30	3.55	0.95	0.07	1.18	0.08	0.01	29.38	0.35	.	.	.	

values listed in kgCaCO<sub>3</sub>/t

Number	Paste PH	Acid Producing Potential		Neutralization Potential		Fizz Rating	
		Sobek	Modified Sobek	Sobek Slight	Moderate	Modified Sobek Slight	Moderate
CAN NBM-1	8.45	8.73	8.46	(49.6)	(70.9)	(46.6)	(52.3)
CAN KZK-1	(8.8)	24.9	(24.6)	59.0	64.8	58.9	(61.6)

**CRM AIR PARTICULATE ON FILTER MEDIA**

SRM 278e is supplied as 2 loaded + 2 blank filters, analysis in ng, good for nondestructive analysis

Number	Al	As	Ba	Ca	Ce	Co	Cr	Cu	Fe	K	Mg	Mn	Na	Ni	Pb
SRM 2783 blank	(30)	.	(0.4)	.	.	(0.04)	(70)	.	.	.	.	.	(15)	(8)	(0.4)
SRM 2783 loaded	23210	11.8	335	13200	(23.4)	7.7	135	404	26500	5280	8620	320	1860	68	317

  

Number	Rb	S	Sb	Sc	Si	Sm	Th	Ti	U	V	W	Zn
SRM 2783 blank	.	(100)	.	.	.	.	.	.	.	.	.	(50)
SRM 2783 loaded	(24.0)	(1050)	71.8	(3.54)	(58600)	(2.04)	(3.23)	1490	(1.234)	48.5	(5.0)	1790

**CRM ATTRITION INDEX**

Number	Attrition Index (AI units)	Standard Deviation	Uncertainty @ 95% CL	Units
ASCRM 025	18.8	± 1.3	± 2.6	750 g

**RM CALCIUM ALUMINATE**

typical analysis

100 g

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	MoO <sub>3</sub>	S	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
DH X0101	72.2	26.74	0.006	0.118	.	0.191	0.008	.	0.011	0.17	.	.	<0.005
DH X0103	68.8	23.38	0.028	0.289	0.296	3.53	0.024	0.014	.	0.450	0.009	0.067	2.36
DH X0102	64.30	18.34	0.054	0.708	.	12.54	0.114	.	0.020	2.02	0.024	0.165	1.48

**CRM CALCIUM CARBONATE**

certified analysis in mass % and mg/kg

analysis in mg/kg

BAM: 100 g

SRM: 20 g units

Number	certified analysis in mass % and mg/kg												analysis in mg/kg										BAM: 100 g	SRM: 20 g units	
	CaCO <sub>3</sub>	CO <sub>3</sub>	Ca	Ba	Cr	Cu	Fe	Mg	Mn	Na	Sr	Zn	Al	B	Cd	Co	Ga	K	La	Ni	Pb	Si	Sn	Ti	Zr
SRM 915b	99.907	59.923	40.0104	(2)	.	.	.	(40)	.	(17)	(150)	.	C1: (8)	P: (3)	S: (30)	.	.	.	.	.	(5)	.	.	.	.
BAM RS 3	99.79	.	.	45.3	<1	<1	<5	183	3.0	47.5	173	<2	<5	<1	<0.5	<1	<1.5	<20	<0.5	<3	<0.1	<20	<1	<0.5	<0.2

**CRM CASTING POWDER**

analysis listed in mass %

powder 30 g

Number	Al <sub>2</sub> O <sub>3</sub>	BaO	C	CaO	CO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	F	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO <sub>2</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	ZnO	ZrO <sub>2</sub>
FLX CRM127	7.82	0.301	(0.12)	34.85	(0.4)	0.021	8.7	0.57	0.09	2.59	0.032	10.45	0.037	37.27	0.241	0.079	0.016
FLX CRM124	7.36	0.287	(7.10)	32.83	(10.4)	0.009	5.2	1.73	0.36	0.90	3.845	5.84	0.111	28.26	0.337	0.010	0.020
FLX CRM125	7.12	0.207	(9.14)	32.07	(12.0)	0.011	4.6	0.77	0.21	0.95	0.259	3.90	0.065	33.29	0.216	(0.005)	0.018
FLX CRM126	5.49	0.061	(15.83)	23.72	(6.5)	0.008	4.5	1.41	0.36	2.47	0.082	7.84	0.066	33.45	0.330	(0.007)	0.020
FLX CRM123	4.63	0.265	(6.30)	29.82	(7.4)	0.018	6.6	1.69	0.41	2.75	0.041	7.84	0.095	35.56	0.202	0.010	0.021

**RM PORTLAND CEMENT WITH EXTENSIVE ANALYSIS** analysis listed in mass %

Number	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	T.Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Ni	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	Sr	TiO <sub>2</sub>	Zr				
IAG OPC-1	4.55	0.0512	62.9	3.19	0.344	2.58	0.404	(0.00870)	(0.044)	21.85	0.01182	0.318	0.00812				
continued analysis listed in mg/kg ~35 g units																	
Number	As	Be	Ce	Co	Cs	Cu	Dy	Er	Eu	Ga	Gd	Hf	Ho	La	Li	Lu	
IAG OPC-1	(4.6)	(0.82)	48.9	21.4	1.00	(23.7)	2.87	1.52	1.00	7	3.75	2.12	0.55	25.9	(13.1)	0.20	
Number	Nb	Nd	Pb	Pr	Rb	Sb	Sm	Ta	Tb	Th	Tm	U	V	W	Y	Yb	Zn
IAG OPC-1	4.9	24.7	(7.2)	6.2	14.7	0.26	4.5	(0.35)	0.52	3.93	0.21	0.83	(64.0)	(0.7)	15.5	1.34	27.8

**CEMENT chart 1 of 2**

# = class, where 1 = CRM and 2 = RM analysis listed in mass %

#	Number	CaO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SrO	TiO <sub>2</sub>	LOI	Units
1	BCS 354	70.0	21.8	4.84	0.30	0.11	0.42	0.10	0.12	2.25	0.11	(0.04)	.	100 g
1	FLX CRM110	68.13	22.01	4.70	0.18	0.94	0.65	0.05	0.037	2.88	0.041	0.170	(3.46)	30 g
1	SRM 1886a	67.87	22.38	3.875	0.152	0.093	1.932	0.021	0.022	2.086	(0.018)	0.084	(1.56)	4 x 5 g
1	FLX CRM107	67.19	21.81	4.23	1.29	0.70	0.70	0.18	0.160	3.13	0.151	0.194	(6.59)	30 g
1	FLX CRM109	66.45	20.39	4.25	2.32	1.06	1.59	0.18	0.052	3.11	0.144	0.203	(5.96)	30 g
2	JCA RM 611	66.25	21.84	5.41	3.20	0.34	1.08	0.40	0.59	0.25	0.28	0.30	(0.51)	30 g
1	SRM 1886b	66.05	22.08	3.903	0.297	0.0164	1.526	0.01682	0.0413	2.757	0.0886	0.2054	(2.174)	5 x 5 g
1	FLX CRM106	66.05	20.29	5.70	1.98	0.86	0.96	0.12	0.111	3.01	0.206	0.271	(2.06)	30 g
1	NCS DC62103h	65.78	22.07	4.56	3.22	0.69	2.11	0.16	.	0.32	.	0.37	0.60	20 g
2	TL 1Ca	65.77	20.23	5.24	2.00	0.28	1.13	0.19	0.57	3.06	0.05	0.20	(1.39)	40 g
1	NCS DC62117	65.71	20.49	4.61	0.26	0.05	0.14	0.05	.	1.9	.	0.12	6.43	20 g
1	FLX CRM105	65.24	20.84	4.27	2.50	1.24	1.57	0.21	0.053	3.37	0.146	0.179	(2.61)	30 g
1	JCA CRM-1	65.21	20.99	5.26	2.67	0.56	2.13	0.26	0.28	2.05	0.05	0.35	(0.63)	60 g
1	FLX CRM108	65.15	20.06	4.66	2.97	0.74	2.15	0.09	0.169	3.31	0.083	0.186	(2.68)	30 g
1	SRM 634a	65.07	20.493	5.015	3.362	0.3572	1.0057	0.0842	0.1767	2.780	(0.0735)	0.2463	(1.66)	100 g
1	BCS 353	64.8	20.5	3.77	4.82	0.49	2.42	0.10	0.077	2.25	0.07	0.16	.	100 g
2	FLX 137	64.77	20.78	4.99	3.07	0.769	1.64	(0.107)	0.171	3.17	0.076	0.221	(2.66)	30 g
1	FLX CRM100	64.51	20.89	5.54	2.62	0.82	1.47	0.23	0.166	2.97	0.286	0.283	2.37	50 g
1	CCRL 205	64.44	20.91	4.32	3.00	0.545	1.50	0.169	0.071	2.97	0.171	0.24	1.51	30 g
2	CCRL 197	64.38	19.23	4.82	3.44	0.531	1.47	0.172	0.221	2.95	0.084	0.27	2.30	30 g
2	CCRL 196	64.31	19.66	5.07	2.99	0.630	1.92	0.279	0.082	3.09	0.033	0.32	1.58	30 g
2	JCA 211S	64.25	20.57	5.60	2.51	0.40	1.26	0.27	0.14	2.10	.	0.30	2.19	40 g
1	CCRL 192	64.20	20.86	4.77	2.05	0.422	3.09	0.185	0.097	2.81	.	0.36	1.13	30 g
1	SRM 1880b	64.16	20.42	5.183	3.681	0.646	1.176	0.0914	0.2443	2.710	(0.0272)	0.236	(1.666)	4 x 5 g
1	SRM 633a	64.129	22.38	2.911	3.738	0.391	1.1532	0.203	0.14263	2.178	(0.0507)	0.2157	(2.460)	4 x 5 g
2	CCRL 195	64.00	20.80	5.05	2.02	0.432	3.17	0.176	0.083	2.53	0.033	0.30	1.44	30 g
2	CCRL 198	63.87	20.05	4.83	3.94	0.457	1.15	0.066	0.112	3.00	0.054	0.32	2.29	30 g
1	FLX CRM113	63.63	20.98	5.06	2.75	0.619	2.49	(0.092)	0.135	2.47	0.064	0.231	(1.53)	30 g
2	CCRL 193	63.18	21.11	3.60	4.47	0.528	3.04	0.058	0.096	2.02	.	0.22	1.48	30 g
1	SRM 1888b	63.13	20.42	4.277	3.062	0.658	3.562	0.1364	0.07307	2.634	0.1099	0.2316	(various)	4 x 5 g
2	JCA RM 613	63.00	19.51	5.36	2.78	1.20	1.07	0.23	0.15	6.07	0.15	0.35	(3.45)	30 g
2	JCA RM 612	62.95	20.12	5.19	2.81	0.90	1.52	0.52	1.02	4.51	0.045	0.28	(2.52)	30 g
2	CCRL 173	62.45	20.01	4.49	2.62	0.447	3.03	0.309	0.192	4.10	.	0.27	2.02	30 g
2	CCRL 174	62.43	20.75	3.71	3.62	0.430	4.83	0.189	0.067	2.64	.	0.21	1.14	30 g
1	NCS DC62101c	62.23	20.41	4.68	3.20	0.71	2.66	0.12	.	3.16	.	0.27	2.18	20 g
2	CCRL 194	62.14	19.73	4.58	3.35	0.936	3.01	0.287	0.181	3.72	.	0.21	1.16	30 g
1	CCRL 206	61.90	19.64	5.16	3.37	0.653	3.84	0.148	0.044	3.47	0.087	0.28	1.55	30 g
1	SRM 1885b	61.87	20.05	4.70	3.044	0.497	3.86	0.293	0.0737	2.832	0.0795	0.2361	(2.310)	5 x 5 g
2	CCRL 172	61.78	19.30	4.66	2.93	0.935	4.74	0.267	0.111	3.21	.	0.26	2.09	30 g

Number	CO <sub>2</sub>	Free CaO	Cl	Cr <sub>2</sub> O <sub>3</sub>	F	Mn	MnO	Mn <sub>2</sub> O <sub>3</sub>	S	ZnO	Ins. Res.
BCS 354	.	.	.	.	.	.	.	0.058	.	.	.
FLX CRM110	.	.	0.008	0.004	.	.	0.029	.	.	0.003	.
SRM 1886a	.	.	(0.0042)	0.0024	(0.02)	.	.	0.0073	.	(0.001)	(0.23)
FLX CRM107	.	.	0.043	0.006	.	.	0.040	.	.	0.013	.
FLX CRM109	.	.	0.049	0.008	.	.	0.051	.	.	0.042	.
JCA RM 611	.	.	.	.	.	.	0.06	.	.	.	.
SRM 1886b	.	(0.24)	0.00399	0.00404	(0.0118)	.	.	0.02639	.	(0.00058)	(0.13)
FLX CRM106	.	.	0.055	0.008	.	.	0.161	.	.	0.012	.
NCS DC62103h	.	.	.	.	.	.	.	.	.	.	0.12
TL 1Ca	.	(0.83)	.	.	.	.	.	.	.	.	(0.21)
NCS DC62117	.	.	.	.	.	.	.	.	.	.	.
FLX CRM105	.	.	0.049	0.008	.	.	0.040	.	.	0.054	.
JCA CRM-1	.	.	.	.	.	0.06	.	.	.	.	.
FLX CRM108	.	.	0.042	0.007	.	.	0.219	.	.	0.036	.
SRM 634a	.	(1.86)	.	(0.0114)	.	.	.	(0.0229)	.	(0.0222)	(0.21)
BCS 353	.	.	.	.	.	.	.	0.23	.	.	.
FLX 137	.	.	.	(0.007)	.	.	.	0.266	.	0.029	.
FLX CRM100	.	.	(0.09)	0.009	.	.	.	0.066	.	0.051	.
CCRL 205	.	0.74	0.008	0.011	.	.	.	0.121	.	0.010	0.34
CCRL 197	1.32	1.31	0.013	0.021	.	.	.	0.089	.	0.109	0.24
CCRL 196	0.97	0.75	0.017	0.015	.	.	.	0.036	.	0.024	0.21
JCA 211S	.	.	0.022	.	.	0.05	.	.	.	.	0.23
CCRL 192	.	0.87	0.031	0.014	.	.	.	0.077	.	0.016	0.20
SRM 1880b	.	(2.227)	0.01830	0.01927	(0.0539)	.	.	0.1981	(0.0131)	(0.01054)	(0.487)
SRM 633a	.	(1.60)	0.0087	(0.0124)	(0.038)	BaO: (0.256)	.	0.1176	(0.049)	0.123	(0.23)
CCRL 195	.	1.43	0.024	0.013	.	.	.	0.091	.	0.017	0.28
CCRL 198	1.55	0.68	0.005	0.010	.	.	.	0.073	.	0.090	0.21
FLX CRM113	.	.	.	(0.007)	.	.	.	0.233	(0.137)	0.030	SO <sub>4</sub> as SO <sub>3</sub> : 2.40
CCRL 193	.	0.89	0.009	0.034	.	.	.	0.243	.	0.020	0.19
SRM 1888b	.	(1.42)	0.0143	(0.01021)	(0.048)	.	.	0.0652	(0.15)	(0.01253)	(0.32)
JCA RM 613	.	.	.	.	.	.	0.08	.	.	.	.
JCA RM 612	.	.	.	.	.	.	0.06	.	.	.	.
CCRL 173	0.6	1.65	0.023	0.009	.	.	.	0.060	.	0.024	0.36 last, expires 12/31/2014
CCRL 174	.	1.04	0.005	0.006	.	.	.	0.073	.	0.014	0.26 last, expires 12/31/2014
NCS DC62101c	.	.	.	.	.	.	.	.	.	.	1.20
CCRL 194	.	0.57	0.013	0.034	.	.	.	0.214	.	0.127	0.17
CCRL 206	.	0.97	0.014	0.011	.	.	.	0.029	.	0.020	0.22
SRM 1885b	.	(0.27)	(0.0021)	0.02709	(0.0524)	.	.	0.1282	(0.042)	0.0354	(0.36) BaO: 0.0149
CCRL 172	1.38	1.04	0.008	0.009	.	.	.	0.088	.	0.004	0.44 last, expires 12/31/2014

## CEMENT chart 2 of 2

# = class, where 1 = CRM and 2 = RM

analysis listed in mass %

#	Number	CaO	Ca	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SrO	TiO <sub>2</sub>	LOI	Units
1	SRM 1884b	61.31	.	19.30	4.851	2.937	0.957	4.74	0.278	0.0965	4.034	0.0258	0.2651	(various)	4 x 4.5 g
1	SRM 1887b	61.15	.	19.59	4.911	2.471	0.961	3.624	0.288	0.1540	4.599	0.2625	0.2034	2.121	5 x 4 g
1	NCS DC62118	60.99	.	21.73	4.75	4.12	0.43	4.37	0.12	.	2.27	.	0.23	0.81	20 g
1	CCRL 191	60.44	.	21.34	4.05	3.56	0.654	4.07	0.198	0.054	3.43	.	0.21	2.15	30 g
1	SRM 1889b	60.11	.	18.39	5.79	2.891	1.115	2.82	0.3653	0.297	4.3721	0.284	0.260	(3.117)	5 x 5 g
1	FLX CRM122	59.00	.	21.94	5.60	1.67	0.900	2.02	0.204	0.066	(3.27)	0.131	0.353	(4.86)	30 g
1	NCS DC62116	57.86	.	16.34	4.01	2.22	0.55	2.28	0.11	.	2.3	.	0.22	13.86	20 g
1	NCS DC62102d	57.25	.	23.54	6.60	3.25	0.71	1.88	0.15	.	2.74	.	0.39	3.13	20 g
2	TL 203Ca	57.09	.	18.75	4.78	2.34	0.93	4.80	0.21	(0.13)	3.28	(0.06)	0.24	(7.24)	40 g
1	FLX CRM130	56.60	.	14.35	11.62	2.88	0.682	1.84	0.277	0.067	10.91	0.052	0.563	(5.12)	30 g
1	JCA CRM-2	56.33	.	25.66	8.94	2.08	0.31	3.05	0.24	0.07	(2.59)	0.07	0.50	(0.47)	60 g
1	FLX CRM118	55.47	.	21.57	6.94	3.88	0.983	2.08	0.181	0.163	(2.97)	0.087	0.301	5.02	30 g
1	FLX CRM103	54.90	.	26.95	7.75	1.78	0.77	4.44	0.33	0.09	2.73	0.070	0.372	(0.59)	50 g
1	TL 201C	54.48	.	25.63	6.81	2.08	0.73	3.35	0.32	.	3.16	.	.	1.96	40 g
1	FLX CRM117	54.22	.	28.05	7.68	1.37	0.916	2.95	0.223	(0.035)	(3.49)	0.098	0.564	(0.402)	30 g
1	FLX CRM115	53.93	.	27.29	8.13	0.972	0.612	2.93	0.194	0.073	(3.90)	0.117	0.610	(1.56)	30 g
1	SRM 1881b	53.78	.	24.04	7.36	3.04	1.23	1.34	0.292	0.153	(2.43)	0.158	0.347	5.73	30 g
1	FLX CRM120	53.63	.	26.51	7.64	1.11	0.692	3.55	0.184	0.086	(4.35)	0.124	0.598	(1.71)	30 g
1	FLX CRM114	51.29	.	28.61	6.94	1.37	0.954	4.93	0.277	0.027	(4.07)	0.108	0.525	(1.28)	30 g
1	FLX CRM116	50.05	.	30.81	9.11	0.86	0.693	4.47	0.201	0.034	(3.14)	0.091	0.690	(-0.394)	30 g
1	TL 200Ca	49.97	.	26.55	8.72	4.07	1.10	2.06	0.21	0.45	2.84	0.13	0.46	(3.30)	40 g
1	SRM 1881b	49.27	.	29.045	8.812	3.365	0.721	2.741	0.790	0.0510	2.72	0.0836	0.3011	(1.699)	4 x 5 g
1	FLX CRM101	48.24	.	30.31	8.81	3.52	2.10	1.70	0.68	0.191	3.16	0.248	0.469	3.84	50 g
2	DH X0210	46.72	33.39	30.30	9.99	1.66	0.541	4.96	0.236	0.066	.	0.077	0.421	.	100 g
1	TL 202C	45.12	.	29.61	10.14	3.27	1.05	4.46	0.32	.	3.17	.	.	1.51	40 g
1	FLX CRM121	44.45	.	30.81	8.78	3.04	2.73	1.41	1.23	0.112	2.55	0.140	0.344	4.24	30 g
1	FLX CRM131	42.89	.	8.73	23.10	3.24	0.287	1.62	0.466	0.060	18.19	0.067	1.15	(2.03)	30 g
1	NCS DC62105g	42.40	.	13.76	3.12	2.13	0.50	2.11	0.14	.	0.21	.	0.18	34.94	20 g
1	NCS DC62104b	39.65	.	12.77	3.66	2.02	0.93	1.20	0.18	.	0.72	.	0.18	38.32	20 g
1	SRM 1882a	39.29	.	4.01	39.14	14.67	0.051	0.51	0.021	(0.070)	.	(0.024)	1.786	(0.20)	4 x 5 g
1	SRM 1883a	29.52	.	0.24	70.04	0.078	0.014	0.19	0.30	(0.003)	.	(0.019)	(0.020)	(0.35)	4 x 5 g
2	DH X0209	.	48.78	21.95	4.63	0.204	1.01	0.717	0.078	0.043	.	0.051	0.095	.	100 g
2	DH X0212	.	46.48	21.16	4.41	3.94	0.495	0.945	0.084	0.191	.	0.086	0.242	.	100 g
2	DH X0211	.	40.63	25.04	6.86	2.98	0.524	2.79	0.156	0.137	.	0.083	0.319	.	100 g

Number	BaO	Free CaO	Cl	Cr <sub>2</sub> O <sub>3</sub>	F	Mn	Mn <sub>2</sub> O <sub>3</sub>	S	Unignited SO <sub>3</sub>	V <sub>2</sub> O <sub>5</sub>	ZnO	Ins. Res.
SRM 1884b	.	(0.418)	(0.0065)	0.00791	(0.0394)	.	0.0750	.	.	.	.	(0.159)
SRM 1887b	(0.022)	0.21	0.01001	0.01551	0.101	.	0.0957	0.025	.	.	0.01560	0.26
NCS DC62118	.	.	.	.	.	.	.	.	.	.	.	1.18
CCRL 191	.	1.64	0.013	0.009	.	.	0.033	.	.	.	0.029	0.43
SRM 1889b	.	(0.52)	0.0101	0.0083	(0.10)	.	0.02639	.	.	.	0.0770	(0.30)
FLX CRM122	.	.	.	(0.004)	.	.	0.111	(0.288)	SO <sub>4</sub> as SO <sub>3</sub> : 2.62	.	0.027	.
NCS DC62116	.	.	.	.	.	.	.	.	.	.	.	.
NCS DC62102d	.	.	.	.	.	.	.	.	.	.	.	.
TL 203Ca	.	(1.23)	.	.	.	.	.	.	.	.	.	(0.58)
FLX CRM130	.	.	.	0.021	.	.	0.062	.	SO <sub>4</sub> as SO <sub>3</sub> : (10.18)	.	0.018	.
JCA CRM-2	.	.	.	.	.	0.15	.	(0.32)	(1.91)	.	.	.
FLX CRM118	.	.	.	0.009	.	.	0.176	(0.131)	SO <sub>4</sub> as SO <sub>3</sub> : 2.89	.	0.053	.
FLX CRM103	.	.	(0.040)	0.007	.	.	0.170	.	.	.	0.014	.
TL 201C	.	.	0.06 Cl-	.	.	.	.	0.31 S <sub>2</sub> -	.	.	.	.
FLX CRM117	.	.	.	(0.004)	.	.	0.193	(0.602)	SO <sub>4</sub> as SO <sub>3</sub> : 1.80	.	0.024	.
FLX CRM115	.	.	.	(0.004)	.	.	0.214	(0.611)	SO <sub>4</sub> as SO <sub>3</sub> : 2.41	.	0.008	.
FLX CRM119	.	.	.	0.008	.	.	0.040	(0.029)	SO <sub>4</sub> as SO <sub>3</sub> : 2.38	.	0.040	.
FLX CRM120	.	.	.	(0.005)	.	.	0.188	(0.632)	SO <sub>4</sub> as SO <sub>3</sub> : 3.18	.	0.008	.
FLX CRM114	.	.	.	(0.005)	.	.	0.154	(0.676)	SO <sub>4</sub> as SO <sub>3</sub> : 2.50	.	0.022	.
FLX CRM116	.	.	.	(0.005)	.	.	0.238	(0.737)	SO <sub>4</sub> as SO <sub>3</sub> : 1.22	.	0.015	.
TL 200Ca	.	(0.34)	.	.	.	.	.	.	.	.	.	(17.42)
SRM 1881b	0.191	(1.16)	0.0081	0.00949	(0.09)	.	0.1175	.	.	.	0.1198	(16.4)
FLX CRM101	.	.	(0.05)	0.010	.	.	0.118	.	.	.	0.044	.
DH X0210	0.071	.	.	.	.	.	0.327	1.77	.	0.011	.	.
TL 202C	.	.	0.01 Cl-	.	.	.	.	0.20 S <sub>2</sub> -	.	.	.	.
FLX CRM121	.	.	.	0.008	.	.	0.111	(0.025)	SO <sub>4</sub> as SO <sub>3</sub> : 2.37	.	0.031	.
FLX CRM131	.	.	.	0.038	.	.	0.029	.	SO <sub>4</sub> as SO <sub>3</sub> : (17.85)	.	0.006	.
NCS DC62105g	.	.	.	.	.	.	.	.	.	.	.	.
NCS DC62104b	.	.	.	.	.	.	.	.	.	.	.	.
SRM 1882a	.	.	.	(0.113)	.	(0.060)	.	.	.	.	(0.004)	.
SRM 1883a	.	.	.	(0.006)	.	(0.003)	.	.	.	.	.	.
DH X0209	0.028	.	.	.	.	.	0.025	1.19	.	.	.	.
DH X0212	.	.	.	.	.	.	0.062	1.18	.	.	.	.
DH X0211	0.041	.	.	.	.	.	0.172	1.48	.	0.014	.	.

## RM CEMENT SET JCA 601B

available in set/15 only

number 1-14 powder 20 g number 15 powder 30 g

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>
JCA 601B 1	5.10	59.07	2.37	1.191	1.31	0.404	0.809	1.479	9.83	17.61	(0.38)	0.282
JCA 601B 2	5.98	65.23	2.90	0.370	1.37	0.097	0.272	0.119	2.34	20.75	(0.06)	0.299
JCA 601B 3	4.45	63.18	2.37	0.696	2.36	0.050	0.373	0.758	5.97	19.11	(0.19)	0.222
JCA 601B 4	5.23	66.63	2.77	0.281	0.87	0.090	0.166	0.198	2.70	20.36	(0.04)	0.333
JCA 601B 5	3.28	64.96	3.37	0.355	1.02	0.058	0.199	0.111	1.79	24.41	(0.03)	0.189
JCA 601B 6	3.87	64.15	4.13	0.413	0.83	0.105	0.223	0.126	2.20	23.18	(0.03)	0.201
JCA 601B 7	2.82	63.36	3.14	0.398	0.80	0.037	0.153	0.096	2.57	26.27	(0.03)	0.164
JCA 601B 8	2.73	63.49	3.05	0.304	0.59	0.104	0.186	0.169	2.48	26.61	(0.02)	0.143
JCA 601B 9	7.94	58.91	2.07	0.320	2.49	0.081	0.328	0.110	.	24.53	(0.05)	0.370
JCA 601B 10	9.47	54.60	1.83	0.342	3.22	0.148	0.239	0.154	.	26.50	(0.05)	0.379
JCA 601B 11	8.89	55.64	1.98	0.337	2.96	0.181	0.311	0.283	.	26.11	(0.06)	0.399
JCA 601B 12	8.75	55.78	2.14	0.319	3.13	0.620	0.189	0.085	.	24.75	(0.04)	1.035
JCA 601B 13	11.03	50.51	1.10	0.291	4.20	0.112	0.348	0.055	.	28.61	(0.05)	0.449
JCA 601B 14	16.05	35.85	0.24	0.188	10.21	0.115	0.274	0.011	.	35.03	(0.05)	0.435
JCA 601B 15	2.07	75.62	7.01	0.000	0.01	0.002	0.030	0.003	0.02	14.87	(0.02)	0.004

**CRM CHLORINE and FLUORINE in CEMENT**

Number	Description	CaF <sub>2</sub>	F	Cl-	Units
NCS DC62121a	Cement Raw Meal	.	.	0.016	20 g
NCS DC62122a	Cement	.	.	0.009	20 g
NCS DC62125a	Cement	(0.37)	0.18	.	20 g

**CRM PORTLAND CEMENT HEAT OF HYDRATION**

Number	Heat of Solution J/g	7 Days J/g	28 Days J/g	Units
JCA 301S	2,483.5	274.0	325.2	600 g

**CRM COMPRESSIVE STRENGTH N/mm<sup>2</sup>**

Number	3 Days	7 Days	28 Days	Units
JCA 401J	29.6	44.4	62.1	4.8 kg

**CRM CLASSIC CEMENT CHEMISTRIES**

20 g units

Number	P - Pozzolana	S - Slag	D - Limestone	D1 - CO <sub>2</sub>	R5 - Unsolved Slag (EDTA)	Description
NCS DC62119a	9.3	4.5	2.4	(1.50)	.	Ordinary Portland Cement
NCS DC62120	0.5	18.5	7	3.5	97.5	Portland Blast-Furnace Slag Cement

**CRM CEMENT CLINKER PHASE ABUNDANCE**

Number	Alite	Alkali Sulfates	Aluminate	Aphthitalite	Arcanite	Belite	Ferrite	Periclase	Units
SRM 2686a	63.53	0.86	2.46	(0.74)	(0.27)	18.80	10.80	3.40	3 x 10 g
SRM 2687	71.24	.	11.82	.	0.92	12.57	2.81	.	3 x 10 g
SRM 2688	64.95	.	4.99	.	.	17.45	12.20	.	3 x 10 g

**CRM PORTLAND CEMENT FINENESS AND BLAINE STANDARD**

Number	Remaining after passing through 80 micron sieve	Blaine	Density g/cm <sup>3</sup>	Units
NCS DC62127e	2.68 %	356.8 m <sup>2</sup> /kg	(3.05)	200 g
TL 201B	.	4,231 cm <sup>2</sup> /g	3.03	40 g
TL 202B	.	4,135 cm <sup>2</sup> /g	2.94	40 g
JCA 102N	.	3,300 cm <sup>2</sup> /g	.	30 g

**CRM CEMENT FINENESS**

certified analysis

informational analysis listed in mass %

46H: 10 x 5 g units

114q: powder 20 x 5 g units

Number	Surface Area			45 µm Sieve				C <sub>2</sub> S C <sub>3</sub> S C <sub>3</sub> A C <sub>4</sub> AF Al <sub>2</sub> O <sub>3</sub> CaO Fe <sub>2</sub> O <sub>3</sub> K <sub>2</sub> O MgO Na <sub>2</sub> O P <sub>2</sub> O <sub>5</sub> SO <sub>3</sub> SiO <sub>2</sub> TiO <sub>2</sub> LOI										
	Blaine	Wagner	Residue	C <sub>2</sub> S	C <sub>3</sub> S	C <sub>3</sub> A	C <sub>4</sub> AF	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	LOI
ASTM METHOD	C204-96a	C115-96a	C430-96	C150-02				C114-02										
SRM 114q	3818 cm <sup>2</sup> /g	2183 cm <sup>2</sup> /g	0.79 %	14	60	7	10	4.7	64.0	3.2	0.70	2.2	0.07	0.12	2.4	20.7	0.30	1.67
SRM 46h	.	.	7.43 %	15	59	8	8	4.9	63.9	2.8	0.68	1.9	0.19	0.21	2.9	20.6	0.30	1.5

**CRM CEMENT FINENESS**

particle size analysis detailed on certificates

40-50 g units

Number	Density g/cm <sup>3</sup>	Blaine cm <sup>2</sup> /g	C <sub>2</sub> S	C <sub>3</sub> S	C <sub>3</sub> A	C <sub>4</sub> AF	Al <sub>2</sub> O <sub>3</sub>	CaO	F.CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	Insol.	LOI
TL 2BGa	3.15	4,206	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
TL 9	3.15	4,175	12	62	7	9	4.66	64.00	1.09	3.01	0.76	2.20	0.26	0.07	2.74	20.47	0.20	0.45	1.46
TL 203BGa	3.05	4,329	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

**RM CEMENT FINENESS - SIEVING METHOD**

Number	45 µm	32 µm	20 µm	16 µm	10 µm	units	percent remaining, ordinary portland cement
JCA 701B	10.4	22.8	43.0	52.4	70.1	30 g	

**CRM CEMENT COMPONENT MATERIAL**

analysis listed in mass %

NCS DC61106: 50g

others: 20 g units

Number	Material	CaO	T.CaCO <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	F	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	S	SO <sub>3</sub>	TiO <sub>2</sub>	LOI
NCS DC62110a	Portland Blast Furnace Slag	55.21	.	7.24	24.78	.	3.00	0.71	2.64	0.18	.	2.47	0.51	2.70
NCS DC62109	Portland Pozzolanic	47.57	.	6.52	32.67	.	3.54	1.43	1.86	0.85	.	2.59	0.16	2.44
NCS DC62111a	Portland Fly Ash	47.25	.	11.25	28.07	.	3.36	0.92	2.71	0.27	.	1.88	0.58	3.26
NCS DC62123	Sulphoaluminate Cement Clinker	43.4	.	32.6	8.56	.	2.21	0.22	1.37	0.09	.	9.55	1.51	0.41
NCS DC62126a	Cement Black Raw Meal	39.28	70.3	.	.	0.15	2.07	.	.	.	.	.	.	38.51
NCS DC62113	Granulated Blast Furnace Slag	35.62	.	12.23	34.93	.	1.26	0.54	10.66	0.42	0.61	1.17	1.06	1.05
NCS DC62112	Aluminate	34.56	.	51.15	7.95	.	1.91	0.13	0.63	0.04	0.1	.	2.03	0.68
NCS DC62124	Sulphoaluminate Cement Raw Meal	33.05	.	22.29	5.09	.	1.34	0.14	1.21	0.06	.	7.07	1.07	28.21
NCS DC62115	Fly Ash for Cement	4.42	.	36.62	48.93	.	4.37	0.57	0.84	0.17	.	0.35	1.46	1.76
NCS DC62115a	Fly Ash for Cement	4.13	.	33.07	51.38	.	4.58	0.86	1.02	0.33	.	0.24	1.14	2.80
NCS DC62114	Pozzolana for Cement	2.83	.	24.2	57.53	.	5.1	3.05	1.24	1.42	.	0.08	1.07	2.99
NCS DC61106	Albite Cement	0.48	.	19.62	67.96	.	0.10	0.098	0.015	11.26	.	.	0.054	0.36

## CRM MAGNETIC CENOSPHERE FROM COAL POWER PLANTS

analysis listed in mass % fine powder concentrate, 100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	Ba	CaO	CO <sub>2</sub>	F%	FeO	T.Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	Sr	TiO <sub>2</sub>	Zr	LOI
VS 9234-2008	25.9	0.084	1.19	(0.43)	.	1.67	2.85	2.9	0.86	0.039	0.48	0.076	.	63.7	0.0217	0.74	0.026	(0.92)
VS 9235-2008	19.3	0.089	2.77	0.51	(0.2)	(2.4)	4.04	3.5	1.64	0.049	1.33	0.19	(0.07)	64.1	0.0480	0.78	0.0246	(1.6)
VS 9236-2008	2.6	0.38	8.2	(0.64)	.	(15.4)	(78.4)	0.12	(1.3)	(0.082)	0.27	(0.036)	0.86	7.7	0.17	0.21	0.0039	(0.42)

continued analysis listed in mg/kg except

Number	Ag	As	Be	Ce	Co	Cr	Cs	Cu	Dy	Er	Eu	Ga	Gd	Ge	Hf	Ho	La	Li	Lu	Mo	Nb
VS 9234-2008	.	.	4.6	115	7.6	59	12	33 (6)	(3.5)	1.5	(11)	(7.3)	.	7.1	(1.2)	60	(42)	0.56	(16)	19	
VS 9235-2008	(0.2)	(11)	2.8	89	11	66	8.6	34 (5.5)	(3.0)	1.4	9.3	(6.7)	(0.9)	(6.9)	(1.1)	46	(55)	0.53	(3.4)	15	
VS 9236-2008	.	.	(0.7)	11	23	67	(0.21)	28 (1.0)	(0.6)	(0.5)	(3)	(1.2)	.	0.97	(0.19)	5.7	.	0.10	(4.6)	(3.1)	

Number	Nd	Ni	Pb	Pr	Rb	Sb	Sc	Sm	Sn	Ta	Tb	Th	Tl	Tm	U	V	Y	Yb	Zn
VS 9234-2008	48	30	17 (13)	116	(0.5)	13		8.4 (1.6)	(1.5)	(1.1)	19	(0.5)	(0.5)	4.3	60	34	3.5	28	
VS 9235-2008	39	35	20 (10)	135	(1.3)	15		7.2 (2.3)	(1.2)	0.92	14	(0.7)	(0.5)	4.6	102	33	3.3	50	
VS 9236-2008	(5.3)	62	3.5 (1.3)	3.8	(0.3)	2.5		1.0 (1)	(0.15)	(0.16)	1.4	(0.06)	(0.09)	(1.0)	26	5.6	0.50	38	

## COAL chart 1 of 2

#=class, 1=CRM and 2=RM mass % except \* for mg/kg ACIRS, AS(C)RM, COCO: 50-250 g SABS: 100-150 g USZ: as shown others: 50 g

#	Number	S	Ash	Volatile Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P
1	NCS FC28143	6.40	31.80	14.00	20,650 J	1.82	.	53.28	.	.	.	2.58	.	0.72	.	.
1	502-684-16033a	5.63	0.32	14.0	(15,206) BTU	.	.	87.2	.	.	.	3.86	.	1.49	.	.
1	SRM 2685c	4.72	.	.	Br:(4.94*)	Mg:(0.0814)	Mn:(0.003684)	.	(0.05540)	.	.	0.1494	.	.	.	.
1	NCS FC28009k	4.31	42.34	16.66	18,060 J	1.84	.	45.40	.	.	.	2.63	.	0.80	.	.
1	NCS FC28142	4.35	33.40	14.38	21,050 J	1.76	.	53.63	.	.	.	2.79	.	0.81	.	.
1	502-674-14157	4.16	10.70	.	.	.	.	.	.	.	.	.	.	.	.	17025
1	502-686-14157	4.16	.	.	.	.	.	.	.	.	.	.	0.065	.	.	17025
1	NCS FC28221	4.04	18.98	32.0	27,790 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28220	4.03	16.52	11.15	28,670 J	.	.	.	.	.	.	.	.	.	.	.
2	502-836-10076	3.99	12.57	(39.18)	(13,093) BTU	.	.	(70.18)	.	.	.	4.88	0.097	1.27	.	.
2	502-837-10182	3.26	9.00	(38.43)	(13,862) BTU	.	.	(72.64)	.	.	.	4.88	0.058	1.36	.	.
1	502-673-17041	3.23	8.04	.	.	.	.	.	.	.	.	.	.	.	.	17025
1	NCS FC28012i	3.22	21.49	11.00	26,010 J	1.66	.	67.71	.	.	.	2.73	.	0.99	.	.
1	NCS FC28210	3.17	25.80	8.77	24,130 J	.	.	.	.	.	.	.	.	.	.	.
1	CZ SF-06-14	3.13	27.21	27.36	23,990 J	10,314 BTU	.	58.28	.	.	.	3.51	.	3.80	.	.
1	NCS FC28141	2.92	28.64	11.50	23,040 J	1.70	.	59.60	.	.	.	2.80	.	0.80	.	.
1	ACIRS S2D	2.877	.	.	.	.	.	.	.	0.010	.	.	0.281	.	.	.
1	NCS FC28216	2.79	8.62	10.86	32,300 J	1.44	.	81.27	.	.	.	3.55	.	1.16	.	.
1	NCS FC28008m	2.68	25.20	27.50	24,490 J	1.57	.	60.26	.	.	.	3.74	.	1.06	.	.
1	CZ SF-07-14	2.52	28.73	38.80	21,337 J	9,173 BTU	.	50.97	.	.	.	4.26	.	1.05	.	.
2	ACIRS M1	2.39	18.68	(32.8)	(28,360) J	1.417	.	(67.4)	.	0.014	0.0160	(4.73)	0.122	(1.34)	.	0.098
2	COCO 036	2.28	13.38	8.28	30,550 J	.	.	.	.	.	.	.	.	.	.	0.088
1	NCS FC28215	2.17	25.2	28.79	24,830 J	.	.	.	.	.	.	.	.	.	.	.
1	502-672-17101	2.53	8.01	.	.	.	.	.	.	.	.	.	.	.	.	17025
1	NCS FC28011j	2.10	12.00	8.29	30,810 J	1.49	.	78.96	.	.	.	3.09	.	1.12	.	.
1	NCS FC28112	2.07	8.08	33.70	32,620 J	1.33	.	78.64	.	.	.	5.01	.	1.31	.	.
2	502-687-13233	2.06	.	.	.	.	.	.	.	.	.	.	0.130	.	.	.
2	502-839-11060	2.03	7.72	(37.57)	(13,586) BTU	.	(2.37)	(76.19)	.	0.0975	0.0071	5.10	0.0132	1.46	Se: 1.0 ppm	.
1	SRM 2683C	1.955	(9.87)	(35.84)	(13,003) BTU	.	(3.185)	(73.38)	.	(0.1127)	(0.0082)	(4.886)	0.0900	(1.635)	.	.
1	NCS FC28007p	1.92	16.26	30.12	27,060 J	1.49	.	67.05	.	.	.	4.06	.	1.21	.	.
2	COCO 002	1.89	14.25	21.16	29,200 J	.	.	.	.	.	.	.	.	last of stock	.	0.037
1	NCS FC28217	1.79	8.68	36.06	31,330 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28209	1.76	27.33	8.21	23,960 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28144b	1.75	85.72	9.12	2,280 J	2.54	.	5.80	.	.	.	1.03	.	0.27	.	.
1	SABS 062	1.74	11.46	5.34	30,170 J	.	.	82.28	.	.	.	2.16	.	1.83	.	0.040
1	NCS FC28106	1.70	8.60	31.81	32,500 J	1.35	.	78.40	.	.	.	4.86	.	1.32	.	.
2	COCO 041	1.67	29.60	17.96	22,870 J	.	.	.	.	.	.	.	.	.	.	.
2	COCO 039	1.67	14.65	17.89	30,240 J	.	.	.	.	.	.	.	.	.	.	0.040
1	NCS FC28214	1.66	27.85	29.21	23,630 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28010L	1.66	19.64	31.33	27,010 J	1.48	.	65.68	.	.	.	4.24	.	1.19	.	.
1	NCS FC28005i	1.65	20.68	8.23	26,240 J	1.74	.	71.17	.	.	.	2.09	.	0.87	.	.
2	502-831-14095	1.57	6.99	(34.30)	(12,765) BTU	FSI:0.78	5.08	(73.08)	.	0.3545	0.0048	4.72	0.117	1.69	Se:0.00013	.
2	COCO 046	1.49	16.65	19.36	29,310 J	.	.	.	.	.	.	.	.	.	.	0.039
1	NCS FC28002w	1.48	14.85	30.75	28,840 J	1.44	.	70.62	.	.	.	4.38	.	1.25	.	.
1	NCS FC28213	1.46	9.87	35.24	30,620 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28138	1.40	44.13	11.36	18,400 J	1.79	.	47.02	.	.	.	2.53	.	0.68	.	.
1	NCS FC28218	1.35	14.58	6.16	29,260 J	.	.	.	.	.	.	.	.	.	.	.
2	COCO 030	1.34	25.52	10.06	24,350 J	.	.	.	.	.	.	.	.	.	.	.
1	CZ SF-01-14	1.33	44.90	31.72	14,617 J	6,284 BTU	.	36.40	.	.	.	3.31	.	0.60	.	.
2	COCO 044	1.30	28.20	20.08	23,000 J	.	.	.	.	.	.	.	.	.	.	0.047
1	NCS FC28139	1.30	22.70	18.37	27,040 J	1.51	.	67.18	.	.	.	3.68	.	1.05	.	.
1	502-681-18058	1.29	9.20	33.6	(13,789) BTU	.	.	77.4 (57.2)	.	.	.	4.97	.	1.50	.	17025
1	NCS FC28140	1.28	25.88	30.43	22,500 J	1.62	.	58.12	.	.	.	3.40	.	1.02	.	.
1	NCS FC28111	1.26	25.50	28.50	23,850 J	1.57	.	59.75	.	.	.	3.73	.	1.01	.	.
2	USZ TTKN	1.21	15.2	29.3	35,260 J	.	.	.	.	.	.	4.88	.	80, 150, or 200 g units	.	.
2	502-685-14005	1.16	.	.	.	.	.	.	.	.	.	.	0.040	.	.	.
1	502-671-16140	1.15	14.24	.	.	.	.	.	.	.	.	.	.	.	.	17025
1	502-685-16140	1.15	.	.	.	.	.	.	.	.	.	.	.	0.041	.	17025
2	COCO 040	1.15	10.52	36.37	30,050 J	.	.	.	.	.	.	.	.	.	.	0.008
1	SRM 2692C	1.064	(7.499)	.	.	.	.	.	.	.	(0.1338*)	.	0.1790	.	.	.

#	Number	S	Ash	Volatile Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P
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COAL chart 2 of 2

#=class, 1=CRM and 2=RM		mass % except * for mg/kg			ACIRS, AS(C)RM, COCO: 120-250 g			SABS: 100-150 g			USZ: as shown		others: 50 g			
#	Number	S	Ash	Volatile Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P
1	SABS 069	1.06	8.22	6.10	32,060	.	.	85.36	.	.	.	2.66	.	1.89	.	0.018
1	NCS FC28202	1.05	8.65	33.23	30,720 J	1.39	.	74.78	.	.	.	4.78	.	1.35	.	.
1	NCS FC28205	1.05	8.62	33.44	30,750 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28208	1.03	15.47	20.59	29,200 J	1.46	.	72.60	.	.	.	3.98	.	1.14	.	.
1	NCS FC28004k	1.03	12.10	8.59	30,230 J	1.59	.	79.82	.	.	.	2.61	.	1.20	.	.
1	NCS FC28105a	1.03	11.87	8.99	31,190 J	1.46	.	79.96	.	.	.	3.31	.	1.12	.	.
1	SABS 035	1.02	26.81	22.18	.	.	.	58.01	.	.	.	2.98	.	1.52	.	0.05
1	SABS 028	0.99	27.00	23.10	.	.	.	57.24	.	.	.	2.94	.	1.45	last	0.09
2	COCO 049	0.98	25.23	17.23	24,400 J	.	.	.	.	.	.	.	.	.	.	0.052
1	SABS 065	0.97	8.0	5.7	32,070	.	.	85.60	.	.	.	2.68	.	1.84	.	0.020
1	SABS 068	0.95	27.09	21.22	25,600	.	.	63.47	.	.	.	3.57	.	1.46	.	0.038
2	COCO 028	0.95	17.86	volati	28,660	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28204	0.95	8.11	34.01	31,340 J	1.36	.	76.22	.	.	.	4.93	.	1.45	.	.
2	502-838-12185	0.963	6.50	(33.78)	(14,337) BTU	.	(1.41)	(80.26)	.	0.2161	0.0060	5.17	0.067	1.60	Se: 2.7	ppm
2	COCO 024	0.96	15.51	26.76	27,920 J	.	.	.	.	.	.	.	.	.	.	0.031
1	SABS 041	0.94	27.62	22.84	.	.	.	57.61	.	.	.	3.08	.	1.48	.	0.065
2	COCO 011	0.93	18.65	24.31	25,020 J	.	.	.	.	.	.	.	.	.	.	0.008
2	COCO 047	0.92	23.59	21.56	24,420 J	.	.	.	.	.	.	.	.	.	.	0.097
1	SABS 055	0.88	14.1	11.5	29,120 J	.	.	75.70	.	.	.	2.93	.	1.93	.	0.031
1	NCS FC28211	0.88	13.41	9.08	30,230 J	.	.	.	.	.	.	.	.	.	.	.
1	SABS 029	0.86	32.97	23.96	.	.	.	50.86	.	.	.	2.86	.	1.17	0.051	.
2	COCO 042	0.85	40.79	21.25	16,700 J	.	.	59.32	.	.	.	2.98	.	1.56	.	.
1	NCS FC28206	0.85	14.46	28.56	26,720 J	.	.	.	.	.	.	.	.	.	.	.
2	COCO 014	0.83	21.88	8.15	27,550 J	.	.	71.25	.	.	.	2.73	.	1.46	.	0.016
1	SABS 059	0.82	16.0	11.0	28,330 J	.	.	74.50	.	.	.	2.84	.	1.79	.	0.031
1	NCS FC28006g	0.82	9.25	31.31	31,490 J	1.38	.	76.91	.	.	.	4.62	.	1.37	.	.
1	NCS FC28110a	0.81	9.62	33.64	29,830 J	1.42	.	74.16	.	.	.	4.44	.	1.38	.	.
2	USZ SOEN	0.78	6.29	44.8	32,160 J	.	.	76.62	.	.	.	5.41	.	1.56	80 or 200 g units	.
1	SABS 039	0.75	24.51	23.34	.	.	.	59.97	.	.	.	2.93	.	1.56	0.079	.
1	SABS 043	0.74	22.31	23.82	.	.	.	61.69	.	.	.	3.03	.	1.56	.	0.071
2	COCO 034	0.74	17.54	21.45	27,590	.	.	.	.	.	.	.	.	.	.	0.090
2	COCO 038	0.73	15.02	23.63	28,350 J	.	.	.	.	.	.	.	.	.	.	0.11
1	SABS 051	0.72	39.70	20.89	.	.	.	44.44	.	.	.	2.45	.	1.10	.	.
1	NCS FC28203	0.71	10.36	20.69	31,660 J	.	.	.	.	.	.	.	.	.	.	.
2	502-846-13156	0.703	12.19	(5.81)	(13,197) BTU	.	(2.14)	(81.94)	.	0.0202	0.0086	2.39	0.0112	1.05	Se: 2.5	ppm
2	ACIRS S2B	0.692	(9.1)	(34.0)	(31,050) J	.	.	(75.4)	.	0.027	0.0037	(4.90)	0.057	(1.79)	Se: (0.4	ppm)
2	502-845-13158	0.665	8.02	(3.83)	(13,573) BTU	.	(3.15)	(87.33)	.	0.0154	0.0051	1.76	0.0169	0.878	Se: 2.0	ppm
1	SABS 046	0.66	11.86	26.87	.	.	.	74.21	.	.	.	3.77	.	1.76	.	.
1	NCS FC28107	0.66	10.41	15.3	31,550 J	1.43	.	79.60	.	.	.	3.80	.	1.02	.	.
1	<u>502-682-17195</u>	0.652	7.50	40.2	(12,486) BTU	.	.	71.5	.	.	.	4.78	.	1.45	.	<u>17025</u>
1	SABS 026	0.65	37.83	22.07	.	.	.	46.63	.	.	.	2.59	.	1.11	0.066	.
1	SABS 047	0.60	13.58	25.45	.	.	.	71.85	.	.	.	3.81	.	1.66	.	0.06
2	ACIRS G7	0.591	9.71	20.32	32,641 J	1.371	.	80.19	.	0.051	0.0096	4.45	0.021	1.82	.	0.032 120g
2	COCO 025	0.59	23.93	22.60	24,300 J	.	.	.	.	.	.	.	.	.	.	0.036
2	ACIRS G6	0.59	10.72	19.93	32,150 J	1.372	CO <sub>2</sub> :0.055	79.36	last	0.041	0.0067	4.33	0.026	1.75	Se:0.8ppm	0.023 125g
2	COCO 045	0.59	10.70	27.61	29,630 J	.	.	.	.	.	.	.	.	.	.	0.035
1	NCS FC28109	0.58	11.98	11.42	30,560 J	1.49	.	79.02	.	.	.	3.28	.	1.03	.	.
1	SABS 066	0.57	15.02	24.11	27,730	.	.	71.97	.	.	.	3.62	.	1.71	.	0.110
1	NCS FC28108	0.57	13.68	30.55	29,530 J	1.42	.	72.65	.	.	.	4.46	.	1.23	.	.
2	ACIRS G5	0.568	10.68	20.03	32,186 J	1.381	.	(79.19)	.	0.046	.	(4.34)	.	(1.77)	.	0.0196 last
2	ACIRS G4	0.567	10.62	20.32	32,420 J	1.37	.	(79.38)	.	0.040	.	(4.39)	.	(1.78)	.	0.026 last
2	USZ BNN	0.54	9.04	46.28	28,950 J	.	.	70.49	.	.	.	5.27	.	.	150 g units	.
2	COCO 043	0.54	14.80	23.94	28,490 J	.	.	.	.	.	.	.	.	.	.	0.107
1	<u>502-670-15196</u>	0.532	8.52	.	.	.	.	.	.	.	.	.	.	.	.	<u>17025</u>
1	<u>502-670-17354</u>	0.53	8.30	.	.	.	.	.	.	.	.	.	.	.	.	<u>17025</u>
1	NCS FC28212a	0.51	9.36	23.27	32,380 J	.	.	.	.	.	.	.	.	.	.	.
1	SABS 058	0.50	31.1	23.1	20,180 J	.	.	53.64	.	.	.	3.06	.	1.33	.	0.023
1	NCS FC28116a	0.50	11.06	23.77	30,000 J	1.44	.	75.34	.	.	.	4.00	.	1.18	.	.
1	SABS CCS 008b	0.49	15.8	25.6	27,550	.	.	71.19	.	.	.	3.85	.	1.70	.	0.111
1	SABS 050	0.48	16.36	24.58	.	.	.	70.79	.	.	.	3.80	.	1.62	.	0.095
1	SABS 049	0.48	16.34	24.31	.	.	.	70.96	.	.	.	3.61	.	1.63	last	0.087
1	SABS 056	0.48	15.5	25.4	27,770 J	.	.	71.18	.	.	.	3.85	.	1.70	last	0.093
1	SABS 057	0.48	15.49	25.42	.	.	.	71.19	.	.	.	3.85	.	1.70	.	1.093
1	SABS 045	0.49	15.45	24.50	.	.	.	71.24	.	.	.	3.73	.	1.71	.	.
1	SABS 037	0.48	15.26	24.84	.	.	.	71.17	.	.	.	3.67	.	1.72	0.102	.
1	CZ SF-04-14	0.48	4.43	23.67	34,618 J	14,883 BTU	.	85.53	.	.	.	4.59	.	1.35	.	.
1	NCS FC28201	0.47	10.45	17.7	31,570 J	.	.	.	.	.	.	.	.	.	.	.
2	502-835-10060	0.469	11.08	(38.20)	(12,604) BTU	.	.	(70.05)	.	.	.	4.85	0.015	1.75	.	.
1	NCS FC28001z	0.46	10.81	19.90	32,160 J	1.39	.	79.42	.	.	.	4.22	.	1.43	.	.
1	SRM 2693	0.4571	.	.	.	.	.	.	.	0.03696	.	.	0.0373	.	.	.
2	COCO 050	0.45	13.19	27.10	28,350 J	.	.	.	.	.	.	.	.	.	.	0.141
1	NCS FC28207	0.43	16.26	7.26	26,100 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28115	0.42	6.38	31.74	30,570 J	1.41	.	77.28	.	.	.	4.47	.	1.19	.	.
1	NCS FC28104	0.40	10.09	11.00	31,860 J	1.45	.	81.45	.	.	.	3.52	.	1.31	.	.
2	COCO 001	0.39	14.66	24.58	26,820 J	.	.	.	.	.	.	.	.	.	last	0.079
1	NCS FC28003h	0.39	13.13	9.80	29,630 J	1.57	.	78.77	.	.	.	2.65	.	0.98	.	.
1	SABS 023	0.37	16.5	25.6	.	.	.	68.25	.	.	.	3.63	.	1.62	.	0.102
1	NCS FC28003j	0.37	13.72	8.73	28,960 J	1.66	.	78.95	.	.	.	2.14	.	0.68	.	.
1	<u>502-680-16275a</u>	0.37	8.92	18.5	(14,156) BTU	.	.	81.7	(72.5)	.	.	4.21	.	1.17	.	<u>17025</u>
1	NCS FC28103	0.35	10.51	9.70	31,740 J	1.47	.	81.44	.	.	.	3.40	.	1.26	.	.
2	502-833-09176	0.341	10.88	(16.48)	(12,918) BTU	.	.	(80.97)	.	.	.	3.97	0.045	1.08	.	.
2	502-834-09112	0.298	12.51	(34.90)	(13,833) BTU	.	.	(68.45)	.	.	.	4.28	0.037	0.913	.	.
2	502-832-11154	0.288	12.29	(23.00)	(13,239) BTU	FSI:1.6	1.63	(77.05)	.	0.0063	0.0062</					

**RM FUSIBILITY OF COAL**

Number	analysis listed in mass %					250 g units			Reducing Temperature °C			
	C	H	N	P	S	MJ/Kg	Volatility	Ash	Deformation	Softening	Hemisphere	Flow
COCO 005	81.70	4.57	1.44	0.015	1.05	32.90	27.19	7.49	1402	1425	1443	1473
COCO 007	72.55	3.69	1.83	0.036	1.55	28.71	21.60	14.51	1329	1353	1381	1420
COCO 021	59.15	3.02	1.51	0.027	1.14	22.78	20.18	28.60	1380	1408	1430	1473
COCO 016	56.64	2.64	1.53	0.030	1.86	21.92	18.26	31.32	1284	1317	1346	1387
COCO 035	62.17	2.98	1.71	0.039	1.92	24.16	15.46	27.55	1369	1394	1419	1452
COCO 031	60.12	3.02	1.58	.	1.65	23.56	17.78	28.22	1315	1345	1375	1405
COCO 020	.	.	.	0.033	1.34	25.78	11.88	25.00	1263	1292	1331	1378

**SULFUR IN COAL**

# = class, where 1=CRM and 2=RM

analysis listed in mass %

#	Number	S	Units	#	Number	S	Units	#	Number	S	Units
1	IARM HC20800A	8.6	50 g	1	BCR 336	3.290	20 g	2	VS1-0.96	0.96	50g, last
1	ASCRM 012 D	5.21	125g, last	2	VS1-1.91	1.91	50g, last	1	IARM HC20075C	0.76	50g, last
2	COCO 037	4.74	50 g	2	ACIRS SIC	1.46	250 g	1	BCR 331	0.499	20 g
2	VS1-4.18	4.18	50g, last	1	BCR 333	1.344	20 g	2	ACIRS S1A	0.42	250 g
2	COCO 019	3.06	100 g	1	BCR 332	0.961	20 g				

**RM COAL**

typical analysis listed in mass %

50 g units, last of stock

Number	S	DRY ANALYSIS			Volatile Matter	IGNITED ANALYSIS										
		C	Heat BTU/lb	Ash		Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO <sub>2</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>
VS6-016	1.41	(47.64)	(12,293)	16.71	35.59	27.07	0.81	7.96	3.56	1.18	0.02	0.38	0.12	0.77	55.62	1.20

**CRM COAL**

analysis listed in mass %

(T) = Total

SARM 20 also contains Ta: 0.00012, Y: 0.0029

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn	Na <sub>2</sub> O	P	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	Sr	TiO <sub>2</sub>	Zr	LOI	Units
SARM 20	11.27	1.87	1.17	0.14	0.43	0.0080	0.27	.	0.14	0.51	17.66	0.0330	0.63	(0.0180)	64.66	120 g
SARM 19	8.01	1.39	1.75	0.24	0.20	0.0157	0.29	0.0130	.	1.49	15.00	0.0126	0.341	0.0351	71.28	120 g
SARM 18	2.57	0.18	0.29	0.145	0.11	0.0022	.	0.0030	.	0.56	6.20	0.0044	0.114	0.0067	90.11	120 g
US CLB-1	(1.51)	0.22	1.25(T)	0.0760	0.0470	(0.0008)	0.0230	.	(0.0700)	(1.49)	(2.51)	.	(0.0780)	.	.	50 g

analysis listed in mg/kg

US CLB-1 also contains informational Ash, Li, Mo, Nb, Nd and Sb

Number	As	Ba	Be	Ce	Co	Cr	Cs	Cu	Ga	Ge	Hf	Hg	La	Ni	Pb	Rb	Sc	Se	Sm	Th	U	V	Zn
SARM 20	4.7	372	2.5	87	8.3	(67)	(2)	18	16	.	4.8	0.25	43	25	26	10	10	0.8	6.3	18	4	47	17
SARM 19	7	304	2.8	56	5.6	50	1.4	13	14	13	5.4	(0.2)	27	16	20	9	7.6	.	4.9	12	5	35	12
SARM 18	.	78	4.1	22	6.7	16	(1)	5.9	(8)	(8)	1.7	(0.04)	10	10.8	(5)	8.1	4.3	.	2.0	3.4	1.5	23	5.5
US CLB-1	(13)	34	.	10	7.0	9.7	.	(10)	(3)	.	(0.2)	(5)	18	5.1	5.2	2.0	(2)	.	(1.4)	(0.55)	12	48	

**CRM COAL**

analysis in mass %

50g units

analysis in mg/kg

Number	Ash	Volatiles	BTU	C	Al	Cl	Fe	H	K	N	Na	S	Hg	Mn	V	Zn
SRM 2684c	(7.945)	(39.40)	(13,851)	(76.82)	(0.8730)	(0.0975)	.	(5.17)	(0.0981)	(1.395)	(0.0606)	3.027	0.0688	(20.51)	(16.3)	.
SRM 1635a *	(6.29)	(44.75)	(11,664)	(68.97)	0.5437	(0.0051)	0.2472	3.92	0.01874	(0.946)	0.1031	(0.294)	0.0836	6.69	13.34	7.3
SRM 1632e *	.	.	.	(76)	0.960	(0.0963)	1.42	(4.97)	0.1248	(1.4)	0.0374	2.738	0.1351	(18.4)	(29.2)	13.0

analysis in mg/kg \* SRM 1632d, 1632e and 1635a also detail many other elements, see certificate

Number	As	Ba	Br	Cd	Ce	Co	Cr	Cu	F	Ni	Pb	Rb	Sb	Se	Sr	Th	Ti	U
SRM 2684c	.	.	(11.1)	.	Ca:(3220)	.	.	.	(64)	Mg:(494)	.	.	.	(1.08)	.	.	.	.
SRM 1635a *	0.860	357.8	(1)	0.282	5.45	2.004	3.56	11.42	(63)	5.37	2.85	1.226	0.251	0.662	160	1.299	254	0.4792
SRM 1632e *	(8.55)	(62.8)	(11.9)	.	(12.24)	(3.622)	(16.57)	(5.70)	.	(11.08)	.	8.49	(0.428)	(1.525)	84.1	.	519	(0.636)

**CRM COAL**

analysis listed in mass % except \* which is mg/kg

powder 50 g

Number	Al%	Ca%	Cd*	Co*	Cr*	Cu*	Fe%	K%	Mg%	Mn%	Na%	Ni*	P%	Pb%	Si%	Ti%	V*	Zn%
NCS FC28127	3.47	1.88	2	9	23	23	1.02	0.29	0.28	0.019	0.052	16	0.010	.	5.61	0.18	60	0.0040
NCS FC28125	2.27	0.28	(<1)	11	5	17	0.24	0.090	0.050	0.0009	0.048	18	0.013	0.0016	2.69	0.090	33	.
NCS FC28123	1.88	0.74	(<1)	4	10	12	0.35	0.026	0.081	0.0030	0.11	8	0.066	0.0016	1.86	0.096	12	(0.001)
NCS FC28124	1.75	0.79	(<1)	4	7	12	0.34	0.020	0.071	0.0016	0.13	8	0.044	0.0016	1.77	0.079	11	.
NCS FC28128	1.22	0.19	.	4	8	12	0.86	0.043	0.059	0.0026	0.026	8	0.0044	.	1.64	0.059	28	(<0.001)
NCS FC28126	0.83	0.65	(<1)	3	5	8	0.32	0.010	0.060	0.008	0.034	5	0.019	.	1.01	0.046	11	.
NCS FC28122	0.25	0.85	.	8	2	2	1.79	0.016	0.24	0.022	0.081	8	0.0029	0.002	0.47	0.010	1	.



**CRM COAL**

BCR: 40 g units GBW: 50 g units

Number	As mg/kg	P mass %	Cl mass %	F mg/kg
GBW 11115	15	0.031	.	.
GBW 11116	34	0.007	.	.
GBW 11117	51	0.092	.	.
GBW 11118	.	.	0.010	.
GBW 11119	.	.	0.057	.
GBW 11120	.	.	0.110	.
GBW 11121	.	.	.	248
GBW 11122	.	.	.	864
GBW 11123	.	.	.	1496
BCR 460	.	.	(0.0059)	225

**CRM COAL AIR DRIED vs. HEATED DRIED ANALYSIS**

20 g powder

Number	Heat J/g	Volatile Matter%	Ash%	Moisture%	S%	Expiry
NCS FC62002a	24190, 24980	4.29, 4.43	23.90, 24.68	3.15 (air dried)	0.36, 0.37	August 2019
NCS FC62001c	22840, 25680	28.37, 31.90	11.30, 12.71	11.06 (air dried)	0.63, 0.71	May 2018 H: (3.32%)

**CRM FUSIBILITY OF COAL ASH**

analysis listed in °C MRed = Mildly Reducing, Oxi = Oxidizing, SRed = Strongly Reducing

Atmosphere Number	Initial Deformation			Softening			Hemishpering			Fluid			Units
	MRed	Oxi	SRed	MRed	Oxi	SRed	MRed	Oxi	SRed	MRed	Oxi	SRed	
NCS FS91001d	1057, 1176, 1208			1072, 1202, 1253			1098, 1236, 1328			1148, 1320, 1401			30 g
NCS FS28001	1161, 1211, .			1190, 1230, .			1198, 1239, .			1204, 1252, .			5 g
NCS FS28002	1217, 1356, .			1340, 1408, .			1357, 1420, .			1369, 1445, .			5 g
NCS FS28003	1285, 1314, .			1314, 1345, .			1322, 1360, .			1340, 1381, .			5 g

**COAL ASH**

# = class, where 1 = CRM and 2 = RM

analysis listed in mass %

#	Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	Units	Other
2	COCO ASH 015	55.67	31.44	2.42	3.99	0.65	0.74	MnO2: 0.036	0.13	0.37	1.89	1.78	.	20 g	
2	COCO ASH 013	54.89	32.44	2.16	4.43	0.84	0.54	MnO2: 0.041	0.06	0.33	2.05	1.82	.	20 g	
1	NCS FC28154	53.17	32.02	2.28	6.47	1.37	0.90	MnO: 0.035	0.41	0.19	0.78	1.34	0.027	5 g	
2	COCO ASH 014	52.29	31.67	2.53	6.46	0.85	0.51	MnO2: 0.050	0.07	0.44	2.73	1.86	.	20 g	
2	ASRM 010-2	52.2	27.1	3.47	10.8	0.92	1.40	Mn <sub>3</sub> O <sub>4</sub> : 0.16	0.47	1.13	0.21	1.34	.	100 g	BaO: 0.14 SrO: 0.11 last
1	JCFA-1 *	50.56	24.25	8.91	4.22	1.27	2.12	MnO: 0.068	2.24	0.586	.	1.31	.	100 g	
1	NCS FC28148	48.03	35.80	3.27	2.81	0.90	0.69	MnO: 0.0073	0.54	0.25	.	1.25	0.049	5 g	
1	NCS FC28150	47.64	26.03	10.44	5.79	1.41	1.87	MnO: 0.097	0.28	0.091	.	1.21	0.042	5 g	
1	NCS FC28151	43.42	28.53	3.33	15.18	0.64	1.21	MnO: 0.042	0.43	0.12	.	1.22	0.062	5 g	
1	NCS FC28146	37.86	33.71	9.90	4.74	0.30	1.27	MnO: 0.037	1.45	1.44	.	1.52	0.020	5 g	
1	NCS FC28147	37.52	32.78	10.97	4.81	0.24	1.17	MnO: 0.020	1.75	1.00	.	1.31	0.019	5 g	
1	NCS FC28149	35.54	25.92	14.92	7.56	0.20	1.63	MnO: 0.17	0.75	0.72	.	1.26	0.032	5 g	
1	NCS FC28145	15.66	7.34	18.37	39.61	0.30	6.05	MnO: 0.44	1.69	0.10	.	0.26	0.0042	5 g	

\* JCFA-1 also contains (in mg/kg) Be: 4.06, Co: 37.4, Cr: 75, Cs: 8.6, Cu: 122, Li: 91, Ni: 32.2, Pb: 47.2, Rb: 54.1, S: 1960, Sb: 2.1, V: 243, and Zn: 63.  
 \* JCFA-1 also contains (in mass %): FeO: 0.88, TFe<sub>2</sub>O<sub>3</sub>: 5.2, C: 1.35, H<sub>2</sub>O: 0.18, H<sub>2</sub>O+: 0.37, Sr: 0.110

**CRM COAL ASH**

analysis listed in mass %

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	Ba	CaO	CO <sub>2</sub>	Org.C	FeO	T.Fe <sub>2</sub> O <sub>3</sub>	H <sub>2</sub> O	H <sub>2</sub> O+	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	LOI
VS 7177-95	27.07	0.028	4.88	.	.	1.59	5.48	(0.13)	.	0.59	1.48	0.059	0.14	(0.064)	.	(0.018)	58.68	0.60	(0.56)
VS 9237-2008	9.7	0.86	43.8	(2.9)	.	(0.3)	5.1	.	.	0.36	5.5	0.22	0.67	(0.024)	3.48	.	15.6	0.59	8.5
VS 7125-94	6.79	0.225	20.91	13.20	(1.33)	0.40	6.28	(2.41)	(5.74)	0.51	6.70	0.094	0.22	0.059	0.17	(0.40)	35.80	0.35	(21.29)

continued analysis listed in mg/kg except % which is mass %

Number	Ag	As	Au	B%	Be	Bi	Ce	Co	Cr	Cs	Cu	Dy	Er	Eu	F%	Ga	Gd	Ge	Hf	Hg	Ho	La
VS 7177-95	(0.15)	.	.	(0.044)	11	(2.1)	138	25	99	(3.3)	176	.	.	(2.6)	(0.017)	(21)	.	(2.7)	(13)	.	.	70
VS 9237-2008	(0.2)	(8.0)	.	.	2.9	.	37	26	42	(1.2)	51	(2.7)	(1.4)	(0.8)	.	15	(3.3)	(6)	3.3	(0.1)	(14)	20
VS 7125-94	0.16	(1.0)	(0.003)	0.0097	2.9	.	38	16	45	(1.1)	45	(3.8)	(2.4)	0.9	(0.0230)	9	(4.2)	2.3	2.6	(0.03)	(0.87)	20

  

Number	Li	Lu	Mo	Nb	Nd	Ni	Pb	Pr	Rb	Sb	Sc	Sm	Sn	Sr%	Ta	Tb	Th	Tl	Tm	U	V	W	Y	Yb	Zn	Zr%
VS 7177-95	96	.	7.4	34	.	66	35	.	22	.	27	(15)	11	0.0403	.	.	(45)	.	.	(15)	145	(3.7)	87	7.8	77	0.033
VS 9237-2008	(9)	0.26	(3.0)	7.8	17	68	22	(4.2)	13	3.0	8.6	3.2	(3.2)	0.83	(0.61)	0.45	7.0	(0.4)	(0.25)	3.1	63	.	15	1.5	76	0.013
VS 7125-94	32	0.40	1.4	8.4	20	49	13	(4.3)	15	.	11	4.1	2.7	0.33	(0.53)	0.68	5.8	.	(0.38)	3.3	61	(1.1)	29	2.6	65	0.0119

**CRM COAL ASH**

Number	Ash%	C%	S%	Units
CZ SFA-01-14	96.60	3.10	0.029	50 g

**CRM COAL WASTE ROCK** analysis listed in mass % 50 g units

Number	Al	Ca	Fe	K	Mg	Mn	Na	P	Si	Ti	V
NCS FC28152	10.76	0.34	2.57	1.27	0.53	0.023	0.15	0.026	20.59	0.44	0.012

**CRM ASH OF COAL WASTE ROCK** analysis in mass % 5 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
NCS FC28153	27.71	0.65	5.01	2.09	1.20	0.041	0.27	0.082	60.03	1.01	0.028

**CRM COAL FLY ASH** analysis listed in mass %

Number	As	Al	Ba	Ca	Fe	K	Mg	Mn	Na	Ni	P	S	Si	Ti	Zn	LOI
IRNT 12-1-01	0.1820	10.8	0.0680	3.42	7.49	1.75	1.17	0.0630	0.551	0.00709	.	.	25.7	0.447	0.0157	.
SRM 2689	(0.0200)	12.94	(0.0800)	2.18	9.32	2.20	0.61	(0.0300)	0.25	(0.0122)	0.10	.	24.06	0.75	(0.0240)	(1.76)
SRM 1633c	0.01862	13.28	0.1126	1.365	10.49	1.773	0.498	0.02402	0.1707	0.0132	(0.192)	(0.110)	(21.30)	0.724	(0.0235)	.
IRNT 12-1-02	0.00739	16.1	0.1090	1.49	5.17	0.651	0.581	0.0441	0.361	0.0105	.	.	22.9	3.61	0.0221	.
BCR 176R	0.0054	.	(0.4650)	.	1.3100	.	.	(0.0730)	(3.4800)	0.0117	.	.	.	.	1.6800	.
IRNT 12-1-03	0.00505	14.7	0.0731	1.86	5.59	1.36	0.788	0.0383	0.303	0.0117	.	.	25.0	1.36	0.0248	.
BCR 038	0.00480	.	.	.	3.3800	.	.	0.0479	3.740	(0.0194)	.	.	.	.	0.0581	.
SRM 2691	(0.0030)	9.81	(0.5900)	18.45	4.42	0.34	3.12	(0.0200)	1.09	(0.0053)	0.51	0.83	16.83	0.90	(0.0120)	(0.23)
SRM 2690	(0.0026)	12.35	(0.5800)	5.71	3.57	1.04	1.53	(0.0300)	0.24	(0.0046)	0.52	0.15	25.85	0.52	(0.0120)	(0.53)

continued analysis listed in mg/kg except % which is mass %

Number	Ag	Au	B	Be	Br	Cd	Ce	Co	Cr	Cs	Cu	Eu	F	Hf	Hg	La
IRNT 12-1-01	.	.	291	4.30	.	.	98.7	25.7	96.8	118	58.7	.	.	.	0.00706	.
SRM 2689	.	.	(21)	.	(3)	.	(48)	(170)	(11)	.	(3)	(7)	(4.67)	.	(-0.003)	.
SRM 1633c	.	.	(16)	.	0.758	(180)	42.9	(258)	(9.39)	173.7	.	.	.	.	1.005	(87.0)
IRNT 12-1-02	.	.	.	.	.	322	52.4	189	20.1	231	4.99	.	.	.	.	164
BCR 176R	(33.1)	(0.604)	.	(836)	226	(47.7)	26.7	810	(8.27)	1050	(0.868)	.	(4.85)	(1.60)	(30.2)	.
IRNT 12-1-03	.	.	.	.	.	183	48.6	191	.	155	.	.	.	.	84.4	.
BCR 038	.	.	.	.	4.6	.	53.8	(178)	.	176	.	.	.	.	.	.
SRM 2691	.	.	(8)	.	(0.9)	.	(26)	(68)	(1)	.	(2)	.	(10)	(-0.003)	.	.
SRM 2690	.	.	(8)	.	(0.7)	.	(19)	(67)	(8)	.	(2)	.	(8)	(-0.003)	.	.

Number	Pb	Rb	Sb	Sc	Se	Sr	Ta	Th	Tl	U	V	W	Yb	Units
IRNT 12-1-01	43.1	150	5.28	20.4	.	275	.	.	.	.	195	.	3.49	50 g
SRM 2689	(52)	.	(9)	(32)	(7)	(700)	.	(25)	.	.	.	.	.	3 x 10 g
SRM 1633c	95.2	117.42	8.56	(37.6)	(13.9)	901	(1.58)	(23.0)	.	(9.25)	286.2	.	(7.7)	75 g
IRNT 12-1-02	40.8	69.0	.	.	.	583	.	23.9	.	.	558	.	.	50 g
BCR 176R	5000	(102)	850	(2.91)	18.3	.	(2.02)	(5.28)	1.32	.	(35)	(28.3)	.	40 g
IRNT 12-1-03	66.9	141	.	29.2	.	407	.	22.1	.	.	381	.	.	50 g
BCR 038	262	.	.	.	.	.	.	.	.	.	.	.	.	5 to 6 g
SRM 2691	(29)	.	(3)	(24)	(17)	(2700)	.	(26)	.	.	.	.	.	3 x 10 g
SRM 2690	(39)	.	(6)	(17)	(0.8)	(2000)	.	(25)	.	.	.	.	.	3 x 10 g

**COAL FLY ASH** analysis listed in mass %

ACIRS: RM, 80g SABS: CRM, 20g NCS: CRM. 30g

Number	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	SO <sub>3</sub>	SrO	TiO <sub>2</sub>	Units	REDUCING, OXIDIZING TEMPERATURES °C			
															Deformation	Spherical	Hemispherical	Flow
SABS 109	37.96	.	2.84	2.54	1.19	1.19	.	2.07	0.31	45.66	2.57	.	1.97	20 g	.	.	.	.
NCS FC82016a	34.20	.	4.73	4.89	0.86	0.76	.	0.42	0.25	51.24	0.43	.	1.26	30 g	.	.	.	.
NCS FC82012a	29.45	.	8.73	7.95	1.16	1.03	.	0.79	0.28	46.99	0.69	.	1.28	30 g	.	.	.	.
ACIRS Al *	28.9	0.18	6.05	14.6	0.46	1.25	0.22	0.43	1.26	44.1	0.32	0.16	1.56	80 g	1257, 1349	1287, 1383	1309, 1398	1367, 1429
NCS FC82013a	28.54	.	5.30	13.43	1.61	0.71	.	0.25	0.11	41.11	5.10	.	2.62	30 g	.	.	.	.
NCS FC82014a	28.09	.	5.15	6.04	1.44	1.05	.	0.52	0.38	54.68	0.49	.	1.14	30 g	.	.	.	.
NCS FC82015a	22.90	.	4.01	6.55	1.53	1.31	.	0.78	0.55	59.66	0.40	.	1.13	30 g	.	.	.	.

\* ACIRS Al also contains Co:(0.0043) Cr:(0.0058) Cu:(0.0099) Ni:(0.0047) Pb:(0.0047) V:(0.0176) Zn:(0.0090)

**INDUSTRIAL FLY ASH**

analysis listed in mass % except \* which is mg/kg

Number	Al	As	Ca	Cd	Cr	Hg*	Na	Ni	Pb	Cu	Fe	K	Sb	V	Zn	ZnO
ECRM 882-1	0.375	0.0054	10.11	0.0183	0.490	0.75	0.697	0.0263	1.324	0.218	22.20	0.960	0.0116	0.0090	.	28.49
JK 43	(0.2)	.	(12)	0.0023	(8)	3.9	(0.5)	(2)	0.21	(0.2)	(20)	(0.3)	.	(0.02)	4.96	.
JK 44	(0.2)	.	(5)	0.0469	(0.2)	2.8	(1)	(0.02)	2.74	(0.2)	(27)	(1.3)	.	(0.02)	27.3	.
JK 45	(0.1)	.	(7)	0.0047	(0.3)	0.25	(7)	(0.05)	0.11	(0.01)	(40)	(0.4)	.	(0.1)	1.53	.
502-843-1000	.	.	.	.	.	0.827	.	.	.	.	.	.	.	.	.	.

Number	Bi	C	Cl	F	Mg	Mn	S	Si	Sn	Units, Class
ECRM 882-1	0.0026	(1.0)	(2.35)	(0.07)	(0.48)	(2)	(0.5)	(1.05)	(0.02)	100 g, CRM
JK 43	.	.	.	.	.	.	.	.	.	15 g, CRM
JK 44	.	.	.	.	.	.	.	.	.	25 g, CRM
JK 45	.	.	.	.	.	.	.	.	.	15 g, CRM
502-843-1000	.	42.4	.	.	.	.	0.29	.	.	20 g, RM

**RM****COAL-TAR PITCH**

analysis listed in mg/kg except as noted

60 g units

Number	%C	S%	%H	Ash	Al	As	Br	Ca	Cd	Cl	Cr	Fe	I	K	Mg	Mn	Na	Ni	P	Pb
DOMTAR CTP A	94.0	0.49	4.0	0.27	245	.	1.7	91	.	118	0.87	200	0.33	43	17	2.7	257	2.5	10	91
DOMTAR CTP B	93.4	0.52	4.3	0.22	228	9	4.8	41	2.5	122	1.1	280	0.6	34	<30	3.3	150	.	3	80
DOMTAR CTP C	83.4	4.46	10.31	0.19	9	0.18	0.25	3	<0.05	18	0.4	14	1.4	2.2	<16	0.21	10	76	236	1

continued informational values listed in mg/kg except as noted

Number	Sb	Si	Sn	Ti	V	Zn	Soft Point °C
DOMTAR CTP A	.	358	.	18	1.2	88	115
DOMTAR CTP B	0.57	408	3.7	16	0.89	90	118
DOMTAR CTP C	0.03	20	<0.7	19	170	1	129

**CRM COATING THICKNESS**Number nominal  $\mu\text{m}$  coating thickness

SRM 1361b	6	12	25	48
SRM 1358b	20	80	255	1000
SRM 1362b	40	80	140	205
SRM 1359b	48	140	505	800
SRM 1363b	255	385	505	635
SRM 1364b	800	1000	1525	1935

These samples are designed for calibrating thickness gauges using magnetic principles. Each sample is a set of four 45 mm x 45 mm plates of coated 1010 sheet steel substrate coated with copper and a thin protective layer of chromium.

**CONTINUOUS CASTING POWDER**

analysis listed in mass %

IRSID: RM, 100 g units NCS: CRM, 50 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	C	C.Free	CO <sub>2</sub>	Ca	F	Fe	K	MgO	Mn	Na	Na <sub>2</sub> O	P	S	TiO <sub>2</sub>	LOI
NCS HC26805	41.31	6.93	3.06	1.57	.	21.46	(4.79)	.	.	3.26	.	.	4.07	.	.	.	.
NCS HC26804	34.95	5.30	15.86	14.49	.	19.13	(5.15)	.	.	0.78	.	.	4.99	.	.	.	.
IRSID 2701	32.70	6.10	3.37	(1.78)	(5.59)	22.90	7.58	(0.145)	0.159	2.19	.	9.42	.	(0.014)	(0.055)	(0.048)	(2.08)
NCS HC26803	30.10	2.14	5.98	4.06	.	30.78	(10.59)	.	.	1.30	.	.	0.52	.	.	.	.
IRSID 2702	28.70	12.60	16.54	15.80	(2.53)	17.80	6.08	1.260	(0.750)	(1.47)	0.071	3.61	.	(0.180)	(0.490)	0.564	(1.26)
NCS HC26802	23.08	14.14	12.71	9.94	.	17.93	(3.86)	.	.	5.86	.	.	2.94	.	.	.	.
NCS HC26801	18.96	16.99	19.97	18.14	.	12.89	(4.47)	.	.	1.39	.	.	9.86	.	.	.	.

**RM****CONTINUOUS CASTING POWDER**

typical analysis listed in mass %

100 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Ca	F	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SrO	TiO <sub>2</sub>	Other
DH X2802	57.50	3.09	25.15	0.074	0.488	0.830	0.981	0.030	1.097	0.060	0.132	0.020	0.055	ZnO: 0.004
DH X2801	55.0	3.58	23.08	0.047	0.467	1.092	4.80	0.033	1.33	0.044	0.245	0.019	0.069	BaO: 0.019
DH 3011	43.23	4.40	26.58	5.59	2.122	0.606	5.85	0.033	2.23	0.106	0.058	0.029	0.178	Y: 0.028
DH 3005	43.10	5.14	27.35	6.23	0.233	0.376	0.39	0.007	7.93	0.091	0.019	.	0.086	
DH 3010	38.56	5.05	27.06	.	2.63	0.155	4.13	0.059	5.479	0.454	0.131	.	0.055	
DH 3013	37.70	5.95	30.73	5.72	0.437	0.288	1.93	0.045	6.43	0.047	0.077	.	0.064	BaO: 0.121

**RM****COVER POWDER**

analysis listed in mass %

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>
DH 5905	19.32	46.50	0.435	0.321	9.17	0.051	.	0.039	0.074	22.93	.	0.035
DH 5906	14.34	33.29	0.598	0.210	19.38	0.052	0.32	0.037	0.061	30.78	0.015	0.037



## CRM COKE

analysis listed in mass % except \* which is mg/kg

Number	Al%	Ca%	Cd*	Co*	Cr*	Cu*	Fe%	K%	Mg%	Mn%	Na%	Ni*	P%	Pb*	Si%	Ti%	V*	Zn*
NCS FC28131	2.72	0.29	<1	7	11	16	0.51	0.094	0.046	0.008	0.050	13	0.015	.	3.22	0.12	27	18
NCS FC28129	2.34	0.60	.	7	15	21	0.75	0.093	0.11	0.021	0.13	15	0.020	14	2.97	0.12	41	11
NCS FC28130	1.96	0.52	<1	6	12	17	0.63	0.061	0.11	0.015	0.063	12	0.022	.	2.35	0.099	34	11

## COKE ASH

analysis listed in mass %

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Co <sub>3</sub> O <sub>4</sub>	Fe	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	LOI
NCS FC28137	35.62	2.82	.	.	5.02	0.78	0.53	0.070	0.47	0.24	.	47.81	.	1.38	0.033	.
NCS FC28136	30.66	6.00	.	.	7.51	0.61	1.50	0.16	0.70	0.41	.	41.61	.	1.37	0.050	.
NCS FC28135	29.95	5.67	.	.	7.23	0.76	1.25	0.18	1.18	0.31	.	42.87	.	1.41	0.049	.
DH 3713	26.33	4.16	0.011	.	8.57	4.120	2.94	0.172	0.568	0.215	S:0.228	49.74	0.056	1.095	0.060	.
DH 3711	13.79	11.60	0.007	7.79	.	3.29	8.69	0.189	3.08	0.607	0.091	43.5	0.103	2.78	0.058	0.52

Number	C.tot	CO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	CuO	NiO	ZnO	ZrO <sub>2</sub>	Units
NCS FC28137	.	.	.	.	.	.	.	CRM, 5 g
NCS FC28136	.	.	.	.	.	.	.	CRM, 5 g
NCS FC28135	.	.	.	.	.	.	.	CRM, 5 g
DH 3713	.	.	0.046	0.037	0.026	0.232	0.028	RM, 100 g
DH 3711	0.039	0.045	0.036	0.009	0.030	0.010	0.041	RM, 100 g

BaO: 0.170 PbO: 0.209

## CRM DUST

Number	Type	Al	Al <sub>2</sub> O <sub>3</sub>	As	C	CaO	Co	Cr	Cr <sub>2</sub> O <sub>3</sub>	Cu	CuO	F	Fe	FeO	K
VS E5	Blast Furnace	.	2.87	.	13	7.9	0.013	.	0.085	.	0.013	0.049	44.3	.	.
VS E4	Blast Furnace	.	2.33	0.0018	13.2	8.8	.	.	.	.	0.034	0.023	44.6	.	.
VS E2	Converter	(0.07)	.	(0.002)	1.383	7.97	(0.003)	(0.1)	.	(0.04)	.	(0.5)	56.4	6.2	(0.2)
VS E1	Electric Furnace	.	3.06	(0.004)	0.684	5.85	(0.03)	.	20.3	(0.1)	.	(0.7)	29.7	(21)	(0.1)

Number	MgO	MnO	Na	Ni	NiO	P	Pb	S	SiO <sub>2</sub>	Sn	TiO <sub>2</sub>	V	V <sub>2</sub> O <sub>5</sub>	Zn	Units
VS E5	2.26	0.5	.	.	0.022	0.041	.	0.26	7.17	.	1.63	.	0.39	0.27	150 g
VS E4	0.82	0.47	.	.	0.033	0.015	0.44	7.46	.	.	0.2	.	0.041	1.52	150 g
VS E2	1.64	1.41	(0.1)	(0.03)	.	0.065	0.276	0.116	1.76	(<0.0005)	.	(0.01)	.	0.59	100 g
VS E1	9.3	1.56	(0.1)	.	3.68	(0.02)	(0.05)	0.072	10.3	(<0.0005)	2.79	(0.04)	.	(0.2)	150 g

## RM DUST

typical analysis listed in mass %

\* samples list Cu as CuO and Ni as NiO

DH 6203-6205: 20 g

all others: 100 g

Number	Type	Al <sub>2</sub> O <sub>3</sub>	C	CO <sub>2</sub>	CaO	Cl	Cr <sub>2</sub> O <sub>3</sub>	CuO	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	PbO	SiO <sub>2</sub>	TiO <sub>2</sub>	ZnO
DH X2901	Blast Furnace	0.961	.	.	5.28	.	0.038	.	0.778	1.147	0.119	0.153	0.006	4.28	0.068	0.267
DH X2902	Blast Furnace	0.823	.	.	3.12	.	0.037	.	0.84	0.678	0.138	0.165	0.017	3.28	0.053	0.271
DH X2903	Blast Furnace	0.701	.	.	2.00	.	0.040	0.006	0.705	0.502	0.111	0.158	0.018	2.44	0.058	1.19
DH 6205	Cupola	1.30	6.80	3.84	4.91	2.88	0.041	0.163	3.68	1.85	2.26	0.147	2.43	34.52	0.060	21.01
DH 6204 *	Cupola	1.06	8.08	2.02	2.54	3.62	0.072	0.079	4.16	1.53	2.63	0.051	3.48	26.94	0.184	30.65
DH 6206 *	Cupola	0.220	2.57	.	0.090	.	0.048	2.021	0.086	0.020	0.085	0.191	.	0.430	0.014	91.1
DH 6203	Electric Furnace	2.57	4.22	1.01	1.23	2.00	0.004	0.311	2.51	3.10	5.12	0.52	1.05	15.65	0.517	12.32

continued

Number	F	Fe	Fe <sub>2</sub> O <sub>3</sub>	Mn	Mn <sub>3</sub> O <sub>4</sub>	MoO <sub>3</sub>	NiO	S	SO <sub>3</sub>	SnO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	-H <sub>2</sub> O
DH X2901	.	59.37	.	0.367	.	.	0.015	0.488	.	.	0.020	.
DH X2902	.	61.67	.	0.341	.	.	0.016	0.577	1.44	.	.	.
DH X2903	.	63.01	.	0.425	.	.	0.012	0.392	.	.	0.020	.
DH 6205	0.096	.	9.49	.	2.57	0.013	.	.	2.70	0.018	0.019	0.107 at 900°C
DH 6204 *	0.247	.	6.29	0.97	.	.	0.0162	1.09	.	.	.	0.055 at 500°C
DH 6206 *	.	.	0.572	0.04	0.061	.	0.297	0.305	.	0.047	.	1.17 at 900°C
DH 6203	0.570	.	36.85	.	4.97	.	.	.	5.29	.	0.004	0.214 at 900°C

analysis for DH 6204 continues in mg/kg

Number	Cd	Li	Mo	Sr	V
DH 6204	197	0.4	510	5.4	2.92

**CRM FLUE DUST**

informational analysis listed in mass %

30 g units

Number	Type	Al <sub>2</sub> O <sub>3</sub>	CO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>
BL 12-1-11	Sinter Plant	4.00	8.60	6.77	3.18	1.23	2.22	0.03	4.11	1.15	65.58	0.23
BL 12-1-10	Foundry	1.64	5.39	12.80	60.95	0.28	7.59	0.16	0.15	2.22	9.80	0.075

continued

certified analysis listed in mg/kg

Number	Ag	As	Ba	Cd	Co	Cr	Cu	Mo	Ni	Pb	Sb	Sn	Sr	V	Zn
BL 12-1-11	.	(8)	160	(3)	8	3910	27	(10)	36	(25)	.	(43)	(58)	56	50
BL 12-1-10	(1)	(8)	(150)	5	31	189	76	(4)	47	56	(3)	(40)	(50)	(33)	86

**CRM FURNACE DUST**

analysis listed in mass %

100 g units

Number	Ag	Al	As	Bi	C	Ca	Cd	Cl	Co	Cr	Cu	F	Fe	H <sub>2</sub> O	Hg
ECRM 876-1	.	0.034	0.023	.	.	3.43	.	.	.	0.17	0.42	.	24.85	.	.
ECRM 880-1	.	1.28	.	.	.	3.15	.	0.085	.	0.027	0.005	0.034	31.0	.	.
ECRM 884-1	0.0028	0.379	0.0054	0.0280	(0.82)	5.22	0.0045	0.991	0.0046	1.86	0.1569	0.411	31.67	(0.30)	(0.0002)

continued

Number	K	Mg	Mn	Mo	Na	Ni	P	Pb	S	Si	Sn	Ti	V	Zn	LOI
ECRM 876-1	1.63	1.31	2.84	.	1.98	0.034	0.128	.	0.87	1.72	.	0.048	.	23.29	.
ECRM 880-1	0.108	0.714	0.218	.	0.041	0.014	0.038	0.017	0.425	3.34	.	0.081	.	0.064	.
ECRM 884-1	0.979	1.848	5.85	0.208	0.585	0.197	0.079	0.442	(0.49)	2.100	0.0186	0.0230	0.0303	17.50	(2.94)

**CRM INDOOR DUST**

analysis listed in mg/kg

8 g units

Number	As	Cd	Cr	Hg	Pb
SRM 2584	17.4	10.0	135.0	5.20	9761
SRM 2583	7.0	7.3	80	1.56	85.9

**CRM ROAD DUST**

analysis listed in mg/kg except \* which is µg/kg

Number	Pd*	Pt*	Rh*	Cd	Co	Hf	Mo	Rb	Sb	Th	V	Y	Units
BCR 723	6.1	81.3	12.8	(2.5)	(29.8)	(2.2)	(40.0)	(75)	(28.2)	(4.8)	(74.9)	(12.5)	25 g

continued analysis listed in mass %

Number	Al	Ba	Cr	Fe	Mn	Ni	Pb	Sr	Ti	Zn	Moisture
BCR 723	(3.75)	(0.046)	(0.0440)	(3.29)	(0.128)	(0.0171)	(0.0866)	(0.0254)	(0.258)	(0.166)	(~3%)



CRM		USED AUTOMOBILE EXHAUST CATALYST						mg/kg	
Number	Pb +/-	Pd +/-	Pt +/-	Rh +/-	Units				
SRM 2557	13931 97	233.2 1.9	1131 11	135.1 1.9	70 g				
SRM 2556	6228 49	326.0 1.6	697.4 2.3	512 0.5	70 g				
FLX CRM132	.	1673 43	1770 18	295 6	30 g				
ERM-EBS04a	.	1596 11	1414 9	210.0 2.2	200 g				
FLX CRM133	.	1075 33	465 32	242 4	30 g				

RM		ELECTRODE CARBON							
Number	Size Analysis	Ash	Bulk Density	Relative Density	Moisture	Volatile Matter	Units		
ACIRS EC	<1% @ +212 $\mu$ m	2.8%	1028 g/L	2.08	0.2%	0.8%	1 kg		

### FERROBORON # = class, where 1 = CRM and 2 = RM typical analysis

#	Number	B	Al	C	Cr	Cu	Fe	Mn	Ni	P	S	Si	Sn	Ti	V	W	Zn	Units
1	VS F21/2	20.91	1.546	0.047	.	0.012	.	.	0.0119	.	.	0.73	0.0055	.	.	.	0.0055	100 g
1	NCS HC11612	20.82	0.018	0.086	.	.	.	0.305	.	0.020	0.0018	0.353	.	.	.	.	.	70 g
1	NCS HC25658	20.58	0.99	0.022	.	.	.	.	0.017	0.0016	1.68	.	.	.	.	.	.	50 g
2	DH 1705	20.23	0.085	0.62	0.925	0.072	75.71	0.416	0.097	0.061	.	1.011	.	0.025	0.006	0.127	.	50 g
1	NCS HC28632	19.33	0.185	0.19	0.26	0.050	.	0.575	0.056	0.027	0.0020	0.65	.	0.030	0.010	.	.	50 g
2	DH 1704	19.13	0.064	0.322	0.038	0.013	79.74	0.299	0.012	0.015	.	0.229	.	0.011	.	0.015	.	50 g
1	NCS HC28631	18.92	0.036	0.40	0.025	0.015	.	0.310	0.013	0.025	0.0023	0.18	.	0.017	0.0090	.	.	50 g
1	NCS HC93623	18.69	0.083	0.45	.	.	.	.	.	0.025	0.0044	0.44	.	0.019	.	.	.	50 g
1	ECRM 587-1	18.67	0.047	0.738	0.104	.	.	0.272	.	0.020	.	0.129	.	0.039	0.004	.	.	100 g
1	NCS HC11613	17.65	0.035	0.181	.	.	.	0.35	.	0.030	0.0023	0.549	.	.	.	.	.	70 g
1	VS F22/3	8.95	7.78	0.161	.	3.43	.	.	.	0.021	0.018	7.82	.	.	.	.	.	100 g

### FERROCHROMIUM # = class, where 1 = CRM and 2 = RM chips as noted all others: powder

#	Number	Cr	Al	C	Co	Cu	Fe	Mn	N	Ni	P	S	Si	Ti	V	Units
1	IRSID 509-1	72.85	.	0.012	.	.	.	.	0.029	.	(0.019)	.	0.230	.	.	100 g
1	ECRM 580-1	72.18	.	0.019	0.047	.	.	.	0.035	.	0.011	.	0.306	.	0.083	100 g
1	VS F11/4	71.41	.	0.119	.	.	27.20	0.161	0.035	0.362	0.023	0.0021	0.68	.	0.084	100 g
2	DH 1602	71.20	0.017	8.12	Nb:0.006	.	19.38	0.103	W:0.038	0.304	0.014	Mg:0.049	0.153	0.009	0.102	50 g
1	IPT 65	71.2	9.2	0.051	0.016	.	17.9	0.128	.	0.077	0.006	0.016	0.71	.	.	100 g
1	BCS 203/6	71.01	.	0.0270	0.0442	.	.	0.153	.	0.218	0.0195	(0.004)	0.381	.	0.0729	100 g
1	SRM 196	70.83	.	0.035	.	.	.	.	.	0.020	0.003	0.373	.	.	.	100 g
1	IRSID 507-1	70.30	.	5.40	.	.	.	0.270	0.049	0.017	.	1.20	.	.	.	100 g
2	DH 1802	70.28	0:0.26	1.31	0.050	W:0.021	27.09	0.209	0.073	0.369	0.026	0.004	0.298	Mg:0.015	0.061	50 g last
1	VS F48	69.8	.	8.80	.	.	.	.	0.020	0.025	0.036	0.103	.	.	.	100 g
2	DFS 1	69.8	.	0.0549	.	H:(0.0024)	.	O:(0.56)	0.0973	.	(0.027)	(0.0017)	(0.87)	.	.	50 g
2	DFS 2	69.6	.	9.03	.	.	.	O:(0.2)	(0.0178)	.	(0.021)	(0.0174)	(0.2)	.	.	50 g
1	JSS 733-1	69.24	.	8.95	.	.	.	.	.	.	0.0219	(0.0248)	(0.262)	.	.	150 g
1	NCS HC37618	69.12	.	8.44	.	.	.	.	.	0.026	0.026	0.30	.	.	.	50 g
1	VS F45	69.0	0.041	0.071	.	.	.	.	0.082	.	0.027	0.0024	1.10	.	.	100 g
1	VS F35/2	68.9	.	0.79	.	.	28.16	.	0.185	.	0.027	0.0022	0.181	.	.	100 g chips
1	VS F46	68.8	.	5.47	.	.	.	.	0.055	.	0.030	0.015	1.05	.	.	100 g
1	BCS 204/6	68.77	.	8.57	0.0359	.	.	0.225	.	0.289	0.0164	0.0190	0.715	0.0565	0.094	100 g
1	NCS HC93604	68.13	.	0.038	.	.	.	0.103	.	0.260	0.022	0.015	0.466	0.016	.	50 g
1	VS F15/2	68.1	0.30	0.080	.	.	.	.	1.79	.	0.036	0.0019	2.08	.	.	100 g chips
1	SRM 64c	68.00	.	4.68	0.051	0.005	24.98	0.16	0.045	0.43	0.020	0.067	1.22	0.002	0.15	100 g
1	NCS HC25635	67.23	.	0.051	.	.	.	0.311	.	0.30	0.028	(0.003)	1.01	.	.	50 g chips
1	NCS HC26607b	65.86	.	7.23	.	.	.	0.38	.	0.29	0.017	0.020	2.18	0.15	.	50 g
1	NCS HC25603b	65.27	.	7.37	0.044	.	24.90	0.31	.	0.39	0.020	0.015	1.27	0.104	0.138	50 g
1	NCS HC37607	64.32	.	0.086	.	.	.	0.35	.	0.034	0.005	1.39	.	.	.	40 g chips
1	VS F50	64.3	0.168	0.079	.	.	.	.	11.2	.	0.0048	0.0058	1.29	.	.	100 g
2	DFS 3	64.2	.	(0.068)	.	.	.	O:(3)	9.71	.	(0.023)	(0.016)	(0.54)	.	.	50 or 100 g
1	NCS HC11606	64.17	.	6.37	.	.	.	0.32	.	0.023	0.013	4.29	.	.	.	100 g
1	NCS HC37608	64.06	.	0.243	.	.	.	0.34	.	0.039	0.019	0.99	.	.	.	40 g chips
1	NCS HC37615	63.50	.	8.78	.	.	.	.	.	0.023	0.025	0.78	0.097	.	.	50 g
1	NCS HC25651	63.31	.	2.55	.	.	.	0.47	.	0.023	0.047	2.04	.	.	.	50 g
1	NM 230	62.89	.	7.86	.	.	.	0.31	.	0.035	0.037	3.46	.	.	.	100 g
1	NCS HC25636a	62.81	.	0.078	0.16	0.032	35.56	0.39	.	0.34	0.028	0.0052	0.32	.	0.098	50 g chips
1	NCS HC25644	62.57	.	0.0064	.	.	.	8.69	.	0.024	0.029	0.75	.	.	.	50 g
1	NCS HC28621	62.54	.	7.78	.	.	27.09	0.307	.	0.026	0.033	1.45	0.166	0.138	.	50 g
1	NCS HC25653	62.49	.	8.70	.	.	.	0.11	.	0.025	0.024	0.15	0.016	.	.	50 g
1	NCS HC37609	61.54	.	8.49	.	.	.	0.20	.	0.024	0.015	2.15	0.24	.	.	40 g
1	NCS HC93611	60.42	.	8.13	.	.	.	0.21	.	0.022	0.059	0.92	.	.	.	50 g
1	NCS HC28622	60.00	.	7.72	.	.	28.65	0.340	.	0.025	0.033	2.43	0.261	0.153	.	50 g
1	NCS HC93605	59.71	.	8.00	.	.	.	0.308	.	0.312	0.037	0.037	2.94	0.410	.	50 g
1	NCS HC37617	59.35	.	8.32	.	.	.	.	.	0.021	0.040	1.91	.	.	.	50 g
1	NCS HC11610	58.83	.	0.040	.	.	.	0.313	4.76	0.020	0.042	0.525	.	.	.	70 g
1	NCS HC28630	58.65	.	0.45	Ca:0.0012	0.020	.	0.35	As:0.0027	0.242	0.030	0.0015	1.43	Zn:0.010	0.154	50 g
1	NCS HC93609	58.28	.	8.36	.	.	.	0.207	.	0.023	0.068	1.15	.	.	.	50 g
1	NCS HC14615a	57.44	.	8.00	.	.	31.46	0.24	.	0.23	0.017	0.015	1.96	.	0.28	50 g
1	NCS HC28619	56.76	.	7.28	.	.	30.22	0.300	.	0.023	0.024	4.25	0.412	0.203	.	50 g
1	NCS HC14615	56.16	.	8.07	.	.	.	0.23	.	0.017	0.045	2.30	.	.	.	50 g
1	NCS HC14614	55.81	.	7.67	.	.	.	0.28	.	0.018	0.032	2.57	.	.	.	50 g
1	NCS HC28620	55.77	.	7.60	.	.	31.41	0.382	.	0.022	0.031	3.95	0.423	0.175	.	50 g
1	NCS HC14613	54.04	.	7.56	.	.	.	0.18	.	0.020	0.032	2.58	.	.	.	50 g
1	BS 130/2	52.6	.	7.70	.	(0.012)	.	0.44	.	0.015	0.045	2.12	(0.18)	(0.36)	.	100 g
1	BS 130/1	51.6	.	7.12	.	(0.015)	.	1.25	.	Mo:(0.005)	0.014	0.034	4.41	(0.38)	(0.32)	100 g
1	ECRM 585-2	49.05	.	5.488	0.0622	.	38.67	0.801	0.0127	0.294	0.0255	0.0320	4.69	0.263	0.282	100 g
1	BS 130/3	49.01	.	6.47	.	(0.01)	.	0.76	.	Mo:(0.003)	0.015	0.028	6.20	(0.41)	(0.38)	100 g
1	SARM 144	49	.	.	.	.	36.9	0.33	.	0.21	.	.	5.31	0.67	0.37	100 g
1	VS F38	.	.	4.62	.	.	.	.	.	.	.	.	.	.	.	100 g last
1	VS F12/3	.	.	0.289	.	.	.	.	.	.	.	.	.	.	.	100 g chips
1	VS F10/2	.	.	0.018	.	.	.	.	.	.	.	.	.	.	.	100 g chips
1	VS F9/2	.	.	0.012	0.042	.	.	.	.	.	.	.	.	.	.	100 g chips

#	Number	Cr	Al	C	Co	Cu	Fe	Mn	N	Ni	P	S	Si	Ti	V	Units
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**CRM FERRONICKEL**

Number	Ni	N	C	Co	Cr	Cu	Fe	Mn	P	S	Si	Units
VS F41	91.4	0.058	0.0124	2.04	.	0.47	5.68	.	.	0.132	.	100 g
NCS HC11617	16.45	.	1.85	0.241	1.87	0.021	.	0.041	0.037	0.213	3.11	60 g
NCS HC11616	13.34	.	2.12	0.247	1.98	0.022	.	0.051	0.039	0.283	3.25	60 g
NCS HC25656	12.16	.	3.06	.	3.62	.	.	.	0.046	0.245	1.04	50 g
NCS HC11618	10.70	.	1.65	0.198	1.56	0.021	.	0.053	0.032	0.211	2.54	60 g

**FERRONIUBIUM**

# = class, where 1 = CRM and 2 = RM

\* notes the total of Nb+Ta

#	Number	Nb	Fe	Si	Al	C	Cr	Cu	Mn	P	Pb	Sn	Ta	Ti	V	W	Zr
2	DH 2816	69.27	27.12	1.748	0.568	0.069	0.026	0.026	0.177	0.132	0.079	0.056	0.064	0.382	0.015	.	.
1	NCS HC25650	66.34	.	1.01	0.89	0.074	.	0.023	.	0.085	.	.	(0.081)	0.49	.	.	.
1	NCS HC18606	66.24	.	1.09	1.35	0.070	.	.	0.29	0.159	.	.	0.084	0.78	.	.	.
1	NCS HC11609	64.89	.	1.34	0.711	0.114	.	0.059	0.37	0.172	.	.	0.087	0.870	.	.	.
1	NCS HC93607	64.60	.	1.04	1.50	0.101	.	0.038	.	0.194	.	.	0.097	0.585	.	.	.
1	VS F20/3	63.5*	33.3	0.67	0.35	0.136	.	.	.	0.039	.	0.0014	63.5*	0.292	.	.	.
1	ECRM 579-1	62.87	.	1.03	1.86	0.037	.	.	.	0.064	.	0.344	3.85	0.567	.	.	.
2	DH 2815	60.15	28.77	1.580	4.82	0.043	0.028	0.209	0.842	0.065	0.140	1.38	0.856	0.185	0.013	0.064	0.105
1	ECRM 576-1	43.90	.	1.79	2.53	0.201	.	.	.	.	.	0.195	0.306	1.32	.	.	.

Number	Co	Mg	Mo	N	Ni	S	Units
DH 2816	.	.	.	.	0.006	0.025	50 g
NCS HC25650	.	.	.	.	.	0.028	50 g
NCS HC18606	.	.	.	.	.	0.008	50 g
NCS HC11609	.	.	.	.	.	0.014	70 g
NCS HC93607	.	.	.	.	.	0.013	50 g
VS F20/3	0.0056	.	.	0.067	.	0.0091	100 g
ECRM 579-1	0.005	.	.	.	.	0.021	100 g
DH 2815	.	0.076	0.020	.	0.019	0.056	50 g
ECRM 576-1	.	.	.	.	.	.	100 g

**FERROPHOSPHORUS**

# = class, where 1 = CRM and 2 = RM

analysis listed in mass %

#	Number	P	Fe	Al	C	Ca	Cr	Cu	Mn	Nb	Ni	S	Si	Ti	V	Units
1	NCS HC93622	27.50	.	.	0.228	.	0.226	.	0.70	.	.	0.017	0.156	0.53	.	50 g
1	SRM 90	26.2	.	.	.	.	.	.	.	.	.	.	.	.	.	75 g
1	NCS HC11614	25.81	.	.	0.032	.	.	.	0.638	.	.	0.0038	0.60	2.14	.	70 g
2	DH 2204	25.69	69.2	0.056	0.043	0.681	0.077	0.214	0.964	0.038	0.047	0.023	1.238	0.836	0.150	50 g
1	NCS HC11615	21.49	.	.	0.130	.	.	.	1.07	.	.	0.061	0.382	0.62	.	70 g
1	VS F28/2	16.05	.	.	.	.	.	.	1.20	.	.	0.021	1.11	.	.	100 g

**FERROTITANIUM**

# = Class, where 1 = CRM and 2 = RM

#	Number	Ti	Al	sol.Al	C	Co	Cr	Cu	Fe	Mn	P	S	Si	V	Zr
2	DH 2409	72.74	2.93	.	.	.	0.384	0.074	19.27	0.192	0.004	.	0.180	1.167	0.383
1	VS F30/4	70.3	3.83	.	0.154	.	0.154	0.065	21.51	0.189	0.0030	0.0054	0.163	2.29	0.231
1	NCS HC15601	70.02	0.3	.	0.057	.	0.039	0.037	26.57	0.106	0.0071	0.0047	1.47	0.011	.
1	VS F30/3	70.0	3.63	.	0.308	.	0.58	0.113	19.74	0.335	0.0044	0.012	0.4	0.56	0.397
1	NCS HC19604	43.81	10.64	.	0.041	.	.	.	.	1.59	0.051	0.011	3.46	0.158	.
1	NCS HC19605	38.81	8.61	.	0.032	.	.	0.025	.	0.81	0.032	0.009	4.20	0.303	.
1	ECRM 584-1	37.17	7.19	(6.0)	0.044	.	.	.	.	1.13	0.032	0.030	1.80	.	.
1	NCS HC93608	32.22	3.00	.	0.095	.	.	0.281	.	0.255	0.014	0.015	0.30	.	.
1	VS F43	31.9	11.11	.	0.098	.	0.354	0.336	.	1.22	0.038	0.0058	2.50	0.152	0.059
1	NCS HC26613	30.24	8.13	.	0.019	.	.	(0.005)	.	1.11	0.020	0.012	1.84	0.19	.
1	NCS HC18604	27.93	5.38	.	0.065	.	.	0.117	.	2.67	0.043	0.013	4.68	.	.
1	NCS HC26609	27.47	6.21	.	0.048	.	.	0.102	.	2.36	0.035	0.020	5.61	.	.
1	NCS HC28638	27.34	7.82	.	0.033	.	0.055	.	.	0.362	0.015	0.0048	4.51	0.15	.
1	VS F42	27.13	11.41	.	0.55	.	2.22	1.32	.	1.1	0.05	0.023	6.74	.	.
1	IRSID 510-1	26.95	(4.9)	.	0.058	.	.	.	.	.	(0.035)	.	4.65	.	.
1	NM 341	24.91	5.54	.	.	.	.	.	.	.	.	.	2.55	.	.
2	BS FeTi-1	19.9	12.5	.	0.57	0.028	0.33	0.60	.	7.7	0.050	0.009	2.9	0.69	3.6
2	BS FeTi-2	19.4	12.7	.	0.46	0.04	0.30	0.43	.	7.91	0.053	0.012	3.2	0.81	3.6

Number	B	Ca	Mg	Mo	N	Nb	Ni	Pb	Sn	W	Zn	Units
DH 2409	.	.	0.070	0.814	.	0.072	0.047	.	0.246	.	.	50 g
VS F30/4	.	.	.	0.60	0.38	.	0.053	.	0.077	.	.	100 g
NCS HC15601	.	.	.	0.028	.	.	0.29	.	.	.	.	50 g
VS F30/3	.	.	.	0.92	0.68	.	0.6	(0.0006)	0.1	.	(0.003)	100 g
NCS HC19604	.	.	.	.	.	.	.	.	0.056	.	.	100 g
NCS HC19605	.	.	.	.	.	.	.	.	0.061	.	.	100 g
ECRM 584-1	.	.	.	.	.	.	.	.	.	.	.	100 g
NCS HC93608	.	.	.	.	.	.	.	.	.	.	.	50 g
VS F43	.	.	.	0.0036	0.085	.	.	.	0.013	.	0.032	100 g
NCS HC26613	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC18604	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC26609	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC28638	.	.	.	.	.	.	.	.	.	.	.	50 g
VS F42	.	.	.	0.106	.	.	.	.	.	0.33	0.129	100 g
IRSID 510-1	.	.	.	.	.	.	.	.	.	.	.	100 g
NM 341	.	.	.	.	.	.	.	.	.	.	.	100 g
BS FeTi-1	0.60	1.12	(0.4)	0.06	0.143	0.05	0.17	.	0.11	.	(0.04)	100 g
BS FeTi-2	1.10	0.96	(0.4)	0.15	0.16	0.03	0.16	.	0.16	.	(0.02)	100 g

## CRM FERROTUNGSTEN

Number	W	Si	Al(tot)	As	C	Cu	Fe	Mn	Mo	P	Pb	S	Sb	Sn	Units
ECRM 555-1	79.9	1.75	0.14	.	0.025	.	(15.2)	.	.	(0.02)	.	(0.018)	.	0.034	100 g
ECRM 590-1	79.55	1.05	(0.36)	.	0.0250	0.0484	.	0.136	0.101	.	.	.	.	0.045	100 g
NCS HC25606a	76.24	0.34	.	0.041	0.036	0.079	.	0.102	.	0.033	.	0.052	.	0.041	50 g
VS F18/2	74.7	0.35	.	0.028	0.075	0.105	.	0.095	0.56	0.042	0.00014	0.071	0.0069	0.038	100 g
VS F48	71.0	0.47	0.64	0.037	0.074	0.096	.	0.695	0.047	0.035	0.0048	0.211	0.014	0.031	100 g

last

## FERROVANADIUM

# = Class, where 1 = CRM and 2 = RM

#	Number	V	Fe	Si	Al	C	Cr	Cu	Mg	Mn	Mo	N	Ni	P	S
1	NCS HC93629	80.90	.	0.86	1.33	0.032	.	.	.	0.046	.	.	.	0.036	0.014
1	IRSID 511-1	80.7	.	0.341	.	0.049	.	.	.	0.049	.	.	.	(0.016)	0.018
2	DH 2510	80.85	14.25	0.894	0.783	0.120	0.201	0.038	0.010	1.154	0.029	.	0.009	0.051	0.016
1	VS F40	80.1	.	1.31	2.12	0.096	0.185	0.81	.	1.49	.	.	.	0.022	0.014
1	ECRM 591-1	79.72	14.59	0.847	3.19	0.141	.	0.0596	.	0.307	.	(0.308)	0.0141	0.0299	0.0153
1	NCS HC11608	79.27	.	0.653	1.41	0.109	.	0.0089	.	0.106	.	.	0.010	0.021	0.035
1	NCS HC28633	54.02	.	0.682	0.0026	0.285	0.110	0.054	.	0.663	.	0.011	0.011	0.056	0.0044
1	NCS HC26608c	53.78	.	0.81	(0.0025)	0.17	0.71	.	.	2.00	.	.	.	0.043	0.0040
1	NCS HC26614	53.71	.	1.35	0.04	0.39	.	.	.	0.27	.	0.095	.	0.060	0.023
1	NM 351	52.10	.	.	.	.	.	.	.	.	.	.	.	.	.
1	NCS HC19606	51.14	.	0.68	0.084	0.565	0.32	.	.	0.43	.	.	.	0.087	0.010
1	NCS HC26608b	50.57	.	0.84	(0.002)	0.22	0.70	.	.	1.64	.	.	.	0.051	0.0044
1	NCS HC93628	50.24	.	0.730	6.10	0.130	.	.	.	0.474	.	.	.	0.042	0.016
1	ECRM 577-1	50.16	.	1.79	0.414	0.089	.	0.054	.	0.158	.	.	0.053	0.035	0.034
1	NCS HC93628a	50.09	.	0.730	6.03	0.152	.	.	.	0.475	.	.	.	0.043	0.017
1	NCS HC37616	49.72	.	0.50	5.18	0.081	.	.	.	0.58	.	.	.	0.016	0.012
1	NCS HC11607	49.40	.	1.67	.	0.235	.	0.022	.	0.321	.	.	.	0.121	0.010
1	NCS HC18608	48.93	.	0.76	0.158	0.40	.	.	.	0.26	.	.	.	0.049	0.043
1	NCS HC28634	47.32	.	1.89	0.0061	0.475	0.289	0.064	.	0.365	.	.	0.067	0.093	0.014
1	<b>BS FeV 45</b>	45.1	33.7	4.90	0.017	0.241	5.82	0.40	0.014	4.12	0.0079	0.26	4.32	(0.13)	0.334
1	VS F19/3	42.6	.	1.47	(0.005)	0.418	1.21	0.204	.	3.30	.	.	.	0.059	0.0102
1	<b>BS FeV 42</b>	42.2	39.2	3.77	(0.05)	0.297	5.18	0.31	0.059	3.37	0.023	0.19	3.87	0.127	0.31
1	VS F32/3	40.2	(40)	(1.2)	(<0.05)	(0.4)	.	(0.2)	.	3.14	.	7.51	.	(0.05)	(0.008)

Number	As	Ca	O	Pb	Ti	Units
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NCS HC93629	.	.	.	.	.	25 g
IRSID 511-1	.	.	.	.	.	100 g
DH 2510	.	.	.	.	0.071	50 g
VS F40	.	.	.	.	.	100 g
ECRM 591-1	0.0022	.	.	.	.	100 g

last of stock  
Co: 0.008 Nb: 0.013 W: 0.025

NCS HC11608	0.0024	.	.	.	.	70 g
NCS HC28633	0.0017	0.022	.	0.0006	.	50 g
NCS HC26608c	.	.	.	Zn: (0.004)	.	50 g
NCS HC26614	.	.	(0.67)	.	.	50 g
NM 351	.	.	.	.	.	100 g

NCS HC19606	.	.	.	.	.	50 g
NCS HC26608b	.	.	.	Zn: (0.0024)	.	50 g
NCS HC93628	.	.	.	.	.	30 g
ECRM 577-1	.	.	.	.	.	100 g
NCS HC93628a	.	.	.	.	.	30 g

NCS HC37616	.	.	.	.	.	50 g
NCS HC11607	0.021	.	.	.	.	70 g
NCS HC18608	.	.	.	.	.	50 g
NCS HC28634	0.024	0.115	.	0.0004	.	50 g
<b>BS FeV 45</b>	(0.013)	0.010	.	.	0.021	100 g

17025, 34

VS F19/3	0.0009	.	.	.	.	100 g
<b>BS FeV 42</b>	(0.01)	(0.052)	.	.	0.033	100 g
VS F32/3	(<0.001)	.	.	.	.	100 g

17025, 34

## CRM RARE EARTH FERROSILICON

\* VS F31/2 lists Rare Earth Oxides

Number	RE	Si	Fe	Ca	Mg	Mn	Ti	Al	C	Ce	Cu	La	Units
VS F31/3 *	39.0	39.6	16.26	1.76	0.320	.	.	7.60	0.032	15.65	0.51	.	100 g
NCS HC39602	21.20	37.18	22.18	1.98	10.56	3.43	1.92	.	.	.	.	.	100 g
NCS HC39601	20.09	40.31	20.81	3.21	9.50	2.72	1.50	.	.	.	.	.	100 g
NCS HC28615	20.00	41.02	.	5.60	.	0.390	0.235	.	.	.	.	.	100 g
NCS HC39603	18.10	43.55	21.78	2.65	8.51	2.23	1.35	.	.	.	.	.	100 g
NCS HC28609	8.66	43.90	(31.67)	1.01	10.20	0.70	0.54	.	.	.	.	.	80 g
NCS HC28612	6.42	43.44	(36.43)	0.90	8.25	0.63	0.435	.	.	.	.	.	80 g
NCS HC28611	5.10	43.22	(40.7)	0.84	5.70	0.55	0.362	.	.	.	.	.	80 g
NCS HC28610	3.71	42.05	(43.4)	0.76	5.52	0.46	0.275	.	.	(1.86)	.	(0.88)	80 g

## FERROSILICOALUMINUM, FERROSILICALCIUM, FERROSILICOCHROMIUM, and FERROSILICOTITANIUM

# = class, where 1 = CRM and 2 = RM

DH, NCS: 50 g units VS: 100 g units

#	Number	Si	Fe	Ca	Cr	Ti	Al	C	Cu	Mg	Mn	Mo	Ni	P	S	V	Zr
2	DH 2902	59.25	24.80	0.220	0.059	11.21	0.613	0.284	0.022	0.234	1.64	0.126	0.043	0.010	0.005	0.154	0.046
2	DH 2901	56.73	26.58	0.200	0.062	12.03	0.597	0.183	0.021	0.210	1.72	0.149	0.044	0.013	0.005	0.161	0.046
1	VS F25/3	51.5	23.06	21.3	.	.	0.67	.	.	.	.	.	.	0.011	0.0056	.	.
2	DH 5403	40.46	20.93	0.028	36.93	0.124	0.579	0.034	0.020	.	0.41	.	0.190	0.022	.	0.074	0.005
1	VS F24/2	49.9	.	.	29.2	.	0.9	0.02	.	.	.	.	.	0.03	0.002	.	.
1	NCS HC93635	27.36	26.23	.	.	.	38.51	1.90	.	.	0.18	.	.	0.072	0.015	.	.
1	NCS HC93636	26.11	.	.	.	.	36.22	0.11	.	.	1.70	.	.	0.021	0.0071	.	.







**CRM MULTI-ELEMENT GLASS DISCS**listed in mg/kg each unit contains uncertified 72% SiO<sub>2</sub>, 12% CaO, 14% Na<sub>2</sub>O, and 2% Al<sub>2</sub>O<sub>3</sub>. Each sample is 6 wafers ~13 mm Ø with choice of height

3 mm	1 mm	Ag	Au	B	Ba	Cd	Ce	Co	Cu	Dy	Er	Eu	Fe	Ga	Gd	K	La
SRM 610	SRM 611	(254)	(25)	(351)	.	.	.	(390)	(444)	.	.	.	458	.	.	(461)	.
SRM 612	SRM 613	22.0	(5)	(32)	(41)	.	(39)	(35.5)	(37.7)	(35)	(39)	(36)	51	.	(39)	(64)	(36)
SRM 614	SRM 615	0.42	(0.5)	(1.30)	.	(0.55)	.	(0.73)	1.37	.	.	(0.99)	(13.3)	(1.3)	.	30	(0.83)
SRM 616	SRM 617	.	(0.18)	(0.20)	.	.	.	.	(0.80)	.	.	.	(11)	(0.23)	.	29	(0.034)

  

3 mm	1 mm	Mn	Nd	Ni	Pb	Rb	Sb	Sc	Sm	Sr	Th	Ti	Tl	U	Yb	Zn
SRM 610	SRM 611	485	.	458.7	426	425.7	.	.	.	515.5	457.2	(437)	(61.8)	461.5	.	(433)
SRM 612	SRM 613	(39.6)	(36)	38.8	38.57	31.4	.	.	(39)	78.4	37.79	(50.1)	(15.7)	37.38	(42)	.
SRM 614	SRM 615	.	.	(0.95)	2.32	0.855	(1.06)	(0.59)	.	45.8	0.748	(3.1)	(0.269)	0.823	SRM 615	SOLD OUT
SRM 616	SRM 617	.	.	.	1.85	(0.100)	(0.078)	(0.026)	.	41.72	0.0252	(2.5)	(0.0082)	(0.0721)	.	.

**CRM URANIUM IN GLASS**

analysis listed in mg/kg 12 mm Ø x 5 mm

Number	U
IRMM 540R	15.0
IRMM 541	49.4

**CRM GLASS SAND**

T = Total

SGT: 200 g

SRM 89: 45 g

other SRM: 75 g

all others: 100 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	PbO	SO <sub>3</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	LOI	
BCS 531	99.74	0.0327	0.00112	0.0040	.	0.00636	0.0039	0.00132	0.00014	.	.	0.00082	SrO:0.00017	.	0.0160	.	.	
UNS SPS	99.32	0.248	.	0.029	.	0.037	0.058	0.0071	.	.	0.045	.	.	.	0.035	.	0.167	
BCS 516	98.73	0.513	0.0040	0.0243	0.0081	0.0596	0.127	0.0387	.	0.0012	.	0.0195	(0.013)	0.0127	.	0.175	(0.075)	0.24
SGT S8	95.63	2.07	.	0.06	.	0.26 T	1.06	0.12	.	.	0.20	.	.	.	0.073	.	0.48	
BCS 528	95.62	2.447	0.0298	0.237	0.0008	0.1111	0.875	0.0887	.	.	0.101	(0.20)	0.0006	.	0.0486	(0.014)	0.271	
SRM 1413	82.77	9.90	0.12	0.74	.	0.24	3.94	0.06	.	.	1.75	.	.	.	0.11	.	.	
SRM 89 *	65.35	0.18	1.40	0.21	.	0.049	8.40	0.03	0.088	.	5.70	0.23	17.50	0.03	0.01	0.005	0.32	
SRM 81a	.	0.66	.	.	0.0046	0.082	.	.	.	.	.	.	.	.	0.12	0.034	.	
SRM 165a	.	0.059	.	.	.	0.012	.	.	.	.	.	.	.	.	0.011	0.006	.	

\* SRM 89 also contains As<sub>2</sub>O<sub>3</sub>: 0.03, As<sub>2</sub>O<sub>5</sub>: 0.36, Cl: 0.05**RM GRAVEL**

typical analysis listed in mass %

100 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CO <sub>2</sub>	CaO	Co <sub>3</sub> O <sub>4</sub>	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	TiO <sub>2</sub>	-H <sub>2</sub> O 900°C
DH 3610	98.80	0.234	.	0.008	.	0.030	0.419	0.014	.	.	0.009	<0.003	.	0.009	.	.	0.153
DH 3609	96.35	1.46	<0.025	0.047	0.005	0.029	0.706	0.334	0.104	.	0.020	0.045	0.019	.	.	0.086	0.48
DH 3605	95.42	0.346	0.030	3.33	0.0002	0.020	0.346	0.070	0.079	0.018	.	0.012	0.008	.	0.013	0.044	0.043

continued analysis listed in mg/kg

listed in mg/kg

Number	BaO	C	CeO <sub>2</sub>	CuO	NiO	V <sub>2</sub> O <sub>5</sub>	ZnO	ZrO <sub>2</sub>	La	Li	Sr
DH 3610	.	.	.	.	.	.	.	.	.	.	.
DH 3609	.	.	.	.	.	<0.006	.	.	.	.	.
DH 3605	0.003	0.020	0.0001	0.005	0.065	0.002	0.001	0.004	1.6	5.9	11.2

## HARDGROVE GRINDABILITY INDEX

Class	Set Number	HGI	HGI	HGI	HGI	Units
CRM	NCS AG82001d-4d	sample 1d: 35	sample 2d: 56	sample 3d: 74	sample 4d: 107	250 g of each 1d - 4d last of stock
CRM	NCS AG82001f-4f	sample 1f: 46	sample 2f: 53	sample 3f: 77	sample 4f: 117	250 g of each 1d - 4d
RM	ACIRS H6	sample A : 32	sample B : 44	sample C : 61	sample D : 87	1 kg of each A - D
RM	ACIRS H5	sample A : 28	sample B : 46	sample C : 63	sample D : 85	1 kg of each A - D last
RM	COCO HGI 007	this sample is for one value:	66	.	.	1 kg
RM	COCO HGI 005	this sample is for one value:	64	.	.	1 kg
RM	COCO HGI 013	this sample is for one value:	64	.	.	1 kg
RM	COCO HGI 008	this sample is for one value:	60	.	.	1 kg
RM	COCO HGI 009	this sample is for one value:	59	.	.	1 kg
RM	COCO HGI 002	this sample is for one value:	57	.	.	1 kg
RM	COCO HGI 004	this sample is for one value:	56	.	.	1 kg
RM	COCO HGI 003	this sample is for one value:	55	.	.	1 kg
RM	COCO HGI 011	this sample is for one value:	55	.	.	1 kg
RM	COCO HGI 006	this sample is for one value:	54	.	.	1 kg
RM	COCO HGI 014	this sample is for one value:	53	.	.	1 kg
RM	COCO HGI 012	this sample is for one value:	51	.	.	1 kg
RM	COCO HGI 010	this sample is for one value:	31	.	.	1 kg

## CRM HARDNESS TEST BLOCKS

for NCS items, please indicate desired hardness when ordering

Number	Scale	Available Range	Units (mm)
NCS HBS	Brinell Hardness S	(8-650)	100 x 80 x 16
NCS HBW	Brinell Hardness W	(8-650)	100 x 80 x 16
NCS HL	Leeb Hardness	(200-900)	90 Ø x 55
NCS HLG	Leeb Type G Hardness	(300-750)	120 Ø x 70
NCS HRA	Rockwell Hardness A	(20-88)	60 x 40 x 10
NCS HRB	Rockwell Hardness B	(20-100)	60 x 40 x 10
<b>BS TRM-3</b>	<b>Rockwell Hardness B</b>	<b>86.3</b>	<b>300 x 300 x ~2 17025</b>
NCS HRC	Rockwell Hardness C	(20-70)	60 x 40 x 10
NCS HR15N	Rockwell Superficial Hardness 15N	(70-94)	60 x 40 x 10
NCS HR30N	Rockwell Superficial Hardness 30N	(42-86)	60 x 40 x 10
NCS HR45N	Rockwell Superficial Hardness 45N	(20-77)	60 x 40 x 10
<b>BS TRM-4</b>	<b>Rockwell Superficial Hardness 15T</b>	<b>71.9</b>	<b>300 x 300 x ~2 17025</b>
NCS HR15T	Rockwell Superficial Hardness 15T	(67-93)	60 x 40 x 10
NCS HR30T	Rockwell Superficial Hardness 30T	(29-82)	60 x 40 x 10
NCS HR45T	Rockwell Superficial Hardness 45T	(1-72)	60 x 40 x 10
NCS HSD	Shore Hardness	(5-105)	65 x 52 x 15
NCS HV	Vickers Hardness	(5-1000)	60 x 40 x 10
NCS HVM	Vickers Microhardness	(5-1000)	25 x 25 x 6

## CRM INCINERATED WASTE

analysis listed in mg/kg

30 g powder

Number	As	Ba	Be	Cd	Co	Cr	Cu	Hg	Mo	Ni	Pb	Sb	Se	Sn	Sr	V	Zn
BL 12-1-12	45	3600	(8)	(60)	23	731	375	7.8	(10)	198	(1389)	(67)	4	(815)	(233)	(69)	10450

informational analysis listed in mass %

Number	Al <sub>2</sub> O <sub>3</sub>	CO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>
BL 12-1-12	(11.92)	(11.05)	(13.68)	(4.44)	(3.23)	(3.41)	(0.46)	(2.56)	(1.77)	(2.22)	(41.78)	(1.14)

## CRM IMPACT

approximate analysis

Number	Energy	Uncertainty	Temperature	Units	Type
SRM 2098	176 - 244 J	8.8 - 12.2 J	21 °C +/- 1'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
ERM-FA415	155.1 J	4.6 J	20 °C +/- 2'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
ERM-FA016	122.0 J	3.6 J	20 °C +/- 2'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
SRM 2097	101.9 J	0.572 J	-40 °C +/- 1'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
SRM 2096	88 - 136 J	4.4 - 6.8 J	-40 °C +/- 1'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
ERM-FA015	79.8 J	2.4 J	20 °C +/- 2'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
ERM-FA013	28.1 J	0.8 J	20 °C +/- 2'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
SRM 2093	15.4 J	0.125 J	-40 °C +/- 1'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
SRM 2092	13 - 20 J	1.4 J	-40 °C +/- 1'	5 pcs of 10 mm x 10 mm x 55 mm	CHARPY v-notch
SRM 2115	13 - 25 J	1.4 J	21 °C +/- 1'	5 pcs of 10 mm x 10 mm x 75 mm	IZOD beam

**CRM LAYER THICKNESS**

BCR: 2 sets of 4 Tantalum foils, 5 mm x 10 mm NMIJ: 13-15 mm squares

Number	Material	Thickness	(+/-)	Layer 1	2	3	4	5	6	7	8
NMIJ 5202a	Si, SiO <sub>2</sub> multi layer	n/a nm	0.7 nm	(20.5)	20.0	20.5	19.9	20.4	surface oxide: (1.32)		
NMIJ 5203a	GaAs, AlAs multi layer	n/a nm	0.10 nm	(9.24)	9.65	9.51	9.64	9.51	9.62	.	.
NMIJ 5204b	GaAs, AlAs single layer	3.26 nm	0.41 nm	.	.	.	.	.	.	.	.
BCR 261T	Ta <sub>2</sub> O <sub>5</sub> single layer	1.72 nm	0.07 nm	30 nm material	.	.	.	.	.	.	.
BCR 261T	Ta <sub>2</sub> O <sub>5</sub> single layer	5.40 nm	0.12 nm	100 nm material	.	.	.	.	.	.	.

**CRM NANOSCALE LAYER THICKNESS**

Number	Certified Values	Informational Data	Units
BAM L200	35 certified lengths from 3.5 - 4642 nm	5 informational lengths 1 - 5 nm	block ~10 x 4 x 5 mm

**CRM LEAD PAINT FILMS**

sold in SET/6 only, thin paint film on polyester sheets last of stock ~7cm wide and ~10 cm long

Number	film, Pb in mg/kg	film, Pb in mg/kg	film, Pb in mg/kg	film, Pb in mg/kg	film, Pb in mg/kg	film, Pb in mg/kg	film, Pb in mg/kg
SRM 2579a	2571 3.58	2572 1.527	2572 1.527	2573 1.040	2574 0.714	2575 0.307	2570 <0.001

**RM ELECTROLYTIC MANGANESE**

typical analysis

50 g units

Number	Al	C	Co	Cr	Cu	Fe	Mn	Ni	P	S	Si	Zn	-H <sub>2</sub> O@900°C
DH 7701	(0.0015)	0.120	0.0012	0.411	0.0070	2.07	95.85	0.0068	0.056	0.0160	1.09	0.0011	0.019

**CRM MANGANESE METAL POWDER**

analysis listed in mass %

Number	Mn	C	Fe	N	P	S	Se	Si	Units
NCS HC25655	97.43	0.080	1.81	.	0.018	0.016	.	0.28	50 g
NCS HC15604	95.52	0.154	3.37	.	0.032	0.019	.	0.92	100 g
NCS HC26615	91.56	0.007	0.039	7.84	.	0.031	0.049	0.009	50 g

**MELTING POINT**

Class	Number	Form	Melting point °C
CRM	<u>501-951</u>	6 inch nickel wire	1452
RM	502-496	6 inch gold wire	1063

17025

## CRM OXIDE

analysis listed in mg/kg except % which is mass %

100 g units

Number	Notes	Ag	Al	As	B	Ba	Be	C	Ca	Cd	Ce	Cl	Co	Cr
BAM RS 1	SiO <sub>2</sub> > 99.99%	.	8.7	<0.1	.	.	.	.	0.42	<0.05	.	.	.	0.062
BAM RS 2	Al <sub>2</sub> O <sub>3</sub> = 99.76%	.	.	(<0.5)	(<5)	.	(<0.2)	.	3.1	(<0.5)	(<0.1)	(<10)	<1	<1.5
BAM RS 5	NiO	<1	(<15)	<0.2	.	<1	.	14	2.2	<0.2	.	.	<2	16.1
BAM RS 6A	MgO 100 - 350 μm	.	46	.	.	(<10)	.	(<50)	994	.	.	.	(<5)	9.2
BAM RS 6B	MgO 50 - 100 μm	.	49	.	.	(<20)	.	(<210)	956	.	.	.	(<5)	8.1

continued

Number	Cu	Fe	Ga	Ge	Hg	In	K	La	Li	Mg	Mn	Mo	Na	Ni	Pb
BAM RS 1	<0.1	0.62	.	<1	<0.05	.	0.48	.	0.25	<0.5	<0.2	.	<2	<0.2	<0.15
BAM RS 2	<2.5	3.3	(<2)	.	.	(<0.5)	(<5)	(<0.3)	<1	<3	<1.5	(<1)	<15	<10	.
BAM RS 5	1.53	41	<0.5	.	.	<1	<2	.	(<2)	<1	<1	<5	<2	78.57%	<2
BAM RS 6A	(<6)	72	.	.	.	.	.	.	.	60.19%	5.4	(<10)	.	3.9	(<5)
BAM RS 6B	(<6)	71	.	.	.	.	.	.	.	60.17%	5.2	(<10)	.	3.3	(<5)

continued

Number	S	Sb	Se	Si	Sn	Sr	Te	Ti	Tl	V	W	Zn	Zr
BAM RS 1	.	.	.	.	.	.	.	1.3	.	.	.	<1.3	<0.1
BAM RS 2	.	.	.	<20	(<1)	.	.	<2	.	(<1)	.	<2	3.2
BAM RS 5	(4)	(<0.1)	<1	(<5)	(<1)	(<1)	(<0.2)	(<2)	(<0.5)	<1	(<1)	3.4	(<1)
BAM RS 6A	.	.	.	.	.	2.0	.	1.3	.	8.4	.	(<6)	(<20)
BAM RS 6B	.	.	.	.	.	2.1	.	1.2	.	7.8	.	(<6)	(<105)

**CRM IRON OXIDE**

analysis listed in mass %

75 g units

Number	Fe <sub>2</sub> O <sub>3</sub>	FeO	Al	C	Ca	Cr	Cu	K	Mg	Mn	Ni	S	Si	Other Impurities
VS P26/2	99.49	<0.1	0.026	(0.005)	(0.005)	0.0194	0.0090	(0.001)	<0.005	0.292	0.024	(0.04)	0.0110	(0.1)

**CRM IRON OXIDE**

Number	Total Iron	Al <sub>2</sub> O <sub>3</sub>	CaO	Cl-	MnO	SiO <sub>2</sub>	SO <sub>4</sub> <sup>2-</sup>	Units
NCS HS41701-7	69.49	0.0030	0.017	0.233	0.212	0.0098	0.019	80 g last of stock

**CRM IRON OXIDE**

analysis listed in mass %

analysis listed in mg/kg

100 g units

Number	T.Fe	Cl	Mn	Al	Ca	Co	Cr	Cu	K	Mg	Mo	Na	Ni	P	Si	Sn	Ti	Zn
ECRM 686-1	69.44	0.095	0.231	407	97	19	182	38	24	27	7	58	127	78	83	25	14	4

**CRM IRON OXIDE and SILICON OXIDE**

analysis listed in mass % except \* which is mg/kg

Number	SiO <sub>2</sub>	Si	Al <sub>2</sub> O <sub>3</sub>	Al*	CaO	C	Cr*	Fe	MgO	Mg*	MnO	Mn*	Ni*	S*	TiO <sub>2</sub>	LOI	Units
IRSID 608-1	60.39	.	9.94	.	8.70	.	.	4.00	1.34	.	0.057	.	.	.	0.714	.	100 g
JSS 009-3 *	.	<0.004	.	(3)	.	(0.02)	9.7	69.84 (tot)	.	(0.3)	.	(0.6)	(0.3)	(1)	.	(0.4)	50 g

\* JSS 009-3 contains (&lt;0.0002) of As, Bi, Ca, Co, Cu, K, Na, P, Pb, Sn, Ti, V, and Zn.

**CRM NICKEL OXIDE**

certified analysis listed in mass % except \* which is mg/kg

25 g units

Number	Al	Co	Cr	Cu	Fe	Mg	Mn	Si	Ti	Bi*	Pb*	Se*
SRM 673	0.001	0.016	0.0003	0.002	0.029	0.003	0.0037	0.006	0.003	0.06	3.5	0.2

continued informational analysis in mg/kg

Certified values show concentrations in nickel oxide. To convert values to the percent concentration in total metal present, multiply the values by 1.29.

Number	Ag	As	Cd	Ga	Sb	Sn	Te	Tl	Zn
SRM 673	<0.1	0.4	0.05	<0.1	<0.5	<0.5	0.4	<0.1	1.7 last of stock

**CRM TITANIUM DIOXIDE SET**

analysis listed in mass %

ONLY available in SET/8 x 20 g units

Number	Cr	Cu	Fe	Mn	Mo	Ni	Si	Sn	V
GSO 2158-81	0.0010	.	.	.	.	.	0.00054	0.00020	.
GSO 2159-81	0.00035	.	0.00055	.	.	0.00046	0.0010	.	.
GSO 2160-81	0.0013	0.0110	0.0010	0.090	.	0.0120	0.0015	0.0018	0.0014
GSO 2161-81	0.0013	0.0024	0.0023	0.0010	0.0130	0.0088	.	0.0028	.
GSO 2162-81	0.0023	0.0043	0.0180	0.0025	0.0048	0.0029	0.0130	0.0047	0.1800
GSO 2163-81	0.038	0.032	0.0180	0.0180	.	0.0280	0.0030	.	0.0016
GSO 2164-81	.	.	0.0095	.	0.0110	.	0.0180	.	.
GSO 2165-81	.	0.0023	0.0082	0.0040	0.0017	0.0014	.	0.035	0.0040

**CRM TITANIUM DIOXIDE**

Number	TiO <sub>2</sub>	Uncertainty	Units
SRM 154c	99.591	+/- 0.062	90 g

**CRM VANADIUM PENTOXIDE**

analysis listed in mass %

NCS: 25-50 g units

SARM, VS: 100 g units

Number	V <sub>2</sub> O <sub>5</sub>	V <sub>2</sub> O <sub>4</sub>	V	Al <sub>2</sub> O <sub>3</sub>	C	CaO	Fe	Fe <sub>2</sub> O <sub>3</sub>	K	K <sub>2</sub> O	Na	Na <sub>2</sub> O	P	S	Si	SiO <sub>2</sub>	TiO <sub>2</sub>	Others
NCS HC26612a	98.99	.	.	.	.	.	0.078	.	.	0.12	.	0.58	0.022	(0.001)	0.080	.	.	As: (0.0008)
NCS HC26612	98.09	.	.	.	.	.	0.16	.	.	0.15	.	1.11	0.027	0.014	0.17	.	.	As: 0.016
NCS HC19611	98.80	.	.	Cr:0.018	.	.	0.061	.	.	0.14	.	1.03	0.010	0.011	0.102	.	.	As:(<0.001)
NCS HC19610	96.68	.	.	Cr:0.099	.	.	0.43	.	.	0.18	.	0.96	0.007	0.014	0.40	.	.	As:(<0.001)
SARM 38	95.52	3.07	55.84	0.14	.	.	.	0.119	.	0.600	.	0.22	.	(0.0045)	.	0.11	.	MgO: 0.0037
VS R30	94.3	.	.	0.007	0.88	0.51	.	0.053	.	0.032	.	0.0064	0.0072	.	0.43	0.21	.	MnO: 2.58

**CRM ZINC OXIDE**

Number	Zn	CaO	Cd	Cl	F	Fe	MgO	Pb	S	SiO <sub>2</sub>	Units
IMN TC9	53.4	6.96	0.0049	0.033	0.055	5.64	3.50	3.77	0.52	5.47	220 g

**CRM PAPER**

AVAILABLE IN SET/20 ONLY

includes software for data processing

5 pages per sample, 8.5 x 11" each

Number	dry TAPPI analysis listed in mass %							Total	400°C	900°C	Base Weight
	CaCO <sub>3</sub>	Kaolin	TiO <sub>2</sub>	Talc	Muscovite	Al <sub>2</sub> O <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	Filler	Ash	Ash	g/m <sup>2</sup>
A	9.88	0.28	0.00	1.41	0.00	.	.	11.57	11.88	7.32	75
B	18.20	0.28	0.00	0.00	0.00	.	.	18.48	18.53	10.65	75
C	12.53	0.56	0.00	0.60	0.00	.	.	13.69	13.58	8.11	75
D	18.29	0.00	0.00	0.00	0.00	.	.	18.29	18.76	10.51	75
E	9.45	0.00	0.00	0.00	0.00	.	.	9.45	10.14	5.78	75
F	11.22	0.00	0.39	0.60	0.00	.	.	12.21	12.34	7.49	75
G	12.26	0.18	0.00	0.41	0.00	.	.	12.85	13.08	7.56	75
H	11.19	1.34	0.00	0.38	0.00	.	.	12.91	11.98	8.01	75
I	18.94	0.00	0.00	0.28	0.00	.	.	19.22	19.71	11.11	80
J	14.79	0.51	0.09	1.48	0.00	.	.	16.87	17.11	10.65	75
K	14.12	2.10	0.28	1.88	0.00	.	.	18.38	18.30	12.17	75
L	0.00	7.54	1.75	0.00	0.00	.	.	9.29	8.81	8.38	75
M	0.16	10.91	0.18	0.00	0.00	.	.	11.25	11.16	10.12	75
N	1.74	0.00	1.51	10.74	0.00	.	.	13.99	14.70	13.28	75
O	1.86	12.69	0.00	0.47	7.57	.	.	22.59	22.99	20.34	80
P	25.61	0.35	0.00	0.00	0.00	.	.	25.96	26.93	15.61	105
Q	0.00	0.30	38.60	0.00	0.00	2.70	1.87	43.47	43.39	43.13	85
R	0.13	19.02	0.25	0.00	0.65	.	.	20.05	20.21	17.56	45
S	0.14	32.04	0.42	0.00	1.08	.	.	33.68	33.57	29.43	60
BLANK	0.00	0.00	0.00	0.00	0.00	.	.	0.02	0.02	0.01	75

**CRM PARTICLE SIZE and MASS VOLUME in ALUMINA**

Number	Permeametry	BET Absorption	Obligatory Porosity	Size Range	Median Size
TL AA	2,300 cm <sup>2</sup> /g	5,000 cm <sup>2</sup> /g	0.57	1-64 Ø µm	12.7 Ø µm
TL AB	10,300 cm <sup>2</sup> /g	31,000 cm <sup>2</sup> /g	0.67	1-31.50 Ø µm	2.1 Ø µm



CRM		PARTICLE SIZE			analysis listed in $\mu\text{m}$
Number	Weight Percentile	Certified Value	Uncertainty	Units	
SRM 659	10	0.48	0.10	5 x 2.5 g powder	
	25	0.81	0.10		
	50	1.43	0.10		
	75	2.08	0.11		
	90	2.80	0.13		
SRM 1018b	1.2 - 98.1	220 - 750	0.4 - 2.0	87 g of 0.2 g glass beads	

CRM		PARTICLE SIZE		
Number	Average Diameter, $\mu\text{m}$	Uncertainty, $\mu\text{m}$	Material	Units
SRM 1691	0.269	$\pm 0.007$	Polystyrene Spheres	5 mL

CRM		PARTICLE SIZE		
Number	Quartz Form	Certified Property	Size Range in Microns	Unit Size
BCR 066	Powder	Stokes' diameter	0.35 - 3.50	10 g
BCR 070	Powder	Stokes' diameter	1.2 - 20	10 g
BCR 067	Powder	Stokes' diameter	2.4 - 32	10 g
BCR 069	Powder	Stokes' diameter	14 - 90	10 g
BCR 130	Powder	Volume diameter	50 - 220	50 g
BCR 068	Sand	Volume diameter	160 - 630	100 g
BCR 131	Powder	Volume diameter	480 - 1800	200 g
BCR 132	Gravel	Volume diameter	1400 - 5000	700 g

CRM		PARTICLE SIZE		
Number	Percentage of Particles Under 20 Microns	Standard Deviation	Uncertainty @ 95% CL	Units
ASCRM 026	1.0	$\pm 0.1$	$\pm 0.2$	210 g

CRM		PARTICLE DENSITY, SURFACE AREA, AND SIZE DISTRIBUTION			
Number	Particle Density Pycnometer Method	Blaine Area With EN 196-6	Particle Size by Laser Diffraction ISO 13320-1	Air Jet Sieving Alpine Test NF X11-640	Units
TL 1BGA	3.11 g/cm <sup>3</sup>	3396 cm <sup>3</sup> /g	11.4% @ 2.0 $\mu\text{m}$ - 99.9% @ 160 $\mu\text{m}$	71.4% @ 31.5 $\mu\text{m}$ - 100% @ 160 $\mu\text{m}$	40 g

CRM		pH STANDARDS		
Number	PH	Accreditation	Units	
TL pH9	9.180	ISO GUIDE 34	10 x 25 mL or as a SET/15 bottles = 5 x pH4, 5 x pH7, 5 x pH9	
TL pH7	6.865	ISO GUIDE 34		
TL pH4	4.005	ISO GUIDE 34		

RM		PLASTER										analysis listed in mass %	100 g units
Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>	LOI	
BCS 202A	0.33	37.4	0.10	0.10	0.39	<0.03	<0.01	53	1.38	0.33	0.03	7.0	

RM		PLASTIC											analysis listed in mass %	50 g pellets
Number	Al	Ca	Cl	Cr	F	Fe	Mg	Na	P	S	Si	Ti	Zn	
JSM P702-1	0.0012	0.0013	(0.0017)	0.0012	.	0.0015	0.0015	0.0012	0.0011	(0.0014)	(0.0008)	0.0009	0.0010	
JSM P703-1	0.022	0.023	(0.018)	0.020	(0.018)	0.021	0.029	0.024	0.017	(0.021)	0.018	0.017	0.020	

CRM		POROUS MATERIAL			
Number	Description	Units	Specific Pore Volume	Median Pore Diameter	Density
BAM P 128	Alumina Ceramic	6 Cylinders 7 g total	220 mm <sup>3</sup> /g	27.6 $\mu\text{m}$	(3.6405) g/cm <sup>3</sup>

## CRM POROUS MATERIALS and SURFACE AREA

Number	Description	Units	$A_{BET}$ (m <sup>2</sup> /g) BET Specific Surface Area	$V_p$ (cm <sup>3</sup> /g) Specific Pore Volume	$D_1$ (nm) Hydraulic Pore Diameter	$D_2$ (nm) Most Frequent Pore Diameter	$D_3$ (nm) Most Frequent Pore Diameter	(nm) Median Pore Width
BAM P 109	Activated Carbon	10g	1396	.	.	.	.	.
BAM P 108	Activated Carbon	10g	550	.	.	.	.	.
BAM P 106	Titanium Dioxide	15g	96.6	0.2341	9.69	8.2	11.5	.
BAM FD107	Faujasite Zeolite	10g	.	0.217 cm <sup>3</sup> /g <sup>-1</sup>	.	.	.	0.86

Number	Description	Units	(nm) Mean Pore Radius	(nm) Most Frequent Pore Radius	(cm <sup>2</sup> /g) Specific Surface Area	(mm <sup>3</sup> /g) Pore Volume 100 Mpa	(mm <sup>3</sup> /g) Pore Volume 195 Mpa	(mm <sup>3</sup> /g) Pore Volume 200 Mpa	(mm <sup>3</sup> /g) Pore Volume 395 Mpa
BAM PM 101	SiO <sub>2</sub>	10g	.	.	0.177	.	.	.	.
BAM PM 102	Alpha-Al <sub>2</sub> O <sub>3</sub>	10g	.	.	5.41	.	.	.	.
BAM FD 120	Alpha-Al <sub>2</sub> O <sub>3</sub>	10g	228.0	232.2	.	545.0	546.7	546.8	548.1
BAM FD 121	Porous glass	12g	15.1	15.3	.	621.8	621.9	621.9	624.6
BAM FD 122	Porous glass	15g	139.0	140.2	.	919.7	922.5	922.6	924.4

## ROHS/WEEE SAMPLES

# = class, where 1 = CRM and 2 = RM analysis listed in mass %

#	Type	Units	Number	As	Br	Cd	Cr	Hg	Pb	Se	Sold As
1	ABS resin	pellets 25 g	NMIJ 8112a	.	.	0.000938	0.009447	0.009410	0.009498	.	individually
1	ABS resin	granules 100g	BAM H010 gran	.	0.0240	0.0093	0.0470	(0.0415)	0.0479	.	individually
1	ABS resin	40 mm Ø x 1 mm	BAM H010 1mm	.	0.0240	0.0093	0.0470	(0.0415)	0.0479	.	individually
1	ABS resin	40 mm Ø x 2 mm	BAM H010 2mm	.	0.0240	0.0093	0.0470	(0.0415)	0.0479	.	individually
1	ABS resin	40 mm Ø x 6 mm	BAM H010 6mm	.	0.0240	0.0093	0.0470	(0.0415)	0.0479	.	individually
1	ABS resin	40 mm Ø x 1-6 mm	BAM H010 set	.	0.0240	0.0093	0.0470	(0.0415)	0.0479	.	set of above 3 discs
1	ABS resin	30 mm Ø x 2 mm	NMIJ 8105a	.	.	0.001070	0.002751	.	0.010828	.	individually
1	plastic	40 mm Ø x 4 mm	JSAC 0631	.	.	0.00225	0.00258	0.00197	0.00245	.	set only
1	plastic	40 mm Ø x 4 mm	JSAC 0632	.	.	0.00461	0.00933	0.00594	0.00929	.	set only
1	polyester	chips 50 g	JSAC 0602-3	.	.	0.00506	0.01125	0.00121	0.01121	.	individually
1	polyester	chips 50 g	JSAC 0601-3	.	.	0.00050	0.0113	0.000130	0.00121	.	individually
1	low density polyethylene	pellets 100 g	ERM-EC681m	0.00170	0.143	0.0146	0.00451	0.00099	0.00697	also Cl S Sb Sn Zn, individually	individually
1	low density polyethylene	pellets 100 g	ERM-EC680m	0.00047	0.0181	0.00208	0.00096	0.000256	0.00113	also Cl S Sb Sn Zn, individually	individually
1	low density polyethylene	pellets 100 g	ERM EC680k	0.00041	0.0096	0.00196	0.00202	0.000464	0.00136	also Cl and S, individually	individually
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 1	.	0	0	0	0	0	.	set only
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 2	.	0.1300	0.0029	0.0053	0.0053	0.0058	.	set only
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 3	.	0.0670	0.0059	0.0110	0.0110	0.0120	.	set only
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 4	.	0.0310	0.0089	0.0320	0.1200	0.0360	.	set only
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 5	.	0.0110	0.0120	0.0660	0.0620	0.0730	.	set only
2	low density polyethylene	48 mm Ø x 5 mm	SCAS PE-5E6 6	.	0.0053	0.0350	0.1300	0.0290	0.1400	.	set only
1	polypropylene resin	30 mm Ø x 2 mm	NMIJ 8136a	.	.	0.00937	0.08906	0.0952	0.09435	.	individually
1	PVC resin	pellets 25 g	NMIJ 8123a	.	.	0.009562	0.09490	0.09370	0.09655	.	individually
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0611	.	.	0.00000	0.00000	.	0.00000	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0612	.	.	0.00086	0.00243	.	0.00242	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0613	.	.	0.00219	0.00488	.	0.00485	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0614	.	.	0.00430	0.00966	.	0.00959	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0615	.	.	0.00866	0.01941	.	0.01929	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0621	.	.	.	.	(<0.0001)	.	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0622	.	.	.	.	0.00100	.	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0623	.	.	.	.	0.00490	.	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0624	.	.	.	.	0.01211	.	.	set only
1	polyvinyl chloride	40 mm Ø x 4 mm	JSAC 0625	.	.	.	.	0.0244	.	.	set only
1	soil	powder 50 g	JSAC 0403	0.0199	.	0.0183	0.0257	0.00111	0.0224	.	individually
1	soil	powder 25 g	JSAC 0466	0.01093	.	0.01199	0.1483	0.01135	0.1214	0.1175	set only
1	soil	powder 25 g	JSAC 0465	0.0550	.	0.06074	0.0738	0.00578	0.6124	0.0587	set only
1	soil	powder 25 g	JSAC 0464	0.02711	.	0.03010	0.0499	0.00286	0.03027	0.02919	set only
1	soil	powder 25 g	JSAC 0463	0.01376	.	0.01468	0.0244	0.001476	0.01516	0.01415	set only
1	soil	powder 25 g	JSAC 0462	0.00715	.	0.00742	0.01496	0.000727	0.00737	0.00716	set only
1	soil	powder 25 g	JSAC 0461	0.002153	.	(0.000030)	0.00972	0.0000075	0.00244	(0.000044)	set only
1	zinc	50 mm Ø x 20 mm	41X ZSC6A	.	.	0.215	<0.0002	0.029	0.0077	.	individually
1	zinc	50 mm Ø x 20 mm	41X ZSC3A	.	.	0.119	0.0148	0.0021	0.0273	.	individually
1	zinc	50 mm Ø x 20 mm	41X ZSC1A	.	.	0.0288	0.0039	0.026	0.06	.	individually
1	zinc	50 mm Ø x 20 mm	41X ZSC4B	.	.	0.0131	0.0299	0.050	0.156	.	individually
1	zinc	50 mm Ø x 20 mm	41X ZSC2A	.	.	0.0016	0.0036	0.0053	0.111	.	individually
#	Type	Units	Number	As	Br	Cd	Cr	Hg	Pb	Se	Sold As

## REFRACTORIES

# = class, where 1 = CRM and 2 = RM T = Total IPT: 80 g VS K6: 75 g VS K10: 125 g all others: 100 g

#	Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	C	CO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	LOI
1	IPT 63	96.28	0.48	.	.	2.21	0.52	0.043	0.18	0.008	.	0.013	0.013	.	.	0.030	(0.002)	0.17
2	DH 2611	60.07	36.82	0.033 T	.	0.054	0.509	0.362	0.170	0.011	.	0.055	0.036	.	0.014	1.50	0.047	0.186
2	DH 2612	40.80	36.45	0.437	0.54	1.80	3.10	0.759	13.13	0.125	.	0.242	0.279	0.034	.	1.25	0.163	0.75
2	DH 2602	34.49	62.82	.	0.004	0.438	1.087	0.24	0.161	.	0.019	.	0.029	.	0.031	0.288	.	0.101
2	DH 2613	25.83	42.78	1.779	0.53	2.31	2.57	0.404	21.03	.	0.122	0.118	0.122	0.066	.	1.199	.	.
2	DH 2609	23.41	63.82	0.739 T	0.170	2.25	1.75	0.526	4.17	0.282	.	0.220	0.339	.	0.121	1.27	0.097	.
1	FLX CRM112	12.16	79.81	.	.	0.147	0.326	0.090	0.755	.	0.024	0.267	0.074	.	(0.04)	0.273	5.95	(5.42)
1	VS K6/4	2.12	0.54	.	.	2.95	2.26	.	92.4	.	.	.	.	.	.	.	.	.
1	VS K10/3	(0.2)	97	(0.05)	.	(0.03)	1.82	(0.03)	.	.	.	(0.5)	.	.	.	0.35	.	.

continued

Number	Co <sub>3</sub> O <sub>4</sub>	CuO	Cr <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>	Li <sub>2</sub> O	NiO	V <sub>2</sub> O <sub>5</sub>	WO <sub>3</sub>	Units
IPT 63	.	.	.	.	(0.0005)	.	.	.	80 g
DH 2611	.	.	.	.	.	.	.	.	100 g
DH 2612	.	.	0.385	.	.	0.032	0.027	.	100 g
DH 2602	.	.	.	.	.	.	.	.	100 g
DH 2613	.	0.004	0.140	.	.	.	0.020	.	100 g
DH 2609	.	.	.	.	.	.	.	.	100 g
FLX CRM112	<0.01	.	0.017	0.099	.	<0.01	.	0.041	80 g
VS K6/4	.	.	.	.	.	.	.	.	100 g
VS K10/3	.	.	.	.	.	.	.	.	125 g

## CRM ALUMINA-MAGNESIA REFRACTORY SET

Number	SOLD IN SET/10 ONLY									certified values				20 g units				informational values			
	Al <sub>2</sub> O <sub>3</sub>	MgO	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	MnO	ZrO <sub>2</sub>	LOI								
JRRM 801	93.49	3.26	0.14	2.00	0.01	0.19	0.00	0.35	0.21	0.00	0.00	0.00	0.14								
JRRM 802	84.25	6.13	2.00	1.03	0.46	0.15	0.95	3.32	1.48	0.00	0.00	0.00	0.06								
JRRM 803	74.23	16.20	0.57	4.90	0.00	0.86	0.01	0.58	2.51	0.00	0.00	0.00	0.36								
JRRM 804	64.66	20.84	4.76	4.02	0.04	0.08	0.11	5.17	0.13	0.01	0.02	0.00	0.01								
JRRM 805	58.03	36.04	0.28	0.73	0.01	0.54	0.68	2.49	1.05	0.00	0.00	0.00	0.17								
JRRM 806	48.85	49.43	0.97	0.16	0.00	0.04	0.04	0.51	0.00	0.00	0.02	0.00	0.21								
JRRM 807	39.96	55.07	2.75	0.32	0.15	0.32	0.53	0.58	0.19	0.00	0.00	0.00	0.57								
JRRM 808	28.68	67.01	0.99	0.56	0.69	0.40	0.22	0.79	0.71	0.00	0.01	0.00	0.84								
JRRM 809	19.86	70.11	4.47	0.11	0.98	0.04	1.06	0.36	2.88	0.00	0.00	0.00	0.48								
JRRM 810	10.08	78.96	0.18	3.11	0.16	0.75	0.51	4.21	1.91	0.00	0.01	0.00	0.22								

## CRM ALUMINA-ZIRCONIA-SILICA REFRACTORY SET

Number	SOLD IN SET/10 ONLY											certified values			20 g units			informational values		
	Al <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	SiO <sub>2</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	TiO <sub>2</sub>	MnO	P <sub>2</sub> O <sub>5</sub>	LOI						
JRRM 710	82.29	2.96	5.62	0.22	1.02	1.15	1.51	0.63	0.04	1.41	3.00	0.00	0.04	0.09						
JRRM 708	79.52	12.84	0.54	1.17	0.29	0.80	1.03	0.74	1.64	0.08	1.02	0.00	0.00	0.13						
JRRM 705	64.14	27.96	1.99	0.19	2.01	0.14	0.48	0.01	0.46	0.30	2.02	0.00	0.01	0.16						
JRRM 707	55.78	18.16	21.17	1.08	0.18	1.81	0.36	0.15	0.84	0.19	0.28	0.00	0.05	0.01						
JRRM 709	50.35	8.32	34.38	0.52	2.91	0.47	0.18	0.21	1.20	1.03	0.09	0.00	0.00	0.20						
JRRM 703	46.34	37.35	14.64	0.03	0.00	0.05	0.72	0.00	0.01	0.53	0.07	0.00	0.03	0.09						
JRRM 702	38.14	42.54	9.99	1.55	0.11	0.37	2.08	0.57	1.97	2.02	0.21	0.00	0.02	0.18						
JRRM 706	25.95	22.72	39.33	1.58	0.01	0.13	1.19	0.95	0.15	3.49	3.77	0.00	0.01	0.72						
JRRM 704	19.58	33.46	42.61	0.15	0.51	0.55	0.68	1.40	0.51	0.22	1.02	0.08	0.13	0.07						
JRRM 701	10.09	48.06	28.44	2.07	1.01	2.00	0.85	0.02	0.47	1.84	4.96	0.00	0.02	0.09						

## CRM BURNT REFRACTORIES

IPT: 80 g units SRM: 75 g units

Number	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	Li <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SrO	TiO <sub>2</sub>	ZrO <sub>2</sub>	LOI
SRM 78a	71.7	19.4	0.11	1.2	1.22	0.12	0.70	0.078	1.3	0.25	3.22	.	(0.42)
IPT 57	71.5	24.3	0.05	1.25	0.83	0.008	0.13	0.35	0.054	0.009	1.19	0.20	0.20
SRM 77a	60.2	35.0	0.05	1.00	0.090	0.025	0.38	0.037	0.092	0.009	2.66	.	(0.22)
IPT 51	40.3	55.0	0.06	1.19	0.69	0.018	0.20	0.09	0.09	.	2.19	0.070	0.16
SRM 76a	38.7	54.9	0.22	1.60	1.33	0.042	0.52	0.07	0.120	0.037	2.03	.	(0.34)

## CRM CHROME-MAGNESIA REFRACTORARY SET

SOLD IN SET/12 ONLY

certified values

informational values

20 g units

Number	MgO	Cr <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	MnO	SiO <sub>2</sub>	TiO <sub>2</sub>	NiO	P <sub>2</sub> O <sub>5</sub>	V <sub>2</sub> O <sub>5</sub>	ZnO	LOI
JRRM 501	87.60	2.82	2.92	0.92	4.80	0.02	0.92	0.00	0.01	0.03	0.01	0.00	0.13
JRRM 502	76.28	7.49	11.98	0.20	1.02	0.01	3.11	0.01	0.02	0.02	0.02	0.00	0.06
JRRM 503	63.11	13.60	7.14	3.81	3.00	0.03	9.09	0.04	0.03	0.03	0.03	0.01	0.11
JRRM 504	54.85	18.35	17.56	2.60	4.11	0.01	2.18	0.01	0.01	0.03	0.01	0.01	0.12
JRRM 505	50.14	21.74	7.76	0.49	17.76	0.10	1.82	0.11	0.07	0.02	0.07	0.02	0.08
JRRM 506	46.65	28.19	14.69	0.46	7.49	0.07	2.16	0.13	0.09	0.01	0.08	0.01	0.07
JRRM 508	30.86	38.18	3.98	1.03	22.70	0.00	3.08	0.01	0.01	0.01	0.00	0.00	0.05
JRRM 512	24.81	4.98	29.25	4.06	26.01	0.02	10.57	0.04	0.01	0.01	0.01	0.01	0.02
JRRM 507	22.36	32.03	25.02	1.61	12.98	0.11	5.69	0.16	0.20	0.01	0.13	0.03	-0.11
JRRM 509	20.45	42.57	20.28	2.86	10.15	0.08	1.96	1.20	0.04	0.01	0.11	0.03	0.13
JRRM 510	16.86	50.38	12.21	0.29	14.99	0.17	4.91	0.13	0.19	0.01	0.11	0.04	-0.25
JRRM 511	10.62	52.51	6.68	0.07	27.22	0.12	2.90	0.10	0.10	0.00	0.05	0.05	-0.48

## CRM FIRECLAY REFRACTORARY SET

SOLD IN SET/10 ONLY

20 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	TiO <sub>2</sub>
JRRM 101	88.57	8.10	1.06	0.31	0.16	0.21	0.11	1.01	0.30
JRRM 102	80.47	13.79	0.04	3.97	0.14	0.67	0.01	0.30	0.45
JRRM 103	80.32	18.07	0.07	0.40	0.35	0.01	0.00	0.12	0.37
JRRM 104	67.35	22.52	0.25	3.24	3.04	0.07	0.01	0.30	2.94
JRRM 105a	69.17	25.35	0.40	0.76	0.81	0.22	0.11	0.65	2.24
JRRM 106	63.61	29.91	0.14	1.92	1.81	0.98	0.02	0.59	0.67
JRRM 107	55.32	37.08	0.71	2.20	2.57	0.49	0.01	0.21	1.15
JRRM 108	55.31	40.08	0.27	1.54	0.80	0.27	0.02	0.20	1.05
JRRM 109	54.23	41.24	0.14	0.89	0.79	0.12	0.01	0.30	1.96
JRRM 110	49.54	46.68	0.10	0.84	0.34	0.16	0.01	0.08	1.66

## CRM FIRECLAY REFRACTORARY SET

SOLD IN SET/15 ONLY

20 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	LOI
JRRM 121	86.3	6.07	1.96	0.01	0.40	0.23	0.12	0.02	3.20	0.32	0.05	1.11	(0.05)
JRRM 125	79.2	18.7	0.13	0.01	0.50	0.69	0.08	0.00	0.07	0.04	0.30	0.02	(0.07)
JRRM 123	79.1	13.3	0.13	0.01	4.13	0.10	1.32	0.01	0.29	0.80	0.45	0.00	(0.03)
JRRM 122	78.2	10.2	0.43	0.81	0.24	2.05	0.65	0.20	1.04	4.89	1.03	0.20	(0.12)
JRRM 124	73.9	16.5	1.09	0.11	2.60	1.79	0.10	0.24	0.31	0.19	2.74	0.11	(0.10)
JRRM 127	68.5	23.0	0.18	0.27	0.92	0.54	0.15	0.17	1.75	1.78	2.19	0.04	(0.07)
JRRM 126	66.9	21.3	0.45	0.65	3.34	3.13	0.12	0.03	0.28	0.49	2.84	0.04	(0.17)
JRRM 129	62.2	30.1	0.15	0.10	1.46	1.92	2.23	0.01	0.23	0.20	0.96	0.11	(0.11)
JRRM 128	54.3	26.0	2.80	0.85	4.45	1.84	3.10	0.24	0.37	3.36	1.37	1.01	(0.02)
JRRM 130	53.4	32.7	1.95	1.05	0.53	1.42	0.61	0.37	2.32	0.91	3.35	0.83	(0.11)
JRRM 131	52.7	36.6	0.78	0.07	2.20	2.61	1.02	0.03	0.76	1.61	1.16	0.26	(0.17)
JRRM 132	50.6	39.1	1.29	0.11	1.64	0.79	0.34	0.11	2.16	2.38	0.29	0.75	(0.15)
JRRM 133	50.1	39.0	0.10	1.27	3.69	0.91	2.03	0.01	0.33	0.34	1.93	0.57	(0.08)
JRRM 134	47.2	44.3	0.20	0.24	1.07	0.37	0.20	0.24	0.13	3.83	1.74	0.35	(0.14)
JRRM 135	37.2	48.9	2.36	0.42	3.05	2.77	1.24	0.04	2.87	0.48	0.07	0.20	(0.18)

**CRM MAGNESIA REFRACTORY SET**

Number	SOLD IN SET/10 ONLY					certified values							informational values				20 g units			
	MgO	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	
JRRM 410	99.08	0.05	0.59	0.05	0.18	0.02	0.00	0.00	0.01	0.00	0.04	0.00	0.02	0.00	0.00	0.01	0.00	0.04	0.00	
JRRM 409	98.03	0.20	0.74	0.49	0.53	0.03	0.01	0.00	0.01	0.00	0.02	0.00	0.03	0.01	0.00	0.01	0.00	0.02	0.00	
JRRM 408	96.19	2.55	0.67	0.13	0.46	0.09	0.00	0.00	0.01	0.00	0.01	0.00	0.09	0.00	0.00	0.01	0.00	0.01	0.00	
JRRM 407	94.55	0.10	0.67	2.14	2.43	0.02	0.08	0.00	0.01	0.00	0.04	0.00	0.02	0.08	0.00	0.01	0.00	0.04	0.00	
JRRM 405	91.95	1.37	1.69	1.34	3.47	0.01	0.01	0.01	0.07	0.00	0.12	0.05	0.01	0.01	0.01	0.07	0.00	0.12	0.05	
JRRM 406	91.85	1.13	4.80	0.87	1.19	0.01	0.00	0.00	0.01	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.00	0.04	0.00	
JRRM 404	88.02	6.01	1.78	2.90	1.22	0.01	0.00	0.00	0.03	0.00	0.05	0.00	0.01	0.00	0.00	0.03	0.00	0.05	0.00	
JRRM 403	85.48	4.06	0.61	1.55	8.14	0.03	0.01	0.00	0.01	0.00	0.04	0.00	0.03	0.01	0.00	0.01	0.00	0.04	0.00	
JRRM 402	83.77	1.99	3.57	5.05	5.46	0.12	0.00	0.00	0.01	0.01	0.07	0.02	0.12	0.00	0.00	0.01	0.01	0.07	0.02	
JRRM 401	81.24	8.10	0.20	3.89	6.42	0.01	0.00	0.00	0.01	0.00	0.03	0.01	0.01	0.00	0.00	0.01	0.00	0.03	0.01	

**CRM SILICA REFRACTORY SETS**

Number	SOLD IN SETS ONLY, AS GROUPED													20 g units												
	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>		
JRRM 221	10.03	2.78	0.02	1.57	0.27	0.68	0.15	0.46	0.01	83.8	0.04	0.01	10.03	2.78	0.02	1.57	0.27	0.68	0.15	0.46	0.01	0.01	83.8	0.04	0.01	new 2017
JRRM 222	7.66	0.16	0.006	3.86	0.78	0.94	0.05	0.20	0.006	84.8	0.78	0.48	7.66	0.16	0.006	3.86	0.78	0.94	0.05	0.20	0.006	0.006	84.8	0.78	0.48	
JRRM 223	5.22	4.14	0.03	2.04	0.37	0.27	0.20	0.69	0.01	86.0	0.04	0.67	5.22	4.14	0.03	2.04	0.37	0.27	0.20	0.69	0.01	0.01	86.0	0.04	0.67	
JRRM 224	4.66	1.95	0.30	2.47	0.90	0.29	0.16	0.28	0.68	87.9	0.15	0.003	4.66	1.95	0.30	2.47	0.90	0.29	0.16	0.28	0.68	0.68	87.9	0.15	0.003	
JRRM 225	3.22	3.19	0.01	1.27	0.63	0.13	0.07	0.90	0.01	89.9	0.42	0.01	3.22	3.19	0.01	1.27	0.63	0.13	0.07	0.90	0.01	0.01	89.9	0.42	0.01	
JRRM 226	2.63	0.97	0.24	2.99	0.47	0.09	0.02	0.19	0.23	91.2	0.29	0.32	2.63	0.97	0.24	2.99	0.47	0.09	0.02	0.19	0.23	0.23	91.2	0.29	0.32	
JRRM 227	1.66	2.41	0.45	0.81	0.11	0.05	0.23	0.05	0.003	92.9	0.09	0.88	1.66	2.41	0.45	0.81	0.11	0.05	0.23	0.05	0.003	0.003	92.9	0.09	0.88	
JRRM 228	0.39	1.78	0.08	0.08	0.10	0.11	0.03	1.18	0.99	93.8	1.21	0.01	0.39	1.78	0.08	0.08	0.10	0.11	0.03	1.18	0.99	0.99	93.8	1.21	0.01	
JRRM 229	1.17	1.41	0.37	0.19	0.07	0.46	0.07	0.07	0.01	95.7	0.12	0.20	1.17	1.41	0.37	0.19	0.07	0.46	0.07	0.07	0.01	0.01	95.7	0.12	0.20	
JRRM 230	0.18	0.60	0.05	0.70	0.02	0.01	0.12	0.07	0.38	97.7	0.03	0.001	0.18	0.60	0.05	0.70	0.02	0.01	0.12	0.07	0.38	0.38	97.7	0.03	0.001	
JRRM 231	0.63	0.005	0.18	0.04	0.004	0.004	0.004	0.006	0.001	98.6	0.003	0.38	0.63	0.005	0.18	0.04	0.004	0.004	0.004	0.006	0.001	0.001	98.6	0.003	0.38	
JRRM 232	0.05	0.004	0.002	0.05	0.004	0.001	0.005	0.005	0.001	99.7	0.002	(0.001)	0.05	0.004	0.002	0.05	0.004	0.004	0.005	0.001	0.001	0.001	99.7	0.002	(0.001)	

**CRM SILICON CARBIDE REFRACTORY SET** available in SET/9 ONLY 50 g

Number	SiC	Tot C	Free C	LOI	Al	Ca	Fe	Mg	N	O	Ti	Free Si
JRRM 1001	99.58	29.81	0.04	.	0.008	<0.001	0.044	<0.001	0.030	0.048	0.0035	0.06
JRRM 1002	0.06	5.03	4.98	5.11	.	.	.	.	.	.	.	.
JRRM 1003	.	10.06	10.01	10.11	.	.	.	.	.	.	.	.
JRRM 1004	.	20.04	19.92	20.01	.	.	.	.	.	.	.	.
JRRM 1005	.	29.93	29.81	29.95	.	.	.	.	.	.	.	.
JRRM 1006	.	49.99	49.97	49.95	.	.	.	.	.	.	.	.
JRRM 1007	89.29	36.75	10.01	.	.	.	.	.	.	.	.	.
JRRM 1008	29.74	14.12	5.21	.	.	.	.	.	.	.	.	.
JRRM 1009	6.18	39.43	37.67	.	.	.	.	.	.	.	.	.

**CRM ZIRCON-ZIRCONIA REFRACTORY SET**

Number	SOLD IN SET/10 ONLY												20 g units												
	ZrO <sub>2</sub>	HfO <sub>2</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	HfO <sub>2</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	
JRRM 601	92.0	1.59	0.26	0.11	5.58	0.00	0.10	0.00	0.06	0.00	0.00	0.16	92.0	1.59	0.26	0.11	5.58	0.00	0.10	0.00	0.06	0.00	0.00	0.16	0.16
JRRM 602	88.4	1.52	0.33	0.07	0.22	0.01	1.62	0.00	5.30	0.76	1.34	0.16	88.4	1.52	0.33	0.07	0.22	0.01	1.62	0.00	5.30	0.76	1.34	0.16	0.16
JRRM 603	84.8	1.45	0.96	5.29	0.95	0.02	2.86	0.65	0.96	0.18	0.83	0.93	84.8	1.45	0.96	5.29	0.95	0.02	2.86	0.65	0.96	0.18	0.83	0.93	0.93
JRRM 604	79.4	1.35	3.05	6.93	0.09	3.06	0.43	1.94	0.01	1.09	1.99	0.13	79.4	1.35	3.05	6.93	0.09	3.06	0.43	1.94	0.01	1.09	1.99	0.13	0.13
JRRM 605	75.5	1.31	10.8	4.84	1.94	1.55	0.17	0.54	1.99	0.45	0.35	0.12	75.5	1.31	10.8	4.84	1.94	1.55	0.17	0.54	1.99	0.45	0.35	0.12	0.12
JRRM 606	72.5	1.26	22.1	0.53	0.02	0.00	0.93	0.01	0.32	2.03	0.01	0.11	72.5	1.26	22.1	0.53	0.02	0.00	0.93	0.01	0.32	2.03	0.01	0.11	0.11
JRRM 607	61.6	1.21	32.9	3.53	0.04	0.00	0.12	0.04	0.03	0.02	0.08	0.13	61.6	1.21	32.9	3.53	0.04	0.00	0.12	0.04	0.03	0.02	0.08	0.13	0.13
JRRM 608	58.8	1.21	34.6	0.70	0.52	0.49	0.09	0.01	3.12	0.03	0.11	0.10	58.8	1.21	34.6	0.70	0.52	0.49	0.09	0.01	3.12	0.03	0.11	0.10	0.10
JRRM 609	55.6	1.12	40.5	0.88	0.30	0.01	0.15	0.02	0.15	0.94	0.08	0.15	55.6	1.12	40.5	0.88	0.30	0.01	0.15	0.02	0.15	0.94	0.08	0.15	0.15
JRRM 610	48.7	0.98	45.7	0.45	3.07	0.00	0.30	0.01	0.54	0.04	0.11	0.09	48.7	0.98	45.7	0.45	3.07	0.00	0.30	0.01	0.54	0.04	0.11	0.09	0.09

**RM RICE STRAW ASH - THERMOSTIL** typical analysis 100 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	C	CO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	TiO <sub>2</sub>	-H <sub>2</sub> O 900°C
DH 5704	92.49	0.198	3.60	0.008	0.30	0.090	0.97	0.362	0.062	0.070	0.273	0.177	0.004	1.38
DH 5708	86.67	1.15	3.83	0.094	0.97	0.931	0.872	3.10	0.117	0.085	0.226	0.255	0.126	1.70
DH 5705	76.31	0.363	4.33	0.265	2.51	2.89	0.653	9.60	0.245	0.116	0.123	0.409	0.217	2.32

**RM SAND FOR SLIDING GATES**

typical analysis listed in mass %

100 g units

Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	C	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe	K <sub>2</sub> O	MgO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	NiO	P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	WO <sub>3</sub>	ZrO <sub>2</sub>	-H <sub>2</sub> O	900°C
DH 4501	72.21	4.92	0.607	0.025	11.53	5.14	0.633	2.40	0.065	0.059	0.053	0.008	.	0.195	0.102	.	.	.	0.204
DH 4502	65.97	5.69	0.47	0.038	14.75	6.31	0.693	3.24	0.074	0.062	0.033	0.007	0.010	0.203	0.110	.	.	.	0.177
DH 4507	27.95	11.00	0.326	0.096	33.41	14.51	.	7.29	0.179	.	0.090	CO <sub>2</sub>	0.013	0.486	0.270	0.019	.	.	0.129
DH 4506	10.22	12.93	0.700	<0.017	42.01	25.03	.	8.18	0.703	.	.	CO <sub>2</sub>	0.007	0.510	0.382	.	.	.	0.091

**RM FOUNDRY SAND**

typical analysis listed in mass % except \* which is mg/kg

100 g units

Number	BaO	CeO <sub>2</sub>	Co <sub>3</sub> O <sub>4</sub>	Cr <sub>2</sub> O <sub>3</sub>	CuO	La*	Li*	Nd*	NiO	Sr*	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	ZnO	ZrO <sub>2</sub>
DH 3301	0.015	0.003	0.020	0.538	0.012	14.0	6.7	8.3	0.003	35.0	0.213	0.007	0.015	0.127

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SiO <sub>2</sub>
DH 3301	2.76	0.720	3.84	0.169	0.570	0.070	0.297	0.027	0.116	90.36

**CRM ZIRCON SAND**

Number	ZrO <sub>2</sub> + HfO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	LOI	Units
JCRM R501	66.5	0.39	0.06	32.6	0.16	0.11	100 g
JCRM R502	60.3	5.87	0.10	32.8	0.24	0.26	100 g

**CRM SILICA POWDER SET**

SOLD IN SET/3 ONLY

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	SiO <sub>2</sub>	TiO <sub>2</sub>	LOI
JCRM R405	1.07	0.029	0.053	0.71	0.023	0.060	97.78	0.022	0.13
JCRM R406	1.31	0.016	0.102	0.13	0.005	0.030	96.71	0.564	0.97
JCRM R404	0.0011	0.00002	0.00006	0.00004	<0.00001	0.0001	>99.99	0.0006	0.00

**SILICA BRICK**

# = class, where 1 = CRM and 2 = RM analysis listed in mass % NH, VS: 75g SRM: 45g others: 100g

#	Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	Li <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	LOI
1	VS K1/2	96.0	0.6	.	1.37	.	1.2	.	.	0.05	0.03	.	0.010	.	.	last of stock
1	ECRM 777-1	95.06	0.795	.	2.826	.	0.330	0.154	.	0.071	.	0.02	.	.	0.444	.
1	NH 8-2-06	92.59	0.82	.	2.53	.	1.11	.	.	.	.	.	.	.	0.70	.
1	ECRM 776-1	62.76	29.28	0.122	0.31	0.022	1.43	2.92	0.019	0.476	.	0.488	.	0.062	1.62	.
1	VS K2/4	58.6	35.1	.	0.4	.	2.94	0.69	.	0.48	0.06	0.19	.	.	1.91	.
1	VS K3/2	32.3	63.6	.	0.44	.	1.15	0.15	.	0.27	.	0.17	.	.	1.34	.
1	SRM 198	.	0.16	.	2.71	.	0.66	0.017	0.001	0.07	.	0.012	.	0.022	0.02	0.21
1	SRM 199	.	0.48	.	2.41	.	0.74	0.094	0.002	0.13	.	0.015	.	0.015	0.06	0.17

**SILICEOUS MATERIAL**

# = class, where 1 = CRM, 2 = RM, and 3 = SUS analysis listed in mass % T = Total AMIS also contains 60+ other elements

#	Number	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	LOI	Units	Other
1	BCS 313/2	99.73	0.068	0.0160	BaO:0.00067	0.0229	0.0108	0.0038	0.00032	0.0057	.	0.0243	.	100 g	SrO: 0.00024
3	AMIS 0415	99.25	0.4	<1	0.001	0.03	0.14	0.03	<1	0.012	0.005	0.02	.	100 g	last
1	NCS DC60116a	98.32	1.10	0.038	0.00030	0.076	0.15	0.026	0.0013	0.076	(0.0069)	0.023	0.14	50 g	
1	GBW 03113	95.74	2.36	0.17	0.00054	0.21	0.67	0.098	(0.0033)	0.25	(0.0076)	0.036	0.35	60 g	
1	SRM 2696	95.61	0.2080	0.426	.	(0.055)	0.652	0.235	0.032	(0.129)	(0.0863)	.	(2.11)	70 g	ZnO:0.051
1	NCS DC60117a	94.41	3.20	0.094	0.00034	0.088	1.26	0.025	0.0011	0.47	(0.0070)	0.019	0.27	50 g	
1	GBW 03114	89.59	5.48	0.34	0.0012	0.48	2.07	0.16	(0.010)	1.09	(0.014)	0.102	0.53	60 g	
2	CERAM CEB1	74.0	16.2	0.52	BaO:0.05	0.48	1.75	0.16	.	0.71	0.14	0.34	5.60	25 or 100g	SrO: 0.02
1	GBW 03117	71.25	2.56	6.37	.	0.18	1.10	3.98	.	13.77	.	0.057	0.44	50 g	
1	SARM 69 *	66.6	14.4	2.37	Cr:0.0223	7.18T	1.96	1.85	0.129	(0.79)	(0.28)	0.777	(3.6)	100 g	last

\* SARM 69 also contains (in ppm) Ba: 518, Co: 28, Cu: 46, Ni: 53, Sc: 20, and Zn: 68.

**CRM SYNTHETIC SILICATE WITH TRACE ELEMENTS**Material base: SiO<sub>2</sub> 72%, Al<sub>2</sub>O<sub>3</sub> 15%, Fe<sub>2</sub>O<sub>3</sub> 4%, CaMg(CO<sub>3</sub>)<sub>2</sub> pure dolomite 4%, Na<sub>2</sub>SO<sub>4</sub> 2.5%, K<sub>2</sub>SO<sub>4</sub> 2.5% analysis listed in mg/kg 70 g units

Number	Ag	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr	Cu	La	Li	Mn
GBW 07701	(0.034)	2.0	2.1	24	0.26	0.31	0.022	2.0	2.6	2.3	2.0	2.1	15	27
GBW 07702	0.064	5.0	5.1	54	0.56	0.61	0.052	5.0	5.6	5.3	5.0	5.1	18	57
GBW 07703	0.11	10	10.0	104	1.1	1.1	0.1	10.0	10.6	10.3	10.0	10	23	107
GBW 07704	0.21	20	20	204	2.1	2.1	0.2	20	20.6	20.3	20.0	20	33	207
GBW 07705	0.51	50	50	504	5.1	5.1	0.5	50	50.6	50	50	50	63	507
GBW 07706	1.0	100	100	1000	10	10	1.0	100	101	100	100	100	113	1000
GBW 07708	5.0	500	500	5000	50	50	5.0	500	500	500	500	500	513	5000
GBW 07709	10.0	.	1000	10000	100	100	10	1000	.	1000	1000	.	1010	10000
GBW 07710	20	.	.	.	200	200	20	.	.	.	2000	.	.	.
GBW 07711	50	.	.	.	500	.	50	.	.	.	5000	.	.	.

continued

Number	Mo	Nb	Ni	Pb	Sb	Sn	Sr	Ti	V	W	Y	Yb	Zn	Zr
GBW 07701	0.21	2.3	2.6	2.5	0.28	0.28	5.0	24	2.8	0.20	2.0	0.2	3.0	2.2
GBW 07702	0.51	5.3	5.6	5.5	0.58	0.58	8.0	54	5.8	0.50	5.0	0.5	6.0	5.2
GBW 07703	1.0	10.3	10.6	10.5	1.1	1.1	13	104	10.8	1.0	10	1.0	11.0	10.2
GBW 07704	2.0	20.3	20.6	20.5	2.1	2.1	23	204	20.8	2.0	20	2.0	21	20
GBW 07705	5.0	50	50.6	50	5.1	5.1	53	504	51	5.0	50	5.0	51	50
GBW 07706	10	100	101	100	10	10	103	1000	101	10	100	10	101	100
GBW 07708	50	500	500	500	50	50	500	5000	500	50	500	50	500	500
GBW 07709	100	.	.	1000	100	100	1000	10000	1000	100	.	100	1000	1000
GBW 07710	200	.	.	2000	200	200	2000	20000	.	200	.	.	2000	.
GBW 07711	500	.	.	5000	500	500	5000	.	.	500	.	.	5000	.

**CRM SILICON METAL POWDER**

analysis listed in mass %

Number	Al	C	Ca	Cr	Cu	Fe	Mg	Mn	Ni	P	S	Ti	V	Zr
NCS DC25007	0.24	.	0.31	.	.	0.39	.	.	.	.	.	.	.	.
SRM 57B	0.1690	(0.0200)	(0.00222)	(0.00173)	(0.00172)	0.3400	.	0.00782	0.00153	0.00163	(0.0030)	0.0346	(0.0025)	0.00178
IPT 134	0.085	0.025	0.102	0.0011	0.0014	0.29	0.0048	0.0113	0.0006	0.0033	0.002	0.0097	0.0004	.
IPT 135	0.045	0.018	0.011	0.0006	0.0008	0.125	0.0012	0.0070	0.0005	0.0027	0.002	0.0113	0.0003	.
NCS HC25649	0.032	.	0.060	.	.	0.53	.	.	.	0.0067	.	0.026	.	.
NCS HC25648	0.026	.	0.055	.	.	0.44	.	.	.	0.0065	.	0.023	.	.

**CRM SILICON CARBIDE**

analysis listed in mass %

Number	SiC	Al	Fe	Units
VS K9/2	99.6	(0.002)	(0.06)	150 g

**CRM SILICON CARBIDE**

in the chart below, (F) = Free and (T) = Total analysis listed in mass % except \* which is mg/kg

Number	C (T)	C (F)	Si (T)	Si (F)	SiO <sub>2</sub> (F)	Al	B	Ca	Cr	Cu	Fe	K	Mg
ECRM 781-1	48.251	(37.22)	35.56	(4.66)	.	4.39 (T)	(0.0149)	(0.0433)	(0.0240)	.	(0.8061)	(0.3765)	(0.0421)
NMIJ 8002a	29.93	.	68.01	.	.	0.0189	.	.	0.00619	0.0115	0.0130	.	.
BAM S008	29.9	0.045	.	(<0.03)	(<0.01)	0.0047	0.00030	0.00025	0.000016	0.000010	0.00048	.	0.000007
BAM S003	29.89	0.0493	.	(0.0481)	(0.0600)	0.0372	0.0063	0.00294	0.00035	0.00015	0.0149	.	0.00063
NMIJ 8001a	29.80	.	68.31	.	.	0.00832	.	.	.	.	0.00467	.	.
ECRM 780-1	26.381	.	63.5	.	.	1.86 (T)	.	0.84	.	.	1.30 (T)	(0.0112)	0.051
BCS 360	23.53	(0.085)	60.8	(0.54)	.	6.52	.	0.115	.	.	(0.19)	.	.
BCS 359	23.46	(0.061)	67.6	(0.32)	.	0.118	.	0.108	.	.	0.175	.	.

  

Number	Mn	Mo	N	Na	Ni	O	Ti	V	Y*	Zr	Notes	Units
ECRM 781-1	(0.0274)	.	(0.0282)	(0.0308)	(0.0210)	.	(0.0320)	(0.0216)	.	.	P: (0.0117) Mo: (0.0264)	100 g
NMIJ 8002a	0.000160	0.0109	.	.	.	.	0.00477	.	0.58	.	Beta Phase	50 g
BAM S008	0.000005	0.0018	.	0.000017	0.00009	0.0146	0.0067	0.0275	.	0.00044	(SiC-6H:99.7, SiC-15R:0.23, SiC-4H:0.06)	50 g
BAM S003	0.000144	.	(0.0093)	0.00177	0.00329	0.0910	0.0079	0.00414	.	0.00252	green micro F800, last of stock	50 g
NMIJ 8001a	.	.	.	.	.	.	0.000637	.	0.31	.	Alpha Phase	50 g
ECRM 780-1	0.029	.	0.325	(0.0502)	.	.	.	.	.	.	n/a	100 g
BCS 360	.	.	(4.77)	.	.	(4.03)	0.025	.	.	.	Sialon Bonded	100 g
BCS 359	.	.	(7.84)	.	.	(0.53)	0.022	.	.	.	Nitrogen Bearing	100 g

**CRM SILICON CARBIDE SET** SOLD IN SET/3 ONLY F = Free T = Total 50 g each

Number	T.Si	F.Si	F.SiO <sub>2</sub>	T.C	F.C	Al	Ca	Cl	Cr	Cu	F	Fe	Mg
JCRM R024	68.97	(0.042)	(0.593)	29.85	(0.423)	0.0193	0.0019	(<0.002)	0.0056	(<0.0006)	(<0.001)	0.0219	0.0002
JCRM R025	68.43	(0.014)	(0.356)	30.49	(1.24)	0.0184	0.0008	(<0.002)	0.0097	0.0021	(0.0574)	0.0233	(<0.0001)
JCRM R026	69.03	(0.012)	(0.311)	29.85	(0.598)	0.0059	0.0004	(<0.002)	(<0.0005)	(<0.0006)	0.0686	0.0011	(<0.0001)

Number	Mn	Mo	N	Ni	O	P	S	Ti	V	Zn	Zr
JCRM R024	0.0004	(<0.001)	(0.048)	0.0060	0.97	(<0.01)	(<0.005)	0.0340	0.0013	(<0.0005)	0.0047
JCRM R025	(<0.0003)	0.0126	0.113	0.0011	0.94	(<0.01)	(0.0431)	0.0040	0.0053	(<0.0005)	0.0012
JCRM R026	(<0.0003)	(<0.001)	0.034	(<0.001)	0.71	(<0.01)	(<0.005)	0.0016	0.0018	(<0.0005)	(<0.0005)

CRM SILICON NITRIDE analysis in mass %								analysis in mg/kg										
Number	Si	N	Al	C	Ca	Fe	O	Co	Mg	Cr	Mn	Na	Ni	Ti	W	Zr	̑-phase of Si <sub>3</sub> N <sub>4</sub>	Units
INDIVIDUAL																		
SRM 8983	.	39.23	.	0.107	.	.	1.20	.	.	.	.	.	.	.	.	.	.	4.5 g
NMIJ 8004a	59.226	38.485	0.07397	.	0.00727	0.01969	.	10.29	.	2.987	.	2.485	8.519	.	2.146	.	25 g	
BAM ED101	.	38.1	0.0469	0.162	0.00141	0.00795	(1.91)	43.5	4.3	.	.	7.59	.	41.3	.	7.43	50 g	
SET ONLY																		
JCRM R006	59.57	38.98	<0.002	0.101	<0.0003	0.0012	1.18	.	<2	<6	<1	.	<8	<4	.	<7	20 g	
JCRM R007	59.45	39.13	0.0707	0.136	0.0931	0.0169	0.79	.	68	49	28	.	<8	58	.	<7	20 g	
JCRM R008	59.03	38.46	0.116	0.097	0.225	0.171	1.56	.	12	92	86	.	<8	72	.	9	20 g	

CRM SILICON NITRIDE analysis listed in mass %								SRM 656 is two 10 g powder units, one ̑ and one ̒ phase powder									
Number	Powder	Mass ̑	Uncertainty ±	Mass ̒	Uncertainty ±	Amorphous	Uncertainty ±										
SRM 656	̑	87.5	0.59	3.0	0.05	9.5	0.61										
SRM 656	̒	16.3	0.81	75.1	2.54	8.6	0.60										

CRM BORON NITRIDE analysis listed in mass %															T = Total		AO = adherent oxide		50 g units	
Number	B.T	B.AO	N	Al	C	Ca	Co	Cr	Fe	H <sub>2</sub> O	Mg	Na	O	Si	Ti					
BAM ED103	43.5	0.070	55.6	0.00070	(0.018)	0.0273	(<0.00001)	0.00047	0.00150	(<0.1)	0.0056	0.00123	0.68	0.0017	0.00049					

CRM SILICOALUMINUM analysis listed in mass %																	
Number	Al	Si	Fe	Ba	C	Ca	Co	Cr	Cu	Mg	Mn	Ni	P	S	Sr	Ti	Units
NCS HC14605	36.67	25.94	24.97	9.12	0.13	1.33	.	0.152	0.045	.	0.12	0.167	0.018	0.012	.	.	70 g
NCS HC93615	34.80	29.87	30.47	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC14603	32.84	24.12	33.54	7.57	0.13	0.71	.	0.085	0.061	.	0.14	0.042	0.015	0.015	.	.	70 g
NCS HC14602	32.82	19.21	38.09	6.52	0.14	0.85	.	0.017	0.137	.	0.25	0.014	0.015	0.013	.	.	70 g
NCS HC13602	32.55	32.01	20.59	7.41	0.27	1.17	.	.	.	0.85	0.197	.	0.017	0.0096	.	.	50 g
NCS HC93614	31.91	33.75	27.84	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC93633	29.67	28.31	37.44	0.45	.	.	.	.	.	.	0.426	.	0.023	0.022	.	.	50 g
NCS HC14604	25.44	19.21	49.14	2.64	0.24	0.44	.	0.053	0.172	.	0.25	0.018	0.011	0.011	.	.	70 g
NCS HC28635	16.63	43.60	17.53	1.64	1.00	15.18	.	0.054	0.046	0.027	0.095	0.026	0.051	0.040	0.023	.	50 g
NCS HC14609	14.46	33.41	35.46	7.72	0.22	5.74	.	0.116	0.32	0.18	0.33	0.016	0.018	0.017	0.092	0.055	60 g
NCS HC14610	13.47	40.58	23.25	10.70	0.24	8.25	0.0032	0.032	0.29	0.12	0.23	0.012	0.021	0.025	0.094	0.124	60 g
NCS HC14608	9.14	53.39	14.22	12.39	0.13	8.28	0.0022	0.021	0.176	0.21	0.17	0.0061	0.022	0.021	0.132	0.084	60 g
NCS HC28637	5.42	52.76	10.54	15.33	0.63	11.10	.	0.031	0.017	0.019	0.15	0.0070	0.024	0.073	0.042	.	50 g
NCS HC28636	4.07	50.36	16.68	24.26	0.34	1.44	.	0.083	0.032	0.032	0.11	0.021	0.016	0.038	0.095	.	50 g
NCS HC14611	1.47	56.74	5.77	17.00	1.56	13.61	0.0016	0.0044	0.0097	0.045	0.065	0.0020	0.016	0.14	0.22	0.126	60 g

CRM SILICOBARIUM analysis listed in mass %												50 g units	
Number	Ba	Si	Al	C	Ca	Fe	Mg	Mn	P	S	Sr		
NCS HC93632	27.54	47.56	2.78	0.99	.	11.75	.	0.16	0.024	0.13	.		
NCS HC93634	14.14	52.62	1.82	0.64	14.08	12.97	0.051	0.104	0.022	0.204	0.063		
NCS HC93631	10.00	37.19	13.46	0.78	5.16	27.56	0.098	0.43	0.032	0.044	.		



## SILICOCALCIUM

# = class, where 1 = CRM and 2 = RM

#	Number	Ca	Si	Al	Ba	C	Cr	Cu	Fe	Mg	Mn	Mo	Ni	P	S	Ti	Units
1	NCS HC93613	31.67	56.20	1.77	.	1.30	.	.	5.58	.	.	.	.	0.018	0.088	.	50 g
1	<b>BS 119</b>	31.3	62.9	0.44	.	0.30	.	.	3.03	.	.	.	.	0.034	0.012	<b>17025</b>	100 g
1	NCS HC37620	30.70	60.09	Sol.Al:1.09	.	0.68	.	.	.	.	.	.	.	0.017	0.033	.	50 g
2	DH 0406	30.48	60.79	0.333	.	0.61	<0.009	.	5.17	0.010	0.056	.	.	0.031	0.022	0.019	50 g
1	NCS HC11604a	30.45	56.02	1.97	.	0.94	.	.	6.93	.	0.037	.	.	0.054	0.073	.	50 g
1	VS F26/3	29.9	60.1	1.52	.	.	.	.	6.19	.	.	.	.	0.024	0.029	0.161	100 g
1	VS F26/2	29.9	59.5	1.52	.	.	.	.	6.29	.	.	.	.	0.024	0.030	0.156	100 g
2	DH 0402	28.48	58.68	1.13	.	.	0.010	0.014	6.74	0.049	0.051	.	.	0.014	.	0.055	50 g
1	58A CQ42001	28.25	55.31	1.88	.	2.44	.	.	6.08	.	.	.	.	0.019	0.0132	.	50 g
1	NCS HC93627	28.02	57.43	1.76	.	1.02	.	.	6.94	.	.	.	.	0.030	0.045	.	50 g
1	NCS HC11619	27.15	61.11	2.15	.	0.55	.	.	6.61	.	0.053	.	.	0.048	0.029	.	50 g
2	DH 0404	26.79	62.53	1.74	.	0.533	0.016	0.020	5.03	0.036	0.094	.	0.007	0.011	.	0.238	50 g
1	NCS HC37621	25.25	60.19	Sol.Al:1.55	.	0.71	.	.	.	.	.	.	.	0.031	0.020	.	50 g
1	VS F25/3	21.3	51.5	0.67	.	.	.	.	23.06	.	.	.	.	0.011	0.0056	.	100 g
1	NCS HC11605	13.22	53.46	2.34	14.02	0.385	0.054	0.079	13.57	0.022	0.075	Sr:0.235	0.023	0.014	0.039	.	60 g
1	VS F44	12.6	49.7	1.68	.	0.166	.	.	19.91	9.6	.	.	V:(2.5)	0.014	0.0066	.	100 g

## CRM

## SILICOCHROMIUM

Number	Cr	Si	Fe	Al	B	C	Co	Cu	Mn	Ni	P	S	Ti	V	Units
SRM 689	36.4	39.5	23.2	0.049	0.0017	0.043	0.034	0.013	0.32	0.20	0.026	0.002	0.40	0.09	100 g
NCS HC25633	33.90	44.06	.	1.00	.	0.045	.	.	0.29	.	0.013	(0.002)	.	.	50 g
NCS HC25643	32.62	49.17	.	1.24	.	0.018	.	.	0.429	.	0.0083	0.0025	.	.	50 g

## SILICOMANGANESE

# = class, where 1 = CRM and 2 = RM

#	Number	Mn	Si	Fe	C	Co	Cr	Cu	Ni	P	S	Ti	V	Units
2	DH 0107	77.82	17.36	2.64	1.65	0.030	.	0.012	0.020	0.135	.	0.122	0.015	50 g
1	BS SiMn-1	73.2	16.0	8.2	1.80	(0.051)	0.019	(0.042)	(0.083)	0.278	0.016	(0.19)	(0.04)	100 g
1	MHCX04	70.0	22.7	5.31	0.80	0.111	0.103	0.104	0.122	0.149	0.012	0.28	0.085	70 g
1	NCS HC25605b	69.77	14.20	.	2.21	.	.	.	.	0.153	0.0052	.	.	50 g
1	NCS HC25657	67.96	25.03	.	0.58	.	.	.	.	0.065	0.011	0.18	.	50 g
1	VS F23/1	67.53	21.18	.	1.45	.	.	.	.	0.235	0.0155	.	.	100 g
1	NCS HC26611b	67.44	18.24	.	1.24	.	.	.	.	0.080	0.009	.	.	50 g
1	NCS HC28618	67.40	19.34	11.65	1.05	0.017	0.045	0.051	0.036	0.107	0.017	0.255	0.063	50 g
1	NCS HC25605c	67.20	21.87	10.01	0.456	0.020	0.029	0.019	0.013	0.132	0.0076	0.175	0.040	50 g
1	NCS HC37612	67.02	18.96	.	1.10	.	.	.	.	0.178	0.016	0.276	.	50 g
1	NCS HC18603	66.70	17.21	.	1.70	.	.	.	.	0.183	0.025	.	.	50 g
1	NCS HC93619	66.40	17.55	.	1.65	.	.	.	.	0.137	0.025	.	.	50 g
1	NCS HC11603b	66.37	17.63	.	1.34	.	.	.	.	0.065	0.008	.	.	100 g
1	NCS HC25605a	66.30	18.28	.	1.09	.	.	.	.	0.145	0.010	0.18	.	50 g
1	NCS HC19607	66.20	18.41	.	1.56	.	.	.	.	0.126	0.022	.	.	50 g
1	NCS HC25640	65.85	24.74	.	0.181	.	.	.	.	0.104	0.010	.	.	50 g
1	NCS HC93625	65.74	17.19	.	1.66	.	.	.	.	0.151	0.026	.	.	50 g
1	NCS HC93637	65.70	17.54	.	1.80	.	.	.	.	0.023	0.023	.	.	100 g
1	NCS HC11603a	65.67	17.49	.	1.33	.	.	.	.	0.065	0.011	.	.	100 g
1	NCS HC37605	65.64	17.67	.	1.55	.	.	.	.	0.14	0.024	0.46	.	50 g
1	YSBC25616-97	65.54	21.88	.	0.435	.	.	.	.	0.141	0.009	.	.	50 g
1	NCS HC25640a	65.50	24.47	.	0.197	.	.	.	.	0.117	0.0079	.	.	50 g
1	MHCX03	65.5	29.2	4.92	0.04	.	0.20	0.13	0.11	0.047	0.004	0.49	.	100 g
1	NCS HC25654	65.29	19.26	.	0.876	.	.	.	.	0.109	0.0122	0.19	.	50 g
2	DH 0106	65.24	18.38	14.60	1.21	0.013	0.011	0.017	0.042	0.080	0.010	0.121	0.015	50 g
1	NCS HC28617	64.97	17.59	15.16	1.57	0.035	0.055	0.096	0.092	0.127	0.018	0.221	0.060	50 g
1	NCS HC93624	64.86	16.87	.	1.79	.	.	.	.	0.120	0.024	.	.	50 g
1	NCS HC93618	63.91	19.04	.	1.13	.	.	.	.	0.140	0.022	.	.	50 g
1	NCS HC93626	63.80	16.42	.	1.91	.	.	.	.	0.097	0.020	.	.	50 g
1	JSS 705-5	62.69	14.99	.	1.941	.	.	.	.	0.239	(0.0087)	.	.	150 g
1	NCS HC28616	62.53	14.33	20.00	2.28	0.048	0.060	0.080	0.167	0.205	0.020	0.222	0.095	50 g
2	DH 0302	62.17	27.95	8.69	0.092	0.054	0.016	0.031	0.032	0.089	.	0.288	0.015	50 g
1	NCS HC26621	61.49	27.49	.	0.039	.	.	.	.	0.072	0.009	0.24	.	50 g
2	DH 0303	60.60	30.66	7.52	0.029	0.023	0.024	0.016	0.039	0.059	.	0.444	0.015	50 g
1	NCS HC25641	60.29	27.88	.	0.082	.	.	.	.	0.078	0.0069	0.41	.	50 g
1	NCS HC37606b	60.13	13.87	.	2.26	.	.	.	.	0.42	0.040	0.25	.	50 g
1	NCS HC25646	59.34	32.90	.	0.018	.	.	.	.	0.043	0.0034	0.24	.	50 g
2	DH 0301	59.06	30.16	9.91	0.015	0.028	0.035	0.019	0.033	0.050	.	0.471	0.015	50 g
1	58A CQ43001	58.49	15.96	.	1.84	.	.	.	.	0.32	0.026	.	.	50 g
1	NCS HC26620	54.97	19.15	.	0.40	.	.	.	.	0.060	0.011	0.24	.	50 g

the below continuation shows only the samples with more data

Number	As	B	Ca	Pb	Sb	Zr
<b>BS SiMn-1</b>	(0.010)	(0.014)	(0.05)	(0.0005)	(0.002)	(0.0007)
MHCX04	0.004	0.03	(0.010)	0.008	.	Zn:0.012
NCS HC28618	0.0099	.	.	0.0007	0.0004	.
NCS HC25605c	.	0.010	.	.	.	.
NCS HC25605a	.	0.0063	.	.	.	.
MHCX03	.	(0.009)	.	.	.	.
NCS HC25654	.	0.022	.	.	.	.
NCS HC28617	0.010	.	.	0.0005	0.0009	.
JSS 705-5	.	0.0231	.	.	.	.
NCS HC28616	0.015	.	.	0.0012	0.0025	.
DH 0302	.	.	.	.	.	0.008
NCS HC25641	.	0.021	.	.	.	.
NCS HC25646	.	0.048	.	.	.	.
DH 0301	.	0.0048	.	.	.	.
NCS HC26620	.	Al:0.015	.	.	Mo:(0.0009)	.

**17025** many more values on certificate  
Al: 0.010, Mo: 0.016, Sn: 0.008

SILICOZIRCONIUM

Number	Zr	Si	Fe	Al	C	Ca	Cr	Cu	Hf	Mn	N	Ni	P	S	Ti	Units
CRM VS F27/2	51.5	26.1	(12)	7.48	0.111	.	.	1.47	.	.	.	.	0.044	(0.001)	0.215	100 g
RM DH 3001	36.06	51.14	8.87	0.852	0.338	0.157	0.004	.	0.804	0.210	0.027	0.013	0.033	0.002	0.073	50 g

CRM BASIC SLAG

analysis listed in mass % 100 g units

Number	Al	B	Ca	Cr	F	Fe	K	Mg	Mn	Na	P	S	Si	Ti	V	Zn
IRSID 802-1	8.53	0.0245	30.62	0.0053	0.243	0.576	0.491	2.87	0.460	0.236	0.109	0.714	15.16	0.366	0.028	0.0025
ECRM 804-1	0.407	.	36.88	.	.	11.92	.	0.88	1.48	.	7.67	0.127	2.59	0.152	0.460	.

CRM FERROALLOY SLAG

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	S	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>
AMIS 0536	8.17	1.72	27.6	0.064	1.69	0.608	5.27	26.0	.	0.85	26.7	0.57	0.35
AMIS 0535	7.51	1.55	27.1	0.071	0.76	0.761	5.89	26.3	0.50	0.76	27.0	0.48	0.34
AMIS 0533	6.99	1.63	26.73	0.119	0.908	0.649	6.31	23.69	0.417	0.827	30.09	0.504	0.338

IRON MAKING SLAG

# = class, where 1 = CRM and 2 = RM

#	Number	CaO	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	C	Fe	FeO	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>	Units
1	NH 7-1-009	49.6	32.8	9.2	.	0.47	.	(0.19)	1.1	0.60	(0.14)	.	1.17	0.38	75 g
2	BS Slag 2	44.6	36.9	10.3	(0.2)	0.24	.	0.16	5.9	0.19	0.16	.	1.16	0.204	50 g
1	IRSID 803-1	43.28	36.38	13.19	.	0.613	.	.	4.05	0.713	.	0.270	0.767	0.502	100 g
1	IRSID 802-1 *	42.84	32.43	16.12	.	0.576	.	.	4.76	0.593	.	0.250	0.714	0.611	100 g
1	NH 7-1-008	42.1	39.1	8.4	.	0.30	.	(0.52)	6.1	0.73	(0.33)	.	(0.65)	0.30	75 g
1	NH 7-1-005	38.8	35.3	10.0	.	0.21	.	(0.19)	12.0	0.47	(0.13)	.	(0.85)	0.32	75 g
1	CAN SL-1	37.48	35.73	9.63	.	.	0.92	(0.51)	12.27	(0.86)	(0.39)	.	1.26	(0.38)	200 g
2	BS Slag 3	37.4	37.3	12.9	(0.038)	0.251	.	0.81	8.3	1.70	0.26	.	0.82	0.62	50 g
2	BS 100A	37.0	35.3	10.10	(0.2)	0.29	.	(0.5)	12.85	0.33	(0.2)	0.0034	1.77	0.48	100 g
1	NH 7-1-010	31.2	44.0	7.94	.	5.5	.	(0.59)	0.73	3.40	(0.18)	.	0.14	0.91	75 g
1	NH 7-1-007	31.2	39.0	6.2	.	0.55	.	(0.38)	18.9	0.78	(0.24)	.	(0.57)	0.39	75 g
2	BS Slag 1	30.4	36.6	18.2	(0.08)	0.28	.	0.36	11.0	1.08	(0.2)	.	1.78	0.40	50 g
1	NH 7-1-014	30.1	33.6	24.0	.	1.27	.	(0.07)	9.3	(0.3)	(0.07)	.	(0.02)	(0.07)	75 g
1	NH 7-1-011	29.4	21.9	24.0	.	1.9	.	(0.04)	17.5	1.97	(0.19)	.	(0.03)	(0.09)	75 g
1	NH 7-1-013	28.7	20.3	38.6	.	1.12	.	(0.03)	8.0	0.26	(0.04)	.	(0.03)	0.78	75 g
1	NH 7-1-015	28.0	(44.7)	14.5	.	1.7	.	(0.08)	9.2	0.58	(0.1)	.	(0.02)	(0.08)	75 g

\* Oxides Calculated, see previous chart "BASIC SLAG" for actual certified values

STEEL MAKING SLAG

# = class, where 1 = CRM and 2 = RM

CMSI, GBW, RH: 50 g units NH: 75 g units all others: 100 g units

#	Number	CaO	T.Ca	CaF <sub>2</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	F	Fe	FeO	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	s.P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
2	RH02	64.7	.	.	(12.9)	11.0	(0.03)	.	(0.2)	(0.2)	.	3.5	0.024	.	P:0.003	.	(0.9)	0.07	.
1	JK S11 *	.	60.0	.	26.8	2.85	0.17	(7.9)	.	(0.2)*	.	4.7	0.12	.	(<0.005)	.	0.30	0.95	(<0.01)
2	BS 101/3	54.4	.	.	18.8	1.42	.	.	10.9	.	0.005	3.0	5.0	0.027	0.74	.	0.18	(0.9)	.
1	CMSI 1745	.	37.64	1.41	14.91	1.78	.	.	13.38	12.33	.	9.28	1.86	.	1.02	.	0.097	0.42	.
2	BS 101/1	52.9	.	.	23.3	0.70	.	.	5.8	.	0.008	8.7	3.47	0.013	0.76	.	0.19	0.8	.
1	<b>BS 101/4</b>	52.5	.	.	16.7	0.86	.	.	(13.3)	.	0.007	4.8	4.79	0.018	0.81	.	0.15	1.16	.
1	IRSID 804-1	51.60	.	.	5.54	(0.79)	.	.	11.92	.	.	1.46	1.91	.	17.58	.	0.127	0.25	0.82
1	BCS 381	49.0	.	.	8.78	0.67	0.33	.	13.3	3.69	.	1.03	3.16	.	15.7	15.2	0.19	0.35	0.94
1	IRSID 805-1	48.92	.	.	6.63	0.616	.	.	14.87	.	.	1.86	2.05	.	16.20	.	0.092	0.342	0.918
2	BS 101/2	47.6	.	.	16.9	0.91	.	.	15.1	.	0.008	7.0	4.8	0.031	0.63	.	0.20	(0.8)	.
1	IRSID 806-1	46.13	.	.	11.72	0.901	.	.	17.89	.	.	3.02	5.94	.	2.25	.	0.110	0.504	0.514
2	BS 101/5	46.1	.	.	15.2	0.74	.	.	19.4	.	0.0044	5.0	5.7	(0.04)	0.71	.	0.12	1.2	.
1	ECRM 879-1	43.70	.	.	8.82	0.803	0.477	0.368	18.97	.	.	2.19	4.45	.	8.46	7.59	0.102	0.535	0.738
1	NH 143	42.90	.	.	4.88	(0.50)	0.97	.	14.53	8.62	.	5.29	2.84	.	16.71	.	0.083	0.15	.
1	NH 146	40.56	.	.	11.38	4.29	0.69	.	20.30	18.47	.	5.47	5.52	.	2.11	.	0.165	0.39	.
1	NH 151	34.83	.	.	15.97	2.06	0.65	.	14.94	0.14	.	5.05	8.44	.	7.92	.	0.079	0.53	.
1	NH 156	34.66	.	.	15.20	7.80	0.75	.	16.35	0.14	.	4.66	3.81	.	5.98	.	0.111	0.36	.
1	CMSI 1744	26.73	.	.	8.91	3.92	.	.	34.33	36.55	.	12.15	2.01	.	0.87	.	0.107	0.32	.
1	VS W4/4	25.5	.	.	16.7	3.62	.	.	23.2	25.5	.	18.3	4.17	.	P: 0.259	.	0.037	1.02	.
1	NH 150	21.77	.	.	15.69	3.23	1.74	.	24.23	27.30	.	(14.46)	8.16	.	0.62	.	0.044	0.15	.
1	NH 152	21.95	.	.	15.91	2.60	28.67	.	14.40	12.79	.	6.17	4.85	.	(0.12)	.	0.028	0.37	.
1	NH 145	20.85	.	.	22.43	2.39	0.99	.	27.97	30.46	.	2.71	9.26	.	2.05	.	0.089	0.56	.
1	NH 149	9.85	.	.	8.42	3.36	53.81	.	14.09	8.12	.	2.89	3.74	.	(0.03)	.	0.040	0.22	.
1	SARM 77	3.64	.	.	26.8	27.5	12.5	.	5.31T	.	.	22.99	.	.	.	.	0.32T	.	.
1	NH 154	(1.15)	.	.	48.67	3.68	1.54	.	10.65	13.36	.	2.44	(28.0)	.	(0.03)	.	0.074	0.27	.

\* JK S11 lists total Fe as FeO

17025



## CONVERTER SLAG

# = class, where 1 = CRM and 2 = RM

#	Number	CaO	Ca	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe	K <sub>2</sub> O	MgO	Mn	MnO	Nb <sub>2</sub> O <sub>5</sub>	P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
2	DH 3911	50.50	.	8.58	0.933	18.51	.	1.54	4.42	.	0.055	2.65	0.160	0.350	0.590
2	DH 3908	47.13	.	12.70	1.096	18.96	0.008	2.513	4.31	.	0.072	1.488	0.110	0.558	0.273
1	NCS HC28810	.	33.35	14.45	1.76	16.52	.	7.10	.	2.78	.	1.60	0.120	1.25	.
1	NCS HC28809	.	32.65	15.40	4.38	13.50	.	7.75	.	2.30	.	1.67	0.195	1.02	.

Number	Cr	CuO	SrO	ZnO	Units
DH 3911	0.154	0.007	.	0.003	100 g
DH 3908	0.331	.	0.028	.	100 g
NCS HC28810	.	.	.	.	80 g
NCS HC28809	.	.	.	.	80 g

## CRM ELECTRIC FURNACE SLAG

50 g units

Number	Ca(tot)	Al <sub>2</sub> O <sub>3</sub>	F	FeO	T.Fe	MgO	MnO	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	TiO <sub>2</sub>
CMSI 1757	28.87	8.72	0.82	1.89	2.26	15.66	2.39	0.030	0.25	24.80	0.25
CMSI 1756	16.22	4.00	0.17	(15.25)	13.11	21.18	13.16	0.125	0.036	21.37	0.18

## CRM FLUORINE SLAG

100 g units

Number	F	T.CaF <sub>2</sub>	Ca	CaO	Al <sub>2</sub> O <sub>3</sub>	C	FeO	MgO	MnO	P	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
JK S10	34.4	70.7	50.8	20.3	0.54	0.022	0.10	0.30	0.03	0.002	7.8	0.05	(<0.01)
IMZ EZP 1	31.62	.	36.76	.	24.85	.	.	(0.85)	.	.	2.61	.	.
IMZ EZP 3	15.78	.	39.53	.	19.13	.	.	8.44	.	.	1.68	.	.
IMZ EZP 2	(0.89)	.	24.03	.	41.38	.	.	16.89	.	.	5.81	.	.

## MANGANESE SLAG

analysis listed in mass %

DH: RM, 100 g units

VS: CRM, 150 g units

Number	Mn	Mn <sub>3</sub> O <sub>4</sub>	Al <sub>2</sub> O <sub>3</sub>	C	CaO	CuO	Fe	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	P	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	ZnO
VS SH11/1	48.0	.	.	.	.	.	.	.	.	.	.	0.014	.	.	.
DH 7403	4.93	.	19.84	.	15.95	.	0.088	.	1.30	12.34	.	0.002	0.818	43.23	.
DH 7404	2.66	.	24.61	.	26.16	.	0.086	.	0.630	7.04	.	0.003	0.959	37.39	.
DH 7402	.	0.113	5.99	11.92	0.405	7.02	.	3.96	0.164	0.118	.	14.03	0.114	11.01	45.16

Number	Ba	CO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	SnO <sub>2</sub>	SrO	TiO <sub>2</sub>	Y <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	-H <sub>2</sub> O@900°C
VS SH11/1	.	.	.	.	.	.	.	.	.	.
DH 7403	(0.475)	0.032	0.007	0.433	.	0.083	0.100	(0.009)	0.039	0.062
DH 7404	0.925	.	0.007	(0.229)	.	0.109	0.164	0.014	0.035	.
DH 7402	.	.	0.086	0.133	0.386	.	0.274	.	0.024	0.077

**CRM PHOSPHATE SLAG**

Number	total P <sub>2</sub> O <sub>5</sub>	citric acid sol. P <sub>2</sub> O <sub>5</sub>	CaO	SiO <sub>2</sub>	Units
BAM 826-1	14.65	10.73	46.48	8.96	100 g
BAM 827-1	20.70	18.79	47.38	6.21	100 g

**CRM SLAG**

analysis listed in mass %

Number	Al <sub>2</sub> O <sub>3</sub>	C	Ca	CaO	F	Fe	FeO	K <sub>2</sub> O	MgO	Mn	MnO	Na <sub>2</sub> O	P	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	Units
NCS HC18809	21.94	.	35.21	.	.	0.30	.	.	6.55	.	0.18	.	.	0.024	0.69	16.50	1.03	.	100 g
NCS HC28808	18.05	.	.	35.71	.	0.48	0.55	0.42	10.92	.	0.542	0.36	.	0.027	0.885	29.62	0.753	.	50 g
NCS HC28806	16.92	.	.	37.53	.	0.211	0.35	0.46	10.80	.	0.414	0.39	.	0.013	1.15	30.36	0.762	.	50 g
NCS HC18807	16.48	.	.	35.77	.	1.10	.	.	8.77	.	0.74	.	.	0.009	0.90	33.04	0.73	.	100 g
NCS HC18806	14.11	.	.	38.84	.	0.60	.	.	8.45	.	0.30	.	.	0.008	1.13	32.75	2.63	.	100 g
NCS HC25801	4.91	.	.	7.79	.	1.77	.	.	3.99	35.31	.	.	0.0056	.	0.66	33.47	.	.	50 g
NCS HC28807	3.67	.	32.32	.	0.76	13.54	10.44	0.033	7.27	.	4.06	0.057	.	1.72	0.134	14.54	1.13	.	50 g
NCS HC18808	1.25	.	24.10	.	.	25.55	.	.	11.66	.	3.34	.	.	2.00	0.13	13.44	2.22	.	100 g
NCS HC15804	.	0.014	.	.	.	0.22	.	.	.	44.42	.	.	0.0032	.	0.32	25.16	.	.	100 g

**CRM TIN SLAG**

Number	Sn	Al <sub>2</sub> O <sub>3</sub>	CaO	FeO	SiO <sub>2</sub>	Units
NCS HC35801	11.96	7.36	4.12	46.18	19.61	70 g
NCS HC35802	2.32	9.32	19.76	22.22	37.49	70 g

**CRM TITANIUM SLAG**

100 g units

Number	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	T.Fe	MgO	MnO	S	SiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>
NCS HC19815	94.69	2.62	0.287	.	1.02	2.67	1.21	0.166	1.92	.
DSZU 123.23-95	85.21	3.40	0.76	1.12	3.29	0.60	0.94	0.16	2.50	0.30
DSZU 123.24-01	85.19	3.28	.	0.76	3.69	.	0.85	0.12	2.88	0.31
NCS HC19814	84.94	3.04	1.83	.	1.08	7.27	0.74	0.247	4.13	.
NCS HC19813	77.66	2.64	1.52	.	6.43	5.28	1.08	0.118	5.50	.

**RM TUNDISH SLAG**

typical analysis listed in mass %

100 g units

Number	CaO	SiO <sub>2</sub>	MgO	Al <sub>2</sub> O <sub>3</sub>	CO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MnO	Mn <sub>3</sub> O <sub>4</sub>	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	S	SO <sub>3</sub>	TiO <sub>2</sub>	-H <sub>2</sub> O 900°C
DH 5903	61.81	21.33	10.07	3.70	0.016	1.36	0.599	.	0.046	0.174	0.151	0.194	.	0.183	0.023
DH 5904	39.47	30.68	14.53	12.37	.	0.591	0.622	.	0.076	.	0.019	.	.	0.038	.
DH 6604	1.609	24.75	64.45	1.884	0.35	4.62	0.089	.	0.098	0.516	0.084	.	0.026	0.141	1.02
DH 6606	1.37	27.46	62.63	1.30	0.16	4.93	0.070	0.093	.	.	0.055	0.022	.	0.103	1.15
DH 6605	.	.	.	.	0.40179	.	.	.	.	0.347	.	.	.	.	1.15451

Number	BaO	C Tot	Cr <sub>2</sub> O <sub>3</sub>	F	NiO	SrO
DH 5903	.	.	.	0.046	.	.
DH 5904	0.180	.	.	.	.	0.025
DH 6604	.	0.471	0.255	.	0.165	.
DH 6606	.	.	.	.	.	.
DH 6605	.	.	.	.	.	.

**VACUUM SLAG**

NCS: CRM, 80 g units

DH: RM, 100 g units

Number	CaO	Al <sub>2</sub> O <sub>3</sub>	Cr	Cr <sub>2</sub> O <sub>3</sub>	Fe	K <sub>2</sub> O	MgO	Mn	MnO	Nb <sub>2</sub> O <sub>5</sub>	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	SrO	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	ZrO <sub>2</sub>	Other
DH 5119	53.43	17.04	.	0.075	2.54	0.012	10.84	2.48	.	0.270	0.102	0.188	8.30	0.033	1.37	0.053	0.240	
DH 5120	52.90	20.33	.	0.039	1.55	0.011	11.68	1.27	.	0.202	0.039	0.281	8.13	0.032	1.28	0.016	0.230	
DH 5121	51.14	23.56	0.039	.	1.27	0.011	11.98	0.769	.	0.109	0.028	0.369	7.63	0.031	0.869	0.012	0.232	
NCS HC19812	3.19	2.05	.	0.94	32.16	.	1.86	.	9.05	.	0.064	0.066	18.26	.	9.15	15.79	.	Met.Fe: 0.24
NCS HC19810	2.04	1.25	.	0.93	31.26	.	1.9	.	10.67	.	0.046	0.052	18.25	.	10.02	17.2	.	Met.Fe: 0.22

**CRM VANADIUM SLAG**

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	Fe	MgO	MnO	P	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	Units
VS SH9/3	1.76	1.61	3.32	28.9	3.53	9.73	0.015	16.63	7.39	22.2	150 g

**CRM SLUDGE**

analysis listed in mg/kg except % which is mass %

SRM 2781: 40 g

SRM 2782: 70 g

all others: 40 g units

Number	Type	Ag	Al%	As	Ba	Be	Bi	Ca%	Cd	Ce	Cl	Co	Cr	Cu	Fe%	Ga	Hg	In
SRM 2782	industrial	30.6	1.37	166	254	.	.	0.67	4.17	1240	.	66.3	109	2594	26.9	35	1.10	238
BCR 146R	industrial	.	.	.	.	.	.	.	18.8	.	.	7.39	196	838	.	.	8.62	.
BCR 145R	mixed	.	.	.	.	.	.	.	3.50	.	.	5.61	(313)	696	.	.	2.01	.
SRM 2781	domestic	98	1.6	7.82	.	.	.	3.9	12.78	.	.	.	202	627.4	2.8	.	3.64	.
IRNT WT-L	water treatment	11.9	3.03	8.87	781	3.73	3.73	8.80	1.97	.	.	6.77	79.0	136	1.70	.	4.25	.
IRNT WT-M	water treatment	40.4	2.61	9.84	787	72	.	5.15	11.9	.	.	8.20	939	959	1.74	.	14.3	.
BCR 143R	amended soil	.	.	.	.	.	.	.	71.8	.	.	12.3	(577)	130.6	.	.	1.10	.

continued SRM 2782 also contains (2.1%) Carbon and trace informational values for Au, Eu, Hf, Rb, Sc, Sm, Ta, Tb, Th, U, Y, and Yb.

Number	K%	La	Li	Mg%	Mn	Mo	N%	Na%	Ni	P%	Pb	S%	Sb	Se	Se	Sn	Sr	Ti	V	Zn
SRM 2782	0.32	58.1	(5.0)	0.26	(300)	10.07	.	1.30	154.1	0.50	574	(0.2)	(2.0)	0.44	(20.3)	.	.	0.0880	80	1254
BCR 146R	.	.	.	.	324	.	.	.	69.7	.	609	.	.	.	.	.	.	.	.	3061
BCR 145R	.	.	.	.	156	.	.	.	247	.	286	.	.	.	.	.	.	.	.	2122
SRM 2781	0.49	.	.	0.59	.	46.7	4.78	0.21	80.2	2.42	202.1	.	.	16.0	5.1	.	.	0.32	.	1273
IRNT WT-L	(0.695)	.	.	0.781	390	.	.	(0.414)	32.0	0.881	122	1.02	17.8	.	.	.	170	.	41.3	1310
IRNT WT-M	0.589	.	.	0.613	942	.	.	(0.303)	240	1.58	841	1.03	12.7	.	.	20.3	160	.	34.2	3080
BCR 143R	.	.	.	.	(904)	.	.	.	299	.	179.7	.	.	(0.6)	.	.	.	.	.	1055

**CRM RED SLURRY**

analysis listed in mass %

50 g units, DSZU individually ShK SET ONLY

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	SiO <sub>2</sub>	TiO <sub>2</sub>	
DSZU 123.41-03	12.7	5.96	57.6	1.12	6.18	4.25	available individually
ShK411-01	12.7	5.67	58.7	.	4.57	4.85	available in SET/6 ONLY
ShK412-01	13.3	7.0	57.3	.	4.67	4.32	available in SET/6 ONLY
ShK413-01	11.2	11.8	35.6	.	22.3	2.09	available in SET/6 ONLY
ShK414-01	11.4	3.35	67.2	.	3.44	3.27	available in SET/6 ONLY
ShK415-01	17.3	4.04	44.4	.	10.5	7.11	available in SET/6 ONLY
ShK416-01	15.1	5.13	52.1	.	7.35	5.92	available in SET/6 ONLY

**RM SODA ASH**

analysis listed in mass %

100 g units

Number	Na <sub>2</sub> CO <sub>3</sub>	NaCl	Fe <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
BCS 526	99.74	0.126	0.0005	0.008

**CRM SURFACE AREA**data listed in m<sup>2</sup>/g

Number	Multipoint +/-	Single Point +/-	Units
SRM 2206	10.99 0.68	10.73 0.68	5 g granulated glass
SRM 1900	2.85 0.09	2.79 0.07	4 g silicon nitride powder

**CRM TENSILE CREEP**

Number	Creep Rate at 400 h	Time to 2% Strain	Time to 4% Strain	Units
BCR 425	72 x 10 <sup>-6</sup> h <sup>-1</sup> ± 5	278 h ± 16	557 h ± 30	3 rods 14 mm Ø x 150 mm

**CRM TENSILE STRENGTH and HARDNESS**

data shows estimates of (material, measurement) uncertainty

Number	ksi Tensile Strength	ksi Yield Strength	% Total Elongation	% Reduction	Hardness	Material	Units
BS TRM-2A	125.6 (0.7, 2.4)	116.2 (0.9, 2.7)	20.1 (0.6, 1.8)	57.7 (0.9, 2.7)	HRB 103 (2, 6)	600 nickel	rod 25 mm Ø x 158 mm
BS TRM-3	98.2 (0.6, 5.5)	44.7 (0.3, 3.1)	52.0 (1.2, 10.8)	57.1 (1.9, 17.3)	HRB 86.3 (0.7, 6.3)	304 steel	sheet 30 cm x 30 cm
BS TRM-1	93.3 (0.3, 2.1)	89.3 (0.5, 3.2)	15.6 (0.2, 1.6)	55.0 (0.4, 2.7)	.	1018 steel	rod 25 mm Ø x 158 mm
BS TRM-1A	83.9 (0.3, 1.7)	70.2 (0.2, 1.5)	18.8 (0.3, 1.8)	56.9 (0.5, 3.2)	.	1018 steel	rod 25 mm Ø x 158 mm
BS TRM-4	36.0 (0.1, 0.8)	28.4 (0.1, 0.7)	11.4 (0.1, 1.1)	(37.0) - -	HR15T 71.9 (0.6, 5.4)	5056 aluminum	sheet 30 cm x 30 cm

**CRM TENSILE STRENGTH**

Number	0.2% Proof Stress (MPa)	0.5% Proof Stress (MPa)	Tensile Strength (MPa)	Elongation Fracture (A in %)	Reduction in Area at Fracture (Z in %)	Units
BCR 661B	300 ± 7	318 ± 7	750 ± 13	40.9 ± 0.9	60 ± 4	1 rod 14 mm Ø x 500 mm

**CRM BORON CARBIDE**

analysis listed in mass %

analysis listed in mg/kg

100 g

Number	Tot.B	Sol.B	B Isotopic Abundance	C	N	O	Al	Ca	Co	Cr	Cu	Fe	Mn	Na	Ni	Si	Ti	Zr
BAM ED102	78.47	0.116	19.907	21.01	0.209	0.10	157	97	0.39	5.6	2.2	686	10.4	63	8.0	268	96	48.9

**CRM CHROMIUM CARBIDE**

analysis listed in mass %

Number	C	Cr	S	Si	Units
NCS HC37619	12.53	83.83	0.008	0.22	50 g

**CRM SILICON CARBIDE**

analysis listed in mass %

Number	SiC	Free C	Si	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	MgO	Units
NCS DC93028	97.87	0.48	0.18	0.55	0.10	0.055	0.39	0.008	50 g
NCS DC93026	84.09	1.71	1.45	6.15	1.41	0.17	0.86	0.082	50 g
NCS DC93027	90.86	3.48	0.24	2.00	0.77	0.47	1.12	0.039	50 g

**CRM TUNGSTEN CARBIDE**

analysis listed in mass %

SRM 276b: 75 g units

all others: 100 g units

Number	Grade	C	Free C	Co	Fe	Mo	Nb	Ni	Ta	Ti
ECRM 783-1	W94-C6	6.188	(0.04)	.	0.0022	.	.	.	.	.
SRM 889	W75-Co9-Ta5-Ti4	(6.0)	.	9.50	(<0.05)	(<0.05)	(<0.05)	(<0.05)	4.60	4.03
SRM 887	W83-Co10	(5.5)	.	10.35	(<0.05)	(<0.05)	(<0.05)	(<0.01)	(<0.01)	(<0.05)
SRM 888	W64-Co25-Ta-5	(4.6)	.	24.7	(<0.05)	(<0.05)	(<0.05)	(<0.05)	4.77	(0.04)



**CRM URBAN AEROSOLS** analysis listed in mass %

Number	Al	Ba	Ca	Cl	Cu	Fe	K	Mg	Mn	Na	P	Pb	S	Si	Sr	Ti	Zn	
NIES 28	5.04	0.0874	6.69	(0.807)	0.0104	2.92	1.37	1.40	0.0686	0.796	(0.145)	0.0403	(3.91)	(14.9)	0.0469	0.292	0.114	
analysis listed in mg/kg																		
Number	As	Be	Cd	Co	Cr	La	Mo	Ni	Rb	Sb	Sc	Se	Sn	Th	U	V	Y	Units
NIES 28	90.2	(5.09)	5.60	(22.0)	(65.6)	(32.7)	(28.4)	63.8	(64.1)	(20.1)	(10.7)	(14.4)	(21.5)	(11.1)	4.33	73.2	(21.9)	1.5 g

**CRM URBAN PARTICULATE MATTER** analysis listed in mass % Org = organic Elem = Elemental powder 2 g

Number	Al	C	C.Org	C.Elem	Ca	Cl	Cu	Fe	K	Mg	Mn	Na	Pb	S	Si	Ti	Zn				
SRM 1648a	3.43	(12.7)	(10.5)	(2.3)	5.84	0.4543	0.0610	3.92	1.056	0.813	0.0790	0.4240	0.655	5.51	12.8	0.4021	0.4800				
analysis listed in mg/kg																					
Number	Ag	As	B	Br	Cd	Ce	Co	Cr	Cs	Hf	La	Ni	Rb	Sb	Sc	Se	Sm	Sr	Th	V	W
SRM 1648a	6.0	115.5	161	502	73.7	54.6	17.93	402	3.4	(5.2)	39	81.1	51.0	45.4	(6-120)	28.4	4.3	215	(7-107)	127	4.6

**CRM VANADIUM NITROGEN ALLOY** analysis listed in mass %

Number	V	N	C	O	Al	Mn	P	S	Si	As	Ca	Cr	Fe	Units
NCS HC28641	78.04	14.13	5.71	(0.6)	0.26	0.0065	0.012	0.0013	0.26	0.0014	0.064	0.082	0.65	25 g
NCS HC28642	77.73	16.64	3.39	(0.6)	0.24	0.0050	0.010	0.0016	0.23	0.0012	0.044	0.082	0.57	25 g
NCS HC93630	77.73	14.57	3.96	.	0.164	0.0082	0.0075	0.0014	0.061	.	.	.	.	25 g
NCS HC28639	77.58	9.44	9.22	(0.5)	0.24	0.0091	0.147	0.0025	0.40	0.0074	0.066	0.0032	1.95	25 g
NCS HC28640	76.73	13.31	6.01	(0.7)	0.28	0.0045	0.142	0.0019	0.40	0.012	0.10	0.019	1.76	25 g
Y 19606	76.57	15.55	3.07	2.26	0.043	0.076	0.011	0.0099	0.24	.	.	.	.	100 g
Y 19607	76.56	15.50	2.93	2.60	0.050	0.050	0.011	0.018	0.23	.	.	.	.	100 g

**CRM ZIRCON CONCENTRATE** \* SARM 62 lists Total Fe as Fe<sub>2</sub>O<sub>3</sub> and Ti as TiO<sub>2</sub> DSU: 20 or 50 g others: 100 g

Number	ZrO <sub>2</sub>	ZrO <sub>2</sub> +HfO <sub>2</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	HfO <sub>2</sub>	MgO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SnO <sub>2</sub>	TiO <sub>2</sub>	ThO <sub>2</sub>	U <sub>3</sub> O <sub>8</sub>	LOI
DSZU 123.47-03	.	66.1	.	0.75	.	0.074	.	.	.	0.099	.	.	0.22	.	.	.
SARM 62 *	64.2	.	32.8	0.88	(0.11)	0.07	.	1.31	(0.04)	.	0.12	.	0.13	0.0158	0.0354	.
BCS 204A	.	53.8	37.6	0.74	0.15	0.18	0.017	.	0.012	0.014	0.77	1.69	2.22	.	.	0.50

**CRM ZIRCONIA - Yttrium Stabilized Zirconium Oxide**

Number	Al	Ca	Fe	Hf	Mg	P	Si	Th	Ti	U	Y	monoclinic ZrO <sub>2</sub>	Units
ERM-ED105	0.0660	0.0242	0.0095	1.535	0.00129	(<0.0075)	0.0195	0.0112	0.0497	0.0292	6.11	(1.94)	powder 47 g

**CRM ZIRCONIA SET** available in SET/4 only 50 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	HfO <sub>2</sub>	K <sub>2</sub> O	MgO	Na <sub>2</sub> O	Nb <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	LOI
JCRM R051	.	0.0017	0.0017	1.96	.	0.0004	0.015	.	(0.005)	(0.0005)	0.71
JCRM R052	.	0.019	(0.0004)	1.81	0.0013	0.0042	0.021	.	0.019	0.0012	0.25
JCRM R053	.	0.021	0.030	1.67	(0.0007)	0.0020	0.028	0.054	0.036	0.127	0.65
JCRM R054	0.136	0.535	0.132	1.60	(0.0003)	0.208	0.0027	0.427	0.300	0.138	0.15