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**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	Sobek Moderate	Modified Slight	Modified 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**

NIOH: 1 filter, analysis in µg, not for xrf SRM: 2 loaded + 2 blank filters, analysis in ng, good for nondestructive analysis

Number	Al	As	B	Ba	Be	Cd	Co	Cr	Cu	Fe	Mg	Mn	Mo	Na	Ni
NIOH A3	225	7.65	(38)	37.4	1.48	15.0	37.3	47.8	75.0	521	74.5	150	37.6	.	60.3
NIOH B3	110	3.76	(18)	18.4	0.73	7.35	18.3	23.5	36.9	256	36.6	73.6	15.9	.	29.7
SRM 2783 loaded *	23210	11.8	.	335	.	.	7.7	135	404	26500	8620	320	.	1860	68
SRM 2783 blank	(30)	.	.	(0.4)	.	.	(0.04)	(70)	.	.	.	.	.	(15)	(8)

Number	Pb	Pt	S	Sb	Sn	Sr	Ti	Tl	V	W	Zn	Zr
NIOH A3	37.0	35.2	.	37.5	37.7	35.2	37.0	2.61	15.5	(38)	226	37.3
NIOH B3	18.2	17.3	.	18.4	18.6	17.3	17.8	1.28	7.61	(19)	111	18.3
SRM 2783 loaded *	317	.	(1050)	71.8	.	.	1490	.	48.5	(5.0)	1790	.
SRM 2783 blank	(0.4)	.	(100)	.	.	.	.	.	.	.	(50)	.

\* SRM 2783 loaded also has certified Ca: 13200, K: 5280; informational Ce: 23.4, Rb: 24.0, Sc: 3.54, Si: 58600, Sm: 2.04, Th: 3.23, and U: 1.234.

**RM ASH**

typical analysis listed in mass %

Number	Type of Ash	pH	Al	Ca	Cr	Cu	Fe	K	Mg	Na	Ni	Ti	Zn
RT 001	Power Plant	10.98	.	.	0.00291	0.00407	(1.6300)	.	.	.	0.00198	(0.0465)	.
RT 012	Industrial	2.86	0.2160	0.2110	16.2000	0.3020	2.8700	7.3300	0.1510	2.9200	1.3300	.	0.0635
RT 019	Water Incenerator	6.64	(3.2800)	(5.1949)	0.00552	0.0279	(1.2700)	(4.9300)	0.6310	(5.0500)	0.00222	(0.2870)	2.2400

continued analysis listed in mg/kg

Number	As	Ag	B	Ba	Be	Cd	Co	Hg	Mn	Mo	Pb	Sb	Se	Sn	Sr	Tl	V	Units
RT 001	.	.	.	428	.	.	.	(306)	.	.	.	.	.	(1010)	.	.	.	100 g
RT 012	54.8	.	18.7	362	(22.4)	202	(26)	120	(480)	(26)	4540	(223)	4.11	(410)	(173)	(42)	(51.8)	100 g
RT 019	77.2	7.35	(336)	352	(2)	432	(26)	(2)	(480)	(26)	4540	(223)	4.11	(410)	(173)	(42)	28.9	50 g

**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	0.020	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 mg/kg		CaCO <sub>3</sub> content is 99.79%							informational values										100 g units			
Number	Ba	Cr	Cu	Fe	Mg	Mn	Na	Sr	Zn	Al	B	Cd	Co	Ga	K	La	Ni	Pb	Si	Sn	Ti	Zr
BAM RS 3	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

**CEMENT**

# = 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	F <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	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
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	NCS DC62103d	65.97	.	22.05	4.65	2.90	0.67	1.97	0.11	.	0.43	.	0.38	0.64	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	SRM 1889a	65.34	.	20.66	3.89	1.937	0.605	0.814	0.195	0.110	2.69	0.042	0.227	(3.28)	4 x 5 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	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	0.23	0.16	.	100 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
2	JCA 211R	64.37	.	20.77	5.67	2.65	0.44	1.16	0.22	0.10	2.13	.	0.31	1.86	30 g
2	CCRL 170	64.32	.	21.71	3.77	2.48	0.628	1.44	0.092	0.074	2.75	.	0.17	2.78	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
2	CCRL 171	63.60	.	21.29	4.16	4.53	0.700	2.06	0.065	0.064	2.24	.	0.22	1.02	30 g
2	CCRL 169	63.47	.	22.07	3.17	3.70	0.429	2.00	0.201	0.135	2.15	.	0.23	2.30	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
1	NCS DC62101b	62.76	.	20.88	4.48	2.64	0.66	2.05	0.11	.	2.98	.	0.32	3.00	20 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	SRM 1885a	62.39	.	20.909	4.026	1.929	0.206	4.033	1.068	0.1220	2.830	0.638	0.195	(1.68)	4 x 5 g
1	GBW 03201a	62.34	.	20.56	5.02	3.16	1.15	1.40	0.18	.	2.29	.	0.21	3.39	25 g
2	CCRL 168	62.28	.	19.91	5.11	2.14	1.227	3.88	0.226	0.191	3.48	.	0.20	0.86	30 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
2	CCRL 167	61.64	.	19.29	5.92	2.44	1.068	3.11	0.355	0.240	4.39	.	0.24	0.84	30 g
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 5 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	SRM 1887a	60.90	.	18.637	6.202	2.861	1.100	2.835	0.4778	0.306	4.622	0.322	0.2658	(1.43)	4 x 5 g
1	NCS DC62102a	58.67	.	21.19	5.31	3.17	0.91	2.91	0.14	.	2.33	.	0.32	4.50	20 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	SRM 1881a	57.58	.	22.26	7.060	3.09	1.228	2.981	0.199	0.1459	3.366	0.036	0.3663	(1.59)	4 x 5 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 CRM103	54.71	.	26.86	7.72	1.77	0.77	4.42	0.33	0.09	2.72	0.070	0.371	0.35	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	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	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	NCS DC62105d	44.09	.	12.31	2.79	1.81	0.48	1.15	0.07	.	0.16	.	0.23	36.70	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	NCS DC62104a	38.70	.	14.26	3.70	2.45	0.70	1.61	0.28	.	0.39	.	0.24	37.40	25 g
1	DH X0202 *	38.01	.	4.08	39.31	15.83	0.111	0.487	0.033	0.043	0.105	.	1.81	.	100 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	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	Unignited SO <sub>3</sub>	V <sub>2</sub> O <sub>5</sub>	ZnO	Ins. Res.
BCS 354	.	.	.	.	.	.	.	.	0.058	.	.	.	.	.
SRM 1886a	.	.	.	(0.0042)	0.0024	(0.02)	.	.	0.0073	.	.	.	(0.001)	(0.23)
JCA RM 611	.	.	.	.	.	.	.	0.06	.	.	.	.	.	.
NCS DC62103d	.	.	.	.	.	.	.	.	.	.	.	.	.	0.13
TL 1Ca	.	.	(0.83)	.	.	.	.	.	.	.	.	.	.	(0.21)
NCS DC62117	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SRM 1889a	.	.	.	(0.0019)	0.0072	(0.05)	.	.	0.2588	.	.	.	0.0048	(0.66)
JCA CRM-1	.	.	.	.	.	.	0.06	.	.	.	.	.	.	.
SRM 634a	.	.	(1.86)	.	(0.0114)	.	.	.	(0.0229)	.	.	.	(0.0222)	(0.21)
BCS 353	.	.	.	.	.	.	.	.	0.23	.	.	.	.	.
FLX CRM100	.	.	.	(0.09)	0.009	.	.	.	0.066	.	.	.	0.051	.
JCA 211R	.	.	.	0.009	.	.	0.07	.	.	.	.	.	.	0.08
CCRL 170	.	1.88	1.38	0.003	0.008	.	.	.	0.045	.	.	.	0.008	0.56
SRM 1880b	.	.	(2.227)	0.01830	0.01927	(0.0539)	.	.	0.1981	(0.0131)	.	.	(0.01054)	(0.487)
CCRL 171	.	0.88	0.88	0.008	0.011	.	.	.	0.050	.	.	.	0.016	0.21
CCRL 169	.	1.66	1.36	0.005	0.013	.	.	.	0.111	.	.	.	0.110	0.28
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	.	.	.	.	.	.
NCS DC62101b	.	.	.	.	.	.	.	.	.	.	.	.	.	0.75
CCRL 173	.	0.6	1.65	0.023	0.009	.	.	.	0.060	.	.	.	0.024	0.36
CCRL 174	.	.	1.04	0.005	0.006	.	.	.	0.073	.	.	.	0.014	0.26
SRM 1885a	.	.	.	(0.0040)	0.0195	(0.13)	.	.	0.0478	.	.	.	(0.0029)	(0.22)
GBW 03201a	.	.	.	.	.	.	.	.	.	.	.	.	.	0.98
CCRL 168	.	.	0.70	0.004	0.011	.	.	.	0.089	.	.	.	0.014	0.33
CCRL 172	.	1.38	1.04	0.008	0.009	.	.	.	0.088	.	.	.	0.004	0.44
CCRL 167	.	.	0.43	0.0006	0.012	.	.	.	0.098	.	.	.	0.013	0.27
SRM 1884b	.	.	(0.418)	(0.0065)	0.00791	(0.0394)	.	.	0.0750	.	.	.	.	(0.159)
NCS DC62118	.	.	.	.	.	.	.	.	.	.	.	.	.	1.18
SRM 1887a	.	.	.	(0.0104)	(0.009)	(0.09)	.	.	0.1186	.	.	.	0.0667	(0.13)
NCS DC62102a	.	.	.	.	.	.	.	.	.	.	.	.	.	0.68
NCS DC62116	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SRM 1881a	.	.	.	(0.013)	0.0588	(0.09)	.	.	0.1042	.	.	.	0.0489	(5.2)
JCA CRM-2	.	.	.	.	.	.	0.15	.	.	(0.32)	(1.91)	.	.	.
FLX CRM103	.	.	.	(0.04)	0.007	.	.	.	0.169	(0.33)	.	SO <sub>4</sub> :2.26	0.014	.
TL 201C	.	.	.	0.06 Cl-	.	.	.	.	.	0.31 S <sub>2</sub> -	.	.	.	.
TL 200Ca	.	.	(0.34)	.	.	.	.	.	.	.	.	.	.	(17.42)
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> -	.	.	.	.
NCS DC62105d	.	.	.	.	.	.	.	.	.	.	.	.	.	.
SRM 1882a	.	.	.	.	(0.113)	.	.	.	(0.060)	.	.	.	(0.004)	.
NCS DC62104a	.	.	.	.	.	.	.	.	.	.	.	.	.	.
DH X0202 *	.	.	.	(<0.01)	.	0.009	.	.	0.039	.	.	.	.	* more certified trace data listed in database
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 601A**

available in set/15 only each unit: powder 20 g

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	MnO	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	SrO	TiO <sub>2</sub>
XRF 3	66.32	20.67	4.57	2.43	0.45	1.53	0.08	0.30	0.13	3.18	0.049	0.28
XRF 6	66.23	20.71	5.02	2.70	0.23	1.81	0.19	0.26	0.05	2.61	0.035	0.24
XRF 4	66.17	20.71	4.73	2.80	0.54	1.37	0.05	0.24	0.40	2.64	0.036	0.26
XRF 5	65.99	20.52	5.07	2.99	0.46	0.94	0.28	0.32	0.10	3.02	0.027	0.25
XRF 2	65.17	21.31	5.29	2.93	0.50	1.77	0.21	0.38	0.11	1.91	0.045	0.31
XRF 9	64.75	23.82	3.40	4.18	0.39	0.78	0.11	0.24	0.06	1.94	0.024	0.16
XRF 7	64.27	22.76	4.26	4.11	0.35	1.03	0.06	0.17	0.06	2.42	0.030	0.25
XRF 8	64.15	23.23	3.82	4.02	0.54	1.52	0.21	0.10	0.19	1.93	0.038	0.27
XRF 1	64.14	22.23	5.35	3.05	0.40	1.75	0.15	0.29	0.06	2.33	0.037	0.33
XRF 10	61.67	22.99	6.29	2.39	0.62	2.71	0.14	0.17	0.13	.	0.043	0.52
XRF 11	59.15	24.43	7.37	2.26	0.51	2.63	0.16	0.26	0.23	.	0.046	0.55
XRF 13	55.36	26.62	9.22	2.02	0.41	2.98	0.61	0.30	0.06	.	0.037	0.41
XRF 14	55.15	25.74	8.70	2.03	0.31	3.98	0.28	0.26	0.04	.	0.051	0.66
XRF 12	54.90	26.34	8.95	1.82	0.44	3.33	0.18	0.23	0.17	.	0.051	0.73
XRF 15	49.28	29.29	10.70	1.32	0.42	5.12	0.48	0.25	0.06	.	0.071	0.64

**CRM CHLORINE and FLUORINE in CEMENT**

Number	Description	CaF <sub>2</sub>	F	Cl-	Units
NCS DC62121	Cement Raw Meal	.	.	0.029	20 g
NCS DC62122	Cement	.	.	0.012	20 g
NCS DC62125a	Cement	(0.37)	0.18	.	20 g

**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 DC62119	4.5	5.8	1.2	0.98	.	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

**CEMENT COMPRESSIVE STRENGTH**

Class	Day Number	3 Strength	7 Strength	28 Strength	Units
CRM	CAN CM-2	.	.	39.8 Mpa	2500 g
RM	JCA 401G	28.1 N/mm <sup>2</sup>	45.8 N/mm <sup>2</sup>	64.8 N/mm <sup>2</sup>	4800 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 DC62127	2.03 %	354.7 m <sup>2</sup> /kg	3.16	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

**CRM CEMENT FINENESS**

certified analysis				informational analysis listed in mass %										46H: 10 x 5 g units	114g: powder 20 x 5 g units				
Number ASTM METHOD	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 C204-96a	Wagner C115-96a	Residue C430-96	C150-02				C114-02											
SRM 114g	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															2 x 25 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 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

**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 DC62110	Portland Blast Furnace Slag	57.4	.	6.26	23.48	.	2.39	0.59	3.31	0.17	.	2.02	0.43	3.68		
NCS DC62109	Portland Pozzolanitic	47.57	.	6.52	32.67	.	3.54	1.43	1.86	0.85	.	2.59	0.16	2.44		
NCS DC62111	Portland Fly Ash	46.52	.	8.93	24.31	.	4.9	0.61	1.9	0.32	.	2.47	0.33	9.09		
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 DC62126	Cement Black Raw Meal	38.89	70.9	.	.	0.15	2.74	.	.	.	.	.	.	37.46		
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 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		

## COAL

# = class, where 1=CRM and 2=RM analysis listed in mass % except \* indicating mg/kg AS(C)RM, COCO: 250 g SABS: 150 g others: 50 g

#	Number	S	Ash	Volatiles Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P
1	IARM HC-30500B	5.4	22.3	32	(11,600) BTU	.	(1.1)	64.2	(45)	.	.	4.2	.	1.10	3	.
1	IARM HC-30450A	4.72	16.8	39	(11,640) BTU	.	(4.9)	64	(44)	.	.	(4.7)	.	(1.2)	(7.5)	.
2	502-674-09254	4.18	10.8	.	.	.	.	.	.	.	.	.	.	.	.	.
2	502-686	4.18	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28221	4.04	18.98	32.0	27,790 J	.	.	.	.	.	.	0.107	.	.	.	.
1	NCS FC28220	4.03	16.52	11.15	28,670 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28008F	3.39	31.02	19.11	22,130 J	1.69	.	55.67	.	.	.	3.22	.	1.02	.	.
1	NCS FC28210	3.17	25.9	8.4	24,470 J	.	.	.	.	.	.	.	.	.	.	.
1	IARM HC-30300B	3.02	8.6	40	(13,900) BTU	.	(1.2)	77	(51.0)	.	.	5.0	.	1.6	5.7	.
2	502-673-09191	3.00	6.40	.	.	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28216	2.79	8.7	10.78	32,340 J	.	.	.	.	.	.	.	.	.	.	.
1	IARM HC-30250A	2.5	32.9	19.3	23,630 J & 10,160 BTU	0.71	57.1	47.9	0.09	(0.0200)	3.2	0.4	1.0	3.2	.	.
1	NCS FC28011d	2.22	20.32	6.63	2,6310 J	1.79	.	72.12	.	.	.	1.85	.	0.84	.	.
1	NCS FC28215	2.17	25.2	28.79	24,830 J	.	.	.	.	.	.	.	.	.	.	.
2	502-672-09159	2.16	7.63	.	.	.	.	.	.	.	.	.	.	.	.	.
2	502-687	2.16	.	.	.	.	.	.	.	.	.	0.140	.	.	.	.
1	NCS FC28112	2.10	8.08	33.90	32,710 J	1.33	.	78.64	.	.	.	5.01	.	1.31	.	.
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)	.	.
2	COCO 002	1.89	14.25	21.16	29,200 J	.	.	.	.	.	.	.	.	.	.	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 FC28106	1.70	8.41	31.92	32,870 J	1.35	.	78.98	.	.	.	4.95	.	1.38	.	.
1	IARM HC-30150C	1.72	18.75	34	(12,060) BTU	.	(2.2)	67.3	(47)	.	.	4.50	.	1.39	(6.2)	.
1	NCS FC28002J	1.61	23.73	30.08	23,760 J	1.58	.	59.95	.	.	.	3.63	.	1.06	.	.
1	NCS FC28214	1.66	27.85	29.21	23,630 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28213	1.49	9.88	36.2	30,760 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28218	1.35	14.58	6.16	29,260 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28140	1.30	25.88	30.43	22,640 J	1.62	.	58.12	.	.	.	3.40	.	1.06	.	.
2	502-681-09147	1.30	9.09	32.6	(13,892) BTU	.	.	78.4	(58.3)	.	.	4.98	.	1.46	.	.
1	NCS FC28111	1.26	25.35	28.65	23,970 J	1.57	.	59.84	.	.	.	3.73	.	1.01	.	.
1	SABS 053	1.20	29.42	27.86	.	.	.	55.76	.	.	.	3.61	.	1.28	.	0.041
2	502-685	1.08	.	.	.	.	.	.	.	.	.	0.050	.	.	.	.
1	SRM 2692C	1.064	(7.499)	.	.	.	.	.	(0.1338*)	.	.	0.1790	.	.	.	.
2	502-671-09082	1.06	9.43	.	.	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28105	1.05	9.61	12.43	32,240 J	1.43	.	81.54	.	.	.	3.70	.	1.16	.	.
1	NCS FC28202	1.05	8.65	33.36	30,770 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28208	1.03	15.48	20.57	29,190 J	.	.	.	.	.	.	.	.	.	.	.
1	SABS 035	1.02	26.81	22.18	.	.	.	58.01	.	.	.	2.98	.	1.52	.	0.05
1	IARM HC-30100B	1.00	6.96	34	(13,370) BTU	.	(6.3)	77	(58)	.	.	5	.	(1.8)	(9)	.
1	SABS 028	0.99	27.00	23.10	.	.	.	77.24	.	.	.	2.94	.	1.45	.	0.09
1	NCS FC28006K	0.98	14.93	32.20	27,570 J	1.47	.	68.35	.	.	.	4.17	.	1.23	.	.
1	NCS FC28204	0.96	8.09	33.96	31,310 J	.	.	.	.	.	.	.	.	.	.	.
1	SABS 041	0.94	27.62	22.84	.	.	.	57.61	.	.	.	3.08	.	1.48	.	0.065
1	SABS 055	0.88	14.14	11.54	.	.	.	75.70	.	.	.	2.93	.	1.93	.	0.031
1	NCS FC28211	0.88	13.41	9.08	30,230 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28110	0.87	8.42	32.94	30,920 J	1.41	.	75.96	.	.	.	4.56	.	1.33	.	.
1	SABS 029	0.86	32.97	23.96	.	.	.	50.86	.	.	.	2.86	.	1.17	0.051	.
1	SABS 040	0.86	26.63	23.00	.	.	.	58.36	.	.	.	3.14	.	1.51	.	0.058
#	Number	S	Ash	Volatiles Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P
1	NCS FC28206	0.85	14.46	28.56	26,720 J	.	.	85.79	.	.	.	2.47	.	1.77	.	0.020
1	SABS 042	0.85	7.94	5.17	.	.	.	57.78	.	.	.	2.98	.	1.46	.	0.100
1	SABS 052	0.78	26.66	22.40	.	.	.	79.3	78	(0.012)	(0.0060)	2.9	0.10	1.35	4	.
1	IARM HC-30080A	0.77	11.76	10	31,250 J & 13,450 BTU	1.6	.	77.4	57	(0.2)	.	5.0	0.24	1.47	(8)	.
1	IARM HC-30075C	0.76	7.2	36	(13,820) BTU	.	(1.9)	77.4	.	.	.	2.93	.	1.56	0.079	.
1	SABS 039	0.75	24.51	23.34	.	.	.	59.97	.	.	.	.	.	.	.	.
1	SABS 043	0.74	22.31	23.82	.	.	.	61.69	.	.	.	3.03	.	1.56	.	0.071
1	SABS 051	0.72	39.70	20.89	.	.	.	44.44	.	.	.	2.45	.	1.10	.	0.11
1	NCS FC28203	0.71	10.36	20.69	31,660 J	.	.	.	.	.	.	.	.	.	.	.
1	SABS 046	0.66	11.86	26.87	.	.	.	74.21	.	.	.	3.77	.	1.76	.	.
1	NCS FC28107	0.66	10.41	15.3	31,640 J	1.43	.	79.80	.	.	.	3.80	.	1.10	.	.
1	SABS 026	0.65	37.83	22.07	.	.	.	46.63	.	.	.	2.59	.	1.11	0.066	.
1	NM CS-1	0.65	36.05	21.20	4944.3 Calg <sup>-1</sup>	.	1.90	53.68	41.89	.	.	3.44	.	1.19	.	.
1	SABS 047	0.60	13.58	25.45	.	.	.	71.85	.	.	.	3.81	.	1.66	.	0.06
1	IARM HC-30060A	0.59	11.5	6	30,400 J & 13,050 BTU	4.0	82	82	0.023	(0.0070)	1.8	0.14	0.95	3.2	.	.
1	NCS FC28109	0.58	11.98	11.30	30,660 J	1.49	.	79.42	.	.	.	3.28	.	1.09	.	.
1	NCS FC28108	0.57	13.84	30.84	29,900 J	1.42	.	72.94	.	.	.	4.46	.	1.26	.	.
2	502-670-09090	0.56	8.42	.	.	.	.	.	.	.	.	.	.	.	.	.
1	IARM HC-30050A	0.55	12.31	5	30,000 J & 12,900 BTU	4.1	81.9	83	0.020	(0.0100)	1.4	0.11	0.8	3	.	.
2	502-682-09357	0.54	5.08	41.3	(13,044) BTU	.	.	74.9	(53.6)	.	.	4.92	.	1.53	.	.
1	NCS FC28116	0.54	6.08	32.34	31,820 J	1.39	.	78.68	.	.	.	4.59	.	1.34	.	.
1	NCS FC28212	0.52	8.49	25.65	30,900 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28001P	0.51	8.48	33.97	3,1520 J	1.38	.	77.03	.	.	.	4.70	.	1.40	.	.
1	SABS 048	0.50	15.66	25.40	.	.	.	71.24	.	.	.	3.76	.	1.65	.	0.09
1	SABS 054	0.49	15.66	25.27	.	.	.	70.96	.	.	.	3.81	.	1.62	.	0.094
1	SABS 050	0.48	16.36	24.58	.	.	.	70.79	.	.	.	3.80	.	1.62	.	0.10
1	SABS CCS 008	0.48	16.33	24.36	27,520 J	.	.	70.50	.	.	.	3.62	.	1.61	.	0.086
1	SABS 049	0.48	16.34	24.31	.	.	.	70.96	.	.	.	3.61	.	1.63	.	0.09
1	SABS 057	0.48	15.49	25.42	.	.	.	71.19	.	.	.	3.85	.	1.70	.	1.093
1	SABS 056	0.48	15.49	25.42	.	.	.	71.19	.	.	.	3.85	.	1.70	.	0.093
1	SABS 037	0.48	15.26	24.84	.	.	.	71.17	.	.	.	3.67	.	1.72	0.102	.
1	NCS FC28201	0.47	10.45	17.7	31,570 J	.	.	.	.	.	.	.	.	.	.	.
1	SRM 2693	0.4571	.	.	.	.	.	.	.	0.03696	.	.	0.0373	.	.	.
1	NCS FC28207	0.43	16.26	7.26	26,100 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28115	0.42	6.38	32.22	31,050 J	1.41	.	77.44	.	.	.	4.42	.	1.21	.	.
1	NCS FC28104	0.40	10.09	11.00	32,040 J	1.45	.	81.45	.	.	.	3.52	.	1.34	.	.
2	COCO 001	0.39	14.66	24.58	26,820 J	.	.	.	.	.	.	.	.	.	.	0.079
1	SABS 023	0.37	16.54	25.63	.	.	.	68.25	.	.	.	3.63	.	1.62	.	0.10
1	NCS FC28103	0.36	10.51	9.60	.	.	.	81.55	.	.	.	3.33	.	1.30	.	.
2	502-680-09176	0.34	11.0	17.6	(13,893) BTU	1.47	.	81.4	(71.9)	.	.	4.06	.	1.10	.	.
1	NCS FC28205	0.31	14.49	11.39	29,980 J	.	.	.	.	.	.	.	.	.	.	.
1	IARM HC-30025C	0.30	6.3	44	(11,850) BTU	.	(21.3)	70	(50)	<0.01	4.7	0.07	0.97	17.9	.	.
1	NCS FC28003F	0.28	16.29	6.35	26,410 J	1.95	.	78.13	.	.	.	0.95	.	0.23	.	.
1	NCS FC28219	0.28	6.1	31.24	30,090 J	.	.	.	.	.	.	.	.	.	.	.
1	NCS FC28113	0.27	7.06	33.40	30,030 J	1.41	.	74.8	.	.	.	4.47	.	1.02	.	.
1	NCS FC28017A	0.27	14.53	5.85	27,160 J	1.93	.	80.04	.	.	.	0.97	.	0.24	.	.
1	NCS FC28114	0.20	4.66	33.41	30,430 J	1.40	.	76.69	.	.	.	4.42	.	1.04	.	.
1	NCS FC28101	0.20	3.95	6.82	34,340 J	1.47	.	90.20	.	.	.	3.01	.	0.58	.	.
1	NCS FC28102	0.19	6.46	7.90	33,100 J	1.50	.	87.47	.	.	.	2.86	.	0.60	.	.
2	ASRM 015	.	.	.	.	1.42	.	.	.	.	.	.	.	.	.	.
#	Number	S	Ash	Volatiles Matter	Heat in J/g or BTU/lb	Density	Moisture	C	Fixed C	Cl	F	H	Hg*	N	O	P

**SULFUR IN COAL**

# = class, where 1 = CRM and 2 = RM VS: part number matches sulfur analysis listed in mass %

#	Number	S	Units	#	Number	S	Units	#	Number	S	Units	#	Number	S	Units
1	IARM HC20500B	5.4	50 g	2	VSl-2.60	2.60	50 g	1	ASCRM 012 C	1.22	125 g	1	IARM HC20060A	0.59	50 g
1	ASCRM 012 D	5.21	125 g	1	IARM HC20250A	2.5	50 g	2	VSl-1.11	1.11	50 g	2	VSl-0.55	0.55	50 g
1	BCR 335	5.08	20 g	2	VSl-2.33	2.33	50 g	1	IARM HC20100B	1.00	50 g	1	IARM HC20050A	0.55	50 g
1	IARM HC20450A	4.72	50 g	2	VSl-2.07	2.07	50 g	1	BCR 332	0.961	20 g	2	VSl-0.51	0.51	50 g
2	VSl-4.25	4.25	50 g	2	VSl-1.97	1.97	50 g	2	VSl-0.93	0.93	50 g	1	BCR 331	0.499	20 g
2	VSl-3.56	3.56	50 g	2	VSl-1.77	1.77	50 g	1	IARM HC20080A	0.77	50 g	2	VSl-0.40	0.40	50 g
1	BCR 336	3.290	20 g	1	IARM HC20150C	1.72	50 g	1	IARM HC20075C	0.76	50 g	1	ASCRM 012 A	0.33	125 g
2	VSl-3.19	3.19	50 g	1	BCR 334	1.609	20 g	2	VSl-0.73	0.73	50 g	1	IARM HC20025B	0.28	50 g
1	IARM HC20300B	3.02	50 g	2	VSl-1.49	1.49	50 g	1	ASCRM 012 B	0.72	250 g				
2	VSl-2.89	2.89	50 g	1	BCR 333	1.344	20 g	2	VSl-0.70	0.70	50 g				

**RM COAL**

typical analysis listed in mass % except Heat values, which are BTU/lb

50 g units

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>
VS6-056	3.23	(51.61)	(13,719)	8.12	40.30	20.72	4.15	23.92	1.62	0.72	0.04	0.47	0.43	4.19	41.79	1.01
VS6-046	1.82	(70.69)	(14,004)	10.32	19.00	28.17	1.66	14.79	2.21	0.78	0.02	0.27	0.37	1.36	48.08	1.23
VS6-006	1.60	(50.98)	(12,302)	16.98	31.97	24.27	1.07	10.01	1.96	0.76	0.04	0.15	0.16	1.03	56.34	1.81
VS6-026	1.56	(52.33)	(12,761)	14.50	33.12	27.83	0.74	7.52	3.79	0.98	0.01	0.44	0.09	0.54	54.56	1.43
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
VS6-036	0.65	(76.70)	(14,994)	4.88	18.58	20.73	12.36	15.22	1.51	1.94	0.07	0.46	0.10	11.52	33.39	1.16
VS6-066	0.61	(58.57)	(13,811)	9.27	32.17	26.62	1.03	3.06	2.57	0.84	0.01	0.33	0.08	1.20	60.19	1.62

**CRM COAL**

analysis listed in mass %

J = J/g B = BTU

SRM 1635: 75 g units

other SRM: 50 g units

analysis listed in mg/kg

Number	Ash	Volatile Matter	Calorific Value	C	Al	Cl	Fe	H	K	N	Na	S	Hg	Mn	V	Zn
SRM 2685b	(15.94)	.	(26940) J	(64.6)	(1.7)	0.0517	(3.9)	(4.5)	(0.26)	(1.1)	(0.08)	4.730	0.1462	(41)	(31)	(17)
SRM 1632d	(7.078)	(36.04)	(13821) B	(76.88)	(0.912)	0.1142	0.749	5.10	0.1094	(1.59)	0.02969	1.462	0.0928	(13.1)	23.74	(12.9)
SRM 2682b	(6.32)	.	(25660) J	(66.6)	(0.46)	(0.00161)	(0.24)	(4.3)	(0.01)	(1.0)	(0.10)	0.4917	0.1088	(26)	(15)	(8.6)
SRM 1635	(4.6)	.	.	.	(0.32)	.	0.239	.	.	.	(0.24)	0.3616	0.0109	21.4	5.2	4.7

continued

analysis listed in mg/kg

Number	As	Ba	Br	Cd	Ce	Co	Cr	Cu	F	Ni	Pb	Rb	Sb	Se	Sr	Th	Ti	U
SRM 2685b	(12)	(105)	(5.6)	.	(18)	(4.6)	(22)	.	.	.	.	(17)	.	(1.9)	.	(2.7)	.	(0.95)
SRM 1632d	(6.1)	40.42	.	(0.08)	(11.7)	3.424	(13.7)	5.83	(63.6)	(10)	3.845	7.36	0.445	(1.29)	63.5	1.428	477	0.517
SRM 2682b	(1.0)	(382)	(3.7)	.	(10)	(1.7)	(15)	.	.	.	.	(<2)	.	(0.91)	.	(1.5)	.	(0.52)
SRM 1635	0.42	.	.	0.03	(3.6)	(0.65)	2.5	3.6	25.9	1.74	1.9	.	.	0.9	.	0.62	.	0.24

**CRM COAL**

analysis listed in mass %

SARM: 120 g units

US: 50 g units

analysis listed in mg/kg

Number	Type	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>	S	SiO <sub>2</sub>	TiO <sub>2</sub>	ASH	LOI	As	Ba	Be	Ce	Co
SARM 20	Sasolberg	11.27	1.87	1.17	0.14	0.43	0.27	0.14	0.51	17.66	0.63	.	64.66	4.7	372	2.5	87	8.3
SARM 19	OFS	8.01	1.39	1.75	0.24	0.20	0.29	.	1.49	15.00	0.341	.	71.28	7	304	2.8	56	5.6
SARM 18	Witbank	2.57	0.18	0.29	0.145	0.11	.	.	0.56	6.20	0.114	.	90.11	.	78	4.1	22	6.7
US CLB-1	Maryland	(1.51)	0.22	1.25(T)	0.0760	0.0470	0.0230	(0.0700)	(1.49 T)	(2.51)	(0.0780)	(6.3)	.	(13)	34	.	10	7.0

continued

analysis listed in mg/kg

Number	Cr	Cs	Cu	Ga	Ge	Hf	Hg	La	Li	Mn	Mo	Ni	P	Pb	Rb	Sc	Se	Sm	Sr	Ta	Th	U	V	Y	Zn	Zr
SARM 20	(67)	(2)	18	16	.	4.8	0.25	43	.	80	.	25	.	26	10	10	0.8	6.3	330	1.2	18	4	47	29	17	(180)
SARM 19	50	1.4	13	14	13	5.4	(0.2)	27	.	157	.	16	130	20	9	7.6	.	4.9	126	.	12	5	35	.	12	351
SARM 18	16	(1)	5.9	(8)	(8)	1.7	(0.04)	10	.	22	.	10.8	30	(5)	8.1	4.3	.	2.0	44	.	3.4	1.5	23	.	5.5	67
US CLB-1	9.7	.	(10)	(3)	.	.	(0.2)	(5)	(8)	(8)	(9)	18	.	5.1	5.2	2.0	(2)	.	.	.	(1.4)	(0.55)	12	.	48	.

**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**

analysis listed in mass % unless otherwise indicated

20 g powder

Number	Heat J/g	Volatile Matter	ASH	Moisture	S	Expiry
NCS FC62001	26560, 27660	26.95, 28.06	13.42, 13.97	3.96 (air dried)	0.62, 0.65	August 2011 (sale price)
NCS FC62001a	25700, 27390	29.93, 31.90	11.46, 12.21	6.17 (air dried)	0.37, 0.39	August 2014 (regular price)
NCS FC62002a	24190, 24980	4.29, 4.43	23.90, 24.68	3.15 (air dried)	0.36, 0.37	August 2014 (regular price)

**CRM FUSIBILITY OF COAL ASH**

analysis listed in 'C Red = Reducing Oxi = Oxidizing

5 g units

Atmosphere Number	Initial Deformation Red, Oxi	Softening Red, Oxi	Hemishpering Red, Oxi	Fluid Red, Oxi
NCS FS28001	1161, 1211	1190, 1230	1198, 1239	1204, 1252
NCS FS28002	1217, 1356	1340, 1408	1357, 1420	1369, 1445
NCS FS28003	1285, 1314	1314, 1345	1322, 1360	1340, 1381

**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
1	NCS FC82015	62.93	17.88	6.11	6.04	0.87	0.90		1.18	0.85	1.20	0.79	.	30 g	
1	NCS FC82014	53.98	31.70	1.44	7.80	1.36	1.08		0.22	0.28	0.28	1.17	.	30 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
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 FC82016	50.08	33.78	5.50	4.36	0.87	0.76		0.41	0.18	1.25	1.77	.	30 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 FC82012	46.77	14.96	21.37	5.51	1.41	1.73		1.36	0.50	3.94	0.63	.	30 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	SABS 108	40.03	34.36	9.13	2.42	0.78	1.98		0.20	2.69	4.46	1.95	.	25 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 FC82017	31.24	10.00	42.40	8.16	1.28	1.17		0.46	0.04	2.76	0.56	.	30 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<sup>-</sup>: 0.18, H<sub>2</sub>O<sup>+</sup>: 0.37, Sr: 0.110

**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)
GBW 08401	0.00114	.	(0.1450)	.	7.65	.	.	0.1178	.	.	.	.	.	.	0.0061	.
NCS ZC78006	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

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)	(7)	(0.003)	.
SRM 1633c	.	.	(16)	.	0.758	(180)	42.9	(258)	(9.39)	173.7	(4.67)	.	.	.	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)	.	.
GBW 08401	.	.	10.7	.	0.16	.	33.2	60	.	53	.	.	.	.	.	.
NCS ZC78006	.	.	.	.	.	.	.	.	.	.	.	111	.	.	.	.

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
GBW 08401	33.8	.	.	1.13	.	.	.	.	.	.	95	.	.	30 or 50 g
NCS ZC78006	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g

**CRM 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	.

Number	Bi	C	Cl	F	Mg	Mn	S	Si	Sn	Units
ECRM 882-1	0.0026	(1.0)	(2.35)	(0.07)	(0.48)	(2)	(0.5)	(1.05)	(0.02)	100 g
JK 43	.	.	.	.	.	.	.	.	.	15 g
JK 44	.	.	.	.	.	.	.	.	.	25 g
JK 45	.	.	.	.	.	.	.	.	.	15 g

**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 D	92.7	0.58	4.8	0.04	1.2	2.2	0.08	1.4	<0.5	1.3	2.2	4	0.84	0.6	<2	0.030	9	.	1	0.6
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 D	0.014	10	<0.2	0.32	0.06	1	86.5
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.

**RM CONTINUOUS CASTING POWDER**

analysis listed in mass %

100 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	P	S	TiO <sub>2</sub>	LOI
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)
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)

**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>	-H <sub>2</sub> O@900'C	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 3011	43.23	4.40	26.58	5.95	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	7.18	0.233	0.376	0.39	0.007	7.93	0.091	0.019	.	0.086	.	
DH 3010	38.56	5.05	27.06	8.97	2.63	0.155	4.13	0.059	5.479	0.454	0.131	.	0.055	.	
DH 3013	37.70	5.95	30.73	5.84	0.437	0.288	1.93	0.045	6.43	0.047	0.077	.	0.064	.	Ba: 0.108
DH X3001	23.40	12.23	17.18	6.00	3.72	1.65	1.02	8.77	7.62	0.161	0.51	.	0.397	1.25	C: 3.80 CO <sub>2</sub> : 3.92

**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

## RM COKE ASH

typical analysis listed in mass %

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Co <sub>3</sub> O <sub>4</sub>	Fe	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>	LOI
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	0.52

Number	C.tot	CO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	CuO	NiO	V <sub>2</sub> O <sub>5</sub>	ZnO	ZrO <sub>2</sub>
DH 3711	0.039	0.045	0.036	0.009	0.030	0.058	0.010	0.041

## 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)
VS E3	Open Hearth Furnace	.	0.25	0.0067	0.082	0.69	0.013	.	0.203	.	0.242	.	52.9	.	.

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
VS E3	1.84	0.86	.	.	0.062	0.083	0.49	2.78	0.43	0.017	.	.	.	4.2	60 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 6207 *	Cupola	1.03	2.45	0.712	9.11	2.44	0.435	0.237	1.65	4.79	1.65	0.269	2.59	4.19	0.086	22.74
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
DH 1501	Iron Ore Sinter	1.23	2.78	2.59	7.11	1.11	.	.	1.59	1.49	0.121	0.104	0.103	6.13	0.107	.

continued

Number	CdO	F	Fe	FeO	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 6207 *	.	0.73	.	.	41.84	1.63	.	.	0.026	0.60	.	0.050	.	0.770 at 900°C
DH 6203	.	0.570	.	.	36.85	.	4.97	.	.	.	5.29	.	0.004	0.214 at 900°C
DH 1501	0.001	0.247	52.32	3.24	71.20	.	0.327	.	.	.	0.830	.	0.051	1.04 at 600°C

continued analysis of DH 6204 and 6207 listed in mg/kg

Number	Ba	Bi	Cd	Co	Ga	In	Li	Mo	Nb	Sr	Tl	U	V	Zr
DH 6204	.	.	197	.	.	0.4	510	.	5.4	.	.	2.92	.	.
DH 6207	382	88	277	30	52.2	4.0	23.5	50.5	8.4	75	2.2	2.6	150	41.3

**CRM NON-FERROUS DUST**

analysis listed in mass %

Number	As	Cd	Cu	Fe	H <sub>2</sub> O	Hg	Pb	Si	Zn	Units
CAN PD-1	0.76	(0.28)	(7.03)	(12.2)	(0.4)	0.0389	2.75	(3.05)	(35.9)	200 g

**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 ELECTRONIC SCRAP MELTED WITH PYRITE**

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

Number	Ag	Au	Be	Cu%	In	Ni%	Pd	Pt	Units
BAM EZ505	692	292	68.8	15.10	91	0.470	90.5	8.5	powder 200 g

**CRM USED AUTOMOBILE EXHAUST CATALYST**

analysis listed in mg/kg

powder 250 g units

Number	Pt	+/-	Pd	+/-	Rh	+/-
BAM EB504	1777	15	279	6	338	4

**FERROBORON**

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

DH, NCS: 50 g units

all others: 100 g units

#	Number	B	Fe	Al	C	Cr	Cu	Mn	Ni	P	S	Si	Sn	Ti	V	Zn
1	VS F21/2	20.91	.	1.546	0.047	.	0.012	.	.	0.0119	.	0.73	0.0055	.	.	0.0055
1	NCS HC25658	20.58	.	0.99	0.022	.	.	.	.	0.017	0.0016	1.68	.	.	.	.
2	DH 1703	18.78	79.36	0.141	0.318	0.080	0.064	0.246	0.359	0.018	.	0.326	.	0.017	0.004	.
1	ECRM 587-1	18.67	.	0.047	0.738	0.104	.	0.272	.	0.020	.	0.129	.	0.039	0.004	.
1	VS F22/3	8.95	.	7.78	0.161	.	3.43	.	.	0.021	0.018	7.82	.	.	.	.

**FERROCHROMIUM**

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

VS F11, F15, F35: chips

all others: powder

#	Number	Cr	Al	C	Co	Cu	Fe	Mn	N	Ni	P	S	Si	Ti	V	Units
1	VS F14/2	73.2	.	8.06	.	.	.	.	.	.	0.012	0.033	0.102	.	.	100 g
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 F35/1	71.3	.	0.88	.	.	26.74	.	.	.	.	0.0022	0.37	.	.	100 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	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
1	VS F15/2	68.1	0.30	0.080	.	.	.	.	1.79	.	0.036	0.0019	2.08	.	.	100 g
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	VS F11/3	67.9	.	0.180	.	.	29.83	0.168	0.044	0.379	0.022	0.0018	1.45	.	0.103	100 g
1	NM 303	64.95	.	6.43	.	.	.	.	.	.	.	.	1.77	.	.	100 g
1	NCS HC25651	63.31	.	2.55	.	.	.	0.47	.	.	0.023	0.047	2.04	.	.	50 g
1	NCS HC25653	62.49	.	8.70	.	.	.	0.11	.	.	0.025	0.024	0.15	0.016	.	50 g
2	BS 130/2	52.61	.	7.76	.	(0.007)	.	0.45	.	.	0.013	0.045	2.12	(0.10)	(0.38)	100 g
2	BS 130/1	51.60	.	7.06	.	(0.011)	.	1.20	.	.	0.016	0.034	4.46	(0.16)	(0.39)	100 g
1	SARM 74	49.7	.	6.44	0.06	.	37.5	0.193	.	0.21	0.018	0.04	4.34	0.47	0.36	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
2	BS 130/3	49.01	.	6.54	.	(0.011)	.	0.76	.	.	0.014	0.029	6.25	(0.18)	(0.36)	100 g

**CRM CARBON IN FERROCHROMIUM**

Number	C	Co	Units
VS F38	4.62	.	Powder 100 g
VS F37	1.1	.	Chips 100 g
VS F12/3	0.289	.	Chips 100 g
VS F10/1	0.021	.	Chips 100 g
VS F10/2	0.018	.	Chips 100 g
VS F9/2	0.012	0.042	Chips 100 g

**FERROMANGANESE**

# = class, where 1 = CRM and 2 = RM analysis in mass % DH, NCS HCl8x and HC25x: 50 g IPT: 120 g JSS, MHCX: 150 g others: 100 g

#	Number	Mn	Fe	Si	C	P	S	As	Co	Cr	Cu	Ni	Pb	Ti	V	Zn	Other
1	VS F5/3	95.9	2.73	1.25	0.079	0.062	0.0095	.	.	.	0.0055	.	.	.	.	.	.
1	NCS HCl5606	92.92	6.64	0.47	0.047	0.020	0.012	.	.	.	.	.	.	.	.	.	.
1	VS F6/2	90.3	5.40	2.00	1.90	0.330	0.0031	.	.	.	0.050	.	.	.	.	.	.
2	DH 1203	88.15	8.87	0.863	1.293	0.114	.	.	0.141	0.076	0.051	0.067	0.003	0.001	0.015	0.030	.
2	DH 1207	88.00	8.780	1.113	1.630	0.081	.	.	0.039	0.060	0.016	0.022	0.002	.	0.026	0.009	.
1	MHCX01	87.5	7.32	1.13	1.34	0.25	0.0040	.	.	0.16	0.11	0.06	.	0.009	.	.	Al: 0.006
1	ECRM 583-1	86.42	.	0.396	0.333	0.146	(0.007)	.	.	.	.	.	.	.	.	.	.
1	NCS HCl5605	85.95	13.83	0.19	0.056	0.030	0.011	.	.	.	.	.	.	.	.	.	.
1	NM 331	85.48	.	1.74	0.115	0.129	.	.	.	.	.	.	.	.	.	.	.
1	VS F29/2	84.6	2.16	.	0.299	0.053	0.032	.	.	.	.	.	.	.	.	.	N: 4.69
1	NCS HCl5607	82.59	16.59	0.73	0.135	0.033	0.0074	.	.	.	.	.	.	.	.	.	.
1	NCS HC25619a	81.95	.	0.75	1.18	0.163	0.0018	.	.	.	.	.	.	.	.	.	.
1	NCS HC25619b	81.74	.	0.75	1.20	0.163	0.0018	.	.	.	.	.	.	.	.	.	.
2	DH 1202	81.59	15.34	0.791	1.353	0.261	.	.	0.014	0.371	0.007	0.053	0.003	0.001	0.011	0.003	.
2	BS 121	81.4	14.9	0.62	1.62	0.38	0.004	.	.	(0.080)	(0.15)	.	.	(<0.001)	79 g,	last of stock	.
1	NM 332	80.8	.	1.14	6.82	0.19	.	.	.	.	.	.	.	.	.	.	.
1	IRSID 503-1	80.8	.	0.865	0.700	0.069	(0.009)	.	.	.	.	.	.	.	.	.	.
1	IPT 54	80.4	15.9	1.74	1.20	0.22	0.003	.	.	0.043	0.059	0.14	.	.	.	.	.
2	DH 1206	80.24	15.91	0.350	1.482	0.229	.	0.159	0.166	0.105	0.088	0.140	.	0.004	0.072	0.001	Mo: 0.028
1	SRM 68c	80.04	12.3	0.225	6.72	0.19	0.008	0.021	.	0.074	.	.	.	.	.	.	.
1	VS F7/4	79.8	12.75	0.269	6.8	0.372	0.0037	.	.	.	.	.	.	.	.	.	.
1	MHCX02	79.7	8.76	4.71	5.04	0.50	0.0033	.	.	0.08	0.05	0.08	.	0.065	.	.	Al: 0.032
1	NCS HC25632	78.42	.	0.69	6.68	0.204	0.009	.	.	.	.	.	.	.	.	.	.
2	DH 1216	78.30	17.03	1.25	1.44	0.123	.	.	0.019	0.071	.	0.047	.	.	0.019	.	Al: 0.033
1	ECRM 502-2	77.87	.	.	6.94	0.148	.	.	.	0.0265	0.0370	0.0384	0.0179	0.0034	.	.	.
1	JSS 701-6	74.4	.	(0.03)	6.94	0.112	(0.002)	.	.	.	.	.	.	.	.	.	.
1	NCS HCl1602	73.88	18.14	0.43	6.72	0.152	0.005	.	.	.	0.080	.	.	.	.	.	.
1	NCS HCl8602	64.78	.	2.38	5.84	0.194	0.017	.	.	.	.	.	.	.	.	.	.

#	Number	Mn	Fe	Si	C	P	S	As	Co	Cr	Cu	Ni	Pb	Ti	V	Zn	Other
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**FERROMOLYBDENUM**

# = class, where 1 = CRM and 2 = RM DH, NCS: 50 g all others: 100 g units

#	Number	Mo	Fe	Si	C	Co	Cr	Cu	Mn	N	Ni	O	P	S	V	W	Other
2	DH 2010	78.09	20.66	0.161	.	0.020	0.035	0.464	0.010	.	0.112	.	<0.017	.	.	.	Al: 0.008
2	DH 2006	73.83	24.03	0.252	0.031	0.194	0.018	0.134	0.070	0.006	0.905	0.329	0.086	.	0.007	0.050	Mg: 0.007 last
2	DH 2008	72.82	25.51	0.71	0.018	.	0.039	0.378	0.088	0.009	0.020	0.216	0.017	0.059	0.022	0.022	.
1	ECRM 578-1	72.23	.	0.208	0.016	.	.	0.136	.	.	.	.	0.024	0.065	.	.	.
2	DH 2012	69.99	27.82	0.790	0.011	.	.	0.390	0.042	0.014	.	0.534	0.028	0.084	.	.	.
1	NCS HC37603	61.41	.	0.30	0.054	.	.	0.126	.	.	.	.	0.046	0.071	.	.	.
1	VS F17/3 *	61.2	.	0.48	0.42	.	.	0.31	.	.	.	.	0.042	0.085	.	0.022	.
1	NM 321A	59.36	39.06	1.155	0.028	.	.	.	0.023	.	.	.	0.08	0.035	.	.	.
1	NCS HC37604	57.65	.	0.71	0.044	.	.	0.117	.	.	.	.	0.046	0.069	.	.	.
1	NCS HCl8605	55.78	.	0.055	0.015	.	.	0.63	.	.	.	.	0.154	0.079	.	.	.

\* VS F17/3 also contains As: 0.021, Bi: 0.0009, Pb: 0.0051, Sb: 0.024, Sn: 0.0029, and Zn: 0.0038

**CRM FERRONICKEL**

Number	Ni	As	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	.	powder 100 g
JSS 760-3	19.56	.	1.73	0.504	1.19	0.0219	.	0.162	0.022	0.0093	1.29	chips 150 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	.	.
2	DH 2811	67.50	29.29	0.271	1.309	0.080	0.038	.	0.181	0.090	0.038	0.066	0.102	0.695	0.011	.	.
2	DH 2803	66.99	28.38	1.88	1.25	0.076	.	0.062	0.276	0.101	.	.	.	0.141	0.084	.	.
1	NCS HC18606	66.24	.	1.09	1.35	0.070	.	.	0.29	0.159	.	.	0.084	0.78	.	.	.
2	DH 2806	65.05	30.69	2.11	0.061	0.081	0.028	0.341	0.129	0.109	0.034	0.084	0.071	0.044	0.015	0.009	0.005
2	DH 2801	64.69	29.77	1.90	0.800	0.432	0.007	0.011	0.102	0.105	0.058	0.098	0.099	0.439	0.028	0.019	.
2	DH 2808	64.49	24.02	3.17	3.20	0.181	0.038	0.048	0.415	0.071	0.008	0.051	0.171	1.82	1.16	.	0.222
2	DH 2812	64.37	29.84	2.09	1.132	0.135	0.012	0.095	0.441	0.089	0.005	0.052	0.317	0.683	0.052	0.008	0.121
2	DH 2807	64.09	31.93	1.94	0.064	0.099	0.028	0.279	0.136	0.114	0.021	0.012	0.066	0.045	0.014	0.018	.
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 2809	60.12	27.46	3.47	2.22	0.495	0.035	0.037	0.530	0.097	0.010	.	0.217	1.35	0.878	.	0.238
1	ECRM 576-1	43.90	.	1.79	2.53	0.201	.	.	.	.	.	0.195	0.306	1.32	.	.	.

Number	Co	Mg	N	Ni	S	Units
DH 2816	.	.	.	0.006	0.025	50 g
DH 2811	.	.	.	0.012	0.085	50 g
DH 2803	.	.	0.010	.	0.36	50 g
NCS HC18606	.	.	.	.	0.008	50 g
DH 2806	0.004	.	0.583	0.017	0.280	50 g
DH 2801	.	0.016	.	0.003	.	50 g
DH 2808	0.003	.	.	0.012	.	50 g
DH 2812	.	0.012	.	0.006	.	50 g
DH 2807	0.005	.	.	0.015	.	50 g
VS F20/3	0.0056	.	0.067	.	0.0091	100 g
ECRM 579-1	0.005	.	.	.	0.021	100 g
DH 2809	0.003	.	.	0.017	.	50 g
ECRM 576-1	.	.	.	.	.	100 g

## FERROPHOSPHORUS

# = class, where 1 = CRM and 2 = RM analysis listed in mass % DH, GBW: 50 g units SRM: 75 g units VS: 100 g units

#	Number	P	Fe	Al	C	Ca	Cr	Cu	Mn	Mo	Nb	Ni	S	Si	Ti	V
2	DH 2203	27.40	66.53	0.012	0.015	0.158	0.230	0.13	2.10	0.011	0.026	0.090	0.002	0.479	1.89	0.356
1	SRM 90	26.2	.	.	.	.	.	.	.	.	.	.	.	.	.	.
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
2	DH 2201	25.01	64.13	0.014	.	0.176	0.284	0.138	5.14	0.040	0.017	0.140	.	3.04	0.974	0.381
1	VS F28/2	16.05	.	.	.	.	.	.	1.20	.	.	.	0.021	1.11	.	.

## FERROTITANIUM

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

#	Number	Ti	Al	Sol.Al	C	Co	Cr	Cu	Fe	Mn	P	S	Si	V	Zr
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	3.63	.	0.308	.	0.58	0.113	19.74	0.335	0.0044	0.012	0.4	0.56	0.397
2	DH 2414	68.40	5.34	.	0.132	0.115	0.506	0.146	16.93	0.151	.	0.0152	.	2.32	0.866
1	ECRM 589-1	68.4	5.34	.	0.13	0.11	.	0.15	16.9	0.15	0.010	0.016	0.41	.	(0.89)
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	0.009	4.20	0.303	.
1	ECRM 584-1	37.17	7.19	(6.0)	0.044	.	.	0.025	1.13	0.032	0.030	0.030	1.80	.	.
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	CMSI 1651	28.76	5.08	.	0.023	.	.	0.012	2.54	0.040	0.012	4.68	.	.	.
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	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
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
DH 2414	.	.	.	0.934	0.64	.	0.663	.	0.550	.	.	50 g
ECRM 589-1	.	.	.	.	0.65	.	.	.	.	.	.	100 g
NCS HC19604	.	.	.	.	.	.	.	.	0.056	.	.	100 g
NCS HC19605	.	.	.	.	.	.	.	.	0.061	.	.	100 g
ECRM 584-1	.	.	.	.	.	.	.	.	.	.	.	100 g
VS F43	.	.	.	0.0036	0.085	.	.	.	0.013	.	0.032	100 g
CMSI 1651	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC18604	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC26609	.	.	.	.	.	.	.	.	.	.	.	50 g
IRSID 510-1	.	.	.	.	.	.	.	.	.	.	.	100 g
VS F42	.	.	.	0.106	.	.	.	.	.	0.33	0.129	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	Cr	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
VS F33/1	78.9	0.62	.	0.002	.	0.048	0.06	.	0.089	5.39	0.017	.	0.022	0.0006	0.0017	100 g
CMSI 1650	76.66	0.34	.	.	0.055	.	0.43	.	0.12	.	(0.028)	.	0.048	.	.	150 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

**FERROVANADIUM**

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

#	Number	V	Fe	Si	Al	C	Co	Cr	Cu	Mg	Mn	Mo	N	Nb	Ni	P	S
1	IRSID 511-1	80.7	.	0.341	.	0.049	.	.	.	.	.	.	.	.	.	(0.016)	0.018
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	NM 351	52.10	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1	ECRM 577-1	50.16	.	1.79	0.414	0.089	.	.	0.054	.	0.158	.	.	.	0.053	0.035	0.034
2	BS FeV 45	45.27	33.8	4.86	(0.013)	0.24	.	5.82	0.41	(0.014)	4.14	0.01	0.26	.	4.28	0.12	0.33
1	VS F19/3	42.6	.	1.47	(0.005)	0.418	.	1.21	0.204	.	3.30	.	.	.	.	0.059	0.0102
2	BS FeV 42	42.35	39.45	3.81	(0.06)	0.30	.	5.21	0.31	(0.06)	3.37	0.024	0.20	.	3.85	0.12	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)
2	DH 2509	37.63	52.05	3.73	0.480	0.216	0.010	2.16	0.315	<0.020	2.41	0.136	0.290	.	0.327	0.034	.

Number	As	Ca	O	Sn	Ti	W	Units
IRSID 511-1	.	.	.	.	.	.	100 g
VS F40	.	.	.	.	.	.	100 g
ECRM 591-1	0.0022	.	.	.	.	.	100 g
NM 351	.	.	.	.	.	.	100 g
ECRM 577-1	.	.	.	.	.	.	100 g
BS FeV 45	.	(0.009)	.	0.022	.	.	100 g
VS F19/3	0.0009	.	.	.	.	.	100 g
BS FeV 42	.	(0.042)	.	0.033	.	.	100 g
VS F32/3	(<0.001)	.	.	.	.	.	100 g
DH 2509	.	.	0.167	.	0.345	0.009	50 g

**CRM RARE EARTH FERROSILICON**

analysis listed in mass % \* VS F31/2 lists Rare Earth Oxides NCS HC28609-28612: 80 g all others: 100 g

Number	RE	Si	Fe	Ca	Mg	Mn	Ti	Al	C	Ce	Co	Cr	Cu	La	Ni	P	S	Se
VS F31/2	36.0*	39	18	1.7	0.3	.	.	8.3	0.03	.	.	.	0.03	.	.	.	.	15.0
NCS HC28614	26.38	38.92	.	6.26	.	0.460	0.416	.	.	.	.	.	.	.	.	.	.	.
NCS HC28613	23.78	40.00	.	5.00	.	0.455	0.280	.	.	.	.	.	.	.	.	.	.	.
NCS HC39602	21.20	37.18	22.18	1.98	10.56	3.43	1.92	.	.	.	.	.	.	.	.	.	.	.
NCS HC39601	20.09	40.31	20.81	3.21	9.50	2.72	1.50	.	.	.	.	.	.	.	.	.	.	.
NCS HC28615	20.00	41.02	.	5.60	.	0.390	0.235	.	.	.	.	.	.	.	.	.	.	.
NCS HC39603	18.10	43.55	21.78	2.65	8.51	2.23	1.35	.	.	.	.	.	.	.	.	.	.	.
NCS HC28609	8.66	43.98	31.67	1.01	10.20	0.66	0.540	.	.	.	.	.	.	.	.	.	.	.
NCS HC28612	6.42	43.54	36.43	0.90	8.25	0.58	0.435	.	.	.	.	.	.	.	.	.	.	.
NCS HC28611	5.10	43.3	40.7	0.84	5.70	0.51	0.362	.	.	.	.	.	.	.	.	.	.	.
NCS HC28610	3.71	42.2	43.4	0.76	5.52	0.42	0.275	.	.	.	.	.	.	.	.	.	.	.
SRM 347	0.86	47.6	.	0.81	4.49	0.53	0.036	0.78	0.017	0.45	0.004	0.14	0.065	0.26	0.082	0.023	0.005	.

**FERROSILICON**

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

#	Number	Si	Fe	Al	C	Ca	Cr	Cu	Mn	Ni	P	S	Ti
1	BAM 529-1	91.11	6.15	0.86	0.10	0.46	.	0.01	0.04	.	0.013	.	0.09
1	NCS HC14606	78.96	20.24	0.24	0.024	0.064	0.0053	0.049	0.058	0.035	0.0093	0.0037	0.032
1	DH 2314	78.33	19.89	0.410	0.031	0.094	0.082	0.049	0.190	0.044	0.028	.	0.067
1	VS F3/3	77.7	.	1.96	0.049	0.40	0.095	.	0.122	.	0.025	0.0023	0.121
1	DH 2315	77.06	19.86	1.316	0.042	0.357	0.143	0.042	0.159	0.048	0.023	.	0.086
1	CMSI 1655	76.74	.	.	0.081	0.30	0.140	.	0.172	.	0.023	0.004	.
2	DH 2305	76.58	18.62	1.64	0.238	1.45	0.021	0.009	0.070	0.004	0.016	.	0.107
1	DH 2310	75.94	19.42	2.041	0.11	1.019	0.019	0.011	0.139	0.006	0.021	.	0.093
1	NCS HC15602	75.9	23.65	0.011	0.0074	(0.0013)	0.077	0.057	0.149	0.026	0.014	0.0035	0.027
1	JK 39	75.9	21.6	1.45	0.105	0.24	.	0.013	0.165	.	0.018	.	0.116
1	SRM 195	75.3	23.6	0.046	0.034	0.053	0.047	0.047	0.17	0.032	0.017	0.001	0.037
1	IPT 143	75.1	22.4	0.57	0.054	0.79	0.0044	0.014	0.110	0.0028	0.025	0.0012	0.068
1	NM 312	74.37	.	1.23	.	1.80	.	.	.	.	0.031	.	.
1	VS F4/2	74.1	.	0.076	0.023	(0.03)	0.119	0.073	0.14	0.061	0.024	(0.002)	0.094
1	NCS HC11601a	73.75	.	1.14	0.073	0.34	0.085	0.031	0.26	.	0.023	0.003	.
1	SRM 58a	73.20	25.23	0.95	0.014	0.30	0.020	0.024	0.16	0.012	0.009	<0.002	0.051
1	NCS HC11601	72.95	.	1.11	0.068	0.30	0.080	0.029	0.26	.	0.023	0.003	.
1	NCS HC18601	72.44	.	2.16	0.19	0.64	0.109	.	0.205	.	0.019	0.010	.
1	NCS HC19602	69.47	23.81	2.45	0.12	2.47	0.077	.	0.308	.	0.027	.	.
2	DH 2306	66.98	30.09	1.42	0.120	0.193	0.155	0.103	0.222	0.075	0.023	.	0.118
1	NCS HC14607	55.73	41.89	0.78	0.19	0.14	0.014	0.060	0.22	0.0063	0.038	0.0048	0.119
2	BS 140/2	51.85	46.12	0.62	(0.03)	0.03	(0.25)	0.14	0.53	0.15	(0.02)	(0.004)	0.10
2	DH 2311	50.00	9.06	4.36	8.31	7.84	0.027	0.016	0.080	0.007	0.011	0.048	0.070
2	BS 140/4	49.80	47.50	0.90	(0.05)	0.09	(0.19)	0.09	1.00	0.11	(0.02)	(0.004)	0.09
2	DH 2312	48.30	12.38	3.40	4.96	10.48	0.083	0.020	0.114	0.013	0.011	0.056	0.062
1	SRM 59a	48.10	50.05	0.35	0.046	0.042	0.080	0.052	0.75	0.033	0.016	0.002	.
2	BS 140/3	47.20	50.85	0.59	(0.05)	0.09	(0.18)	0.09	0.60	0.09	(0.02)	(0.004)	0.07
2	BS 140/1	45.20	52.80	0.68	(0.03)	0.04	(0.25)	0.13	0.46	0.15	(0.02)	(0.004)	0.09
1	IPT 70	44.7	54.1	0.21	0.087	0.16	0.046	0.066	0.283	0.022	0.018	(0.006)	0.018
1	VS F2/3	44.2	.	1.03	0.027	0.056	0.324	.	0.306	.	0.035	0.0023	.
1	VS F1/3	24.5	.	0.74	0.499	.	0.361	.	0.510	.	0.042	0.0027	0.072
1	SARM 33	15.60	80.2	0.62	1.01	.	0.43	0.29	0.75	0.28	0.043	.	.

#	Number	Si	Fe	Al	C	Ca	Cr	Cu	Mn	Ni	P	S	Ti
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Number	As	B	Ba	Co	Mg	Mo	N	O	Sn	Sr	V	Zn	Zr	Units
BAM 529-1	.	.	.	.	0.04	.	.	.	.	.	.	.	.	100 g
NCS HC14606	0.0012	0.0029	0.0060	0.0031	0.0051	0.0013	.	(0.256)	0.0003	.	0.0024	.	.	70 g
DH 2314	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
VS F3/3	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
DH 2315	.	.	.	.	0.025	.	.	.	.	.	.	.	.	50 g
CMSI 1655	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
DH 2305	.	.	.	.	0.013	.	.	.	.	.	0.005	.	.	50 g
DH 2310	.	.	0.042	.	0.029	.	.	.	.	.	.	.	.	50 g
NCS HC15602	.	.	.	.	.	.	.	.	.	.	0.0036	.	.	50 g
JK 39	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
SRM 195	.	0.0010	.	<0.01	.	.	.	.	.	.	.	.	0.011	75 g
IPT 143	.	.	0.126	.	0.039	.	.	.	.	0.014	.	.	0.082	50 g
NM 312	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
VS F4/2	.	.	.	.	.	.	(0.02)	.	.	.	.	0.0013	.	100 g
NCS HC11601a	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
SRM 58a	.	0.0010	.	<0.01	.	.	.	.	.	.	.	.	0.002	75 g
NCS HC11601	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
NCS HC18601	.	.	.	.	.	.	.	.	.	.	.	.	.	50 g
NCS HC19602	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
DH 2306	.	.	.	.	0.019	.	.	.	.	.	0.007	.	.	50 g
NCS HC14607	0.0015	0.0032	0.0043	0.0047	0.0068	0.011	.	(0.665)	0.0004	.	0.011	.	.	70 g
BS 140/2	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
DH 2311	.	.	.	.	1.153	.	.	.	.	.	.	.	.	50 g
BS 140/4	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
DH 2312	.	.	.	.	0.193	.	.	.	.	.	.	.	.	50 g
SRM 59a	.	0.058	.	.	.	.	.	.	.	.	.	.	.	50 g
BS 140/3	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
BS 140/1	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
IPT 70	.	.	.	.	0.016	.	.	.	.	.	.	.	.	60 g
VS F2/3	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
VS F1/3	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g
SARM 33	.	.	.	.	.	.	.	.	.	.	.	.	.	100 g

**FERROSILICALCIUM, FERROSILICOCHROMIUM, and FERROSILICOTITANIUM**

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

DH: 50 g units VS: 100 g units

#	Number	Si	Fe	Ca	Cr	Ti	Al	C	Cu	Mg	Mn	Mo	Ni	P	S	V	Zr
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	.	.
2	DH 2903	61.48	23.14	0.246	0.059	10.01	0.650	0.623	0.025	0.273	1.57	0.130	0.044	0.012	0.010	0.149	0.041
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



**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 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
IPT 61	99.79	0.054	.	(0.004)	.	0.014	(0.007)	(0.003)	.	.	(0.002)	.	.	.	0.026	0.010	(0.06)
IPT 62	99.62	0.11	.	(0.004)	.	0.072	(0.007)	(0.004)	.	.	(0.002)	.	.	.	0.036	0.010	0.10
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 S6	98.66	0.60	.	<0.02	.	0.032T	0.40	<0.02	.	.	<0.02	.	.	.	0.024	.	0.14
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

**CRM GLASS REFRACTIVE INDEX**

Number	High Wavelength	Refractive Index	Low Wavelength	Refractive Index	Certified Data Points	Units
SRM 1822	1082.97 nm	1.507143	404.66 nm	1.532710	15	5 x 12 x 17 mm
SRM 1822a	644.0250 nm	1.517277	480.1254 nm	1.526132	6	25 x 25 x 3 mm

**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 3608	97.88	0.680	0.056	0.129	.	0.026	0.542	0.097	0.056	.	0.018	0.020	0.010	0.001	.	0.034	0.30
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 3608	.	0.028	.	.	.	.	.	.	.	.	.
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

**HARGROVE GRINDABILITY INDEX**

Class	Set Number	HGI	HGI	HGI	HGI	units
CRM	SABS 1001	sample A : 37	sample B : 49	sample C : 55	sample D : 71	4 kg of each sample A - D
CRM	NCS AG82001c-4c	sample 1c: 36	sample 2c: 56	sample 3c: 75	sample 4c: 120	250 g of each sample 1c - 4c
RM	ASRM 011-10	sample A : 32	sample B : 50	sample C : 72	sample D : 97	2 kg of each sample A - D

**CRM HARDNESS TEST BLOCKS**

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
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
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	-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-FA014	60.7 J	1.7 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	-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**

BAM L101: BK7 glass plate 30 x 30 x 1 mm  
other BAM: 100Cr6 steel disc 30 mm Ø x 5 mm

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

Number	Material	Thickness	(+/-)	Layer 1	2	3	4	5	6	7	8	9	10	
BAM L102	TiN	single layer	3.14 µm	0.19 µm	.	.	.	.	.	.	.	.	.	
BAM L105	VC	single layer	2.69 µm	0.16 µm	.	.	.	.	.	.	.	.	.	
BAM L104	TiC	single layer	2.57 µm	0.17 µm	.	.	.	.	.	.	.	.	.	
BAM L103	VN	single layer	2.20 µm	0.19 µm	.	.	.	.	.	.	.	.	.	
BAM L100	Ti/Al	multi layer	1.63 µm	0.15 µm	.	.	.	.	.	.	.	.	.	
BAM L101	TiO <sub>2</sub> /SiO <sub>2</sub>	multi layer	964 nm	24 nm	(93.6)	(91.5)	(92.1)	(106.2)	(93.5)	(92.4)	(93.7)	(101.7)	(91.4)	(108.4)
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 5204a	SiO <sub>2</sub>	single layer	3.49 nm	0.19 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 LEAD PAINT FILMS**

sold in SET/6 only, thin paint film on polyester sheets

~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

**CRM LENGTH STANDARDS**

The following certified length standards are available in different 'grades.' These grades specify the standard deviation of the certified length. Each set has certain grades available to choose from.

**SET L-D83 - Includes 83 pieces, from 0.5 mm to 100 mm. Choose any grade for the set.**

0.5, 1.0, 1.005, 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.09, 1.1, 1.11, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.2, 1.21, 1.22, 1.23, 1.24, 1.25, 1.26, 1.27, 1.28, 1.29, 1.3, 1.31, 1.32, 1.33, 1.34, 1.35, 1.36, 1.37, 1.38, 1.39, 1.4, 1.41, 1.42, 1.43, 1.44, 1.45, 1.46, 1.47, 1.48, 1.49, 1.5, 1.6, 1.7, 1.8, 1.9, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

**L-D38 - Includes 38 pieces, from 1 to 100 mm. Choose any grade from B to E.**

1, 1.005, 1.01, 1.02, 1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.08, 1.09, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

**L-D10A - Includes 10 pieces, from 1 mm to 1.009 mm. Choose any grade from B to E for the set.**

1, 1.001, 1.002, 1.003, 1.004, 1.005, 1.006, 1.007, 1.008, 1.009

**L-D10B - Includes 10 pieces, from 0.991 mm to 1 mm. Choose any grade from B to E for the set.**

0.991, 0.992, 0.993, 0.994, 0.995, 0.996, 0.997, 0.998, 0.999, 1

**L-D8 - Includes 8 pieces, from 125 mm to 500 mm. Choose any grade from B to E for the set.**

125, 150, 175, 200, 250, 300, 400, 500

**L-D5 - Includes 5 pieces, from 600 mm to 1000 mm. Choose any grade from B to E. Available as a set or individually.**

600, 700, 800, 900, 1000

**LK-D12 - Includes 12 pieces from 10 mm to 291.8 mm. Choose any grade from B to E for the set.**

10, 20, 20H, 41.2, 51.2, 81.5, 101.2, 121.5, 121.8, 191.8, 201.5, 291.8

**LQ-D20A - Includes 20 pieces, from 5.12 mm to 100 mm. Choose any grade from B to E for the set.**

5.12, 10.24, 15.36, 21.5, 25, 30.12, 35.24, 40.36, 46.5, 50, 55.12, 60.24, 65.36, 71.5, 75, 80.12, 85.24, 90.36, 96.5, 100

**LQ-D20B - Includes 5 pieces, from 5.12 mm to 25 mm. Choose any grade from B to D for the set.**

5.12, 10.24, 15.36, 21.5, 25

**LQ-D20C - Includes 6 pieces, from 25 mm to 50 mm. Choose any grade from B to D for the set.**

25, 30.12, 35.24, 40.36, 46.5, 50

**LQ-D20D - Includes 6 pieces, from 50 mm to 75 mm. Choose any grade from B to D for the set.**

50, 55.12, 60.24, 65.36, 71.5, 75

**LQ-D20E - Includes 6 pieces, from 75 mm to 100 mm. Choose any grade from B to D for the set.**

75, 80.12, 85.24, 90.36, 96.5, 100

The following grades specify the standard deviation ( ± μm)

Length (mm)	Grade A	Grade B	Grade C	Grade D	Grade E
-10	0.1	0.1	0.2	0.5	1.0
>10-18	0.1	0.2	0.3	0.6	1.0
>18-30	0.1	0.2	0.3	0.6	1.0
>30-50	0.1	0.2	0.4	0.7	1.5
>50-80	0.1	0.3	0.5	0.8	1.5
>80-120	0.2	0.3	0.6	1.0	2.0
>120-180	0.2	0.4	0.8	1.2	2.5
>180-250	0.3	0.5	1.0	1.6	3.5
>300	0.4	0.7	1.2	2.0	4.0
400	0.5	0.8	1.5	2.4	4.5
500	0.5	1.0	1.8	2.8	6.0
600	0.6	1.2	2.2	3.5	7
700	0.7	1.4	2.5	4.0	8
800	0.8	1.6	3.0	4.5	9
900	0.9	1.8	3.5	5	10
1000	1.0	2.0	4.0	6	11

**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

**RM MELTING POINT**

Number	Form	Melting point °C
501-951	6 inch nickel wire	1452°C
502-496	6 inch gold wire	1063°C

**MULTIELEMENT OXIDE MATERIAL**

analysis listed in mass % BAM: CRM glass disc 39 mm Ø x 5 mm BR: RM powder 5 g units

Number	Al <sub>2</sub> O <sub>3</sub>	As <sub>2</sub> O <sub>3</sub>	BaO	CaO	CdO	CeO <sub>2</sub>	Cl	CoO	Cr <sub>2</sub> O <sub>3</sub>	CuO	FeO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	MoO <sub>3</sub>	Na <sub>2</sub> O
BR 8	1.27	0.172	0.577	0.67	.	0.128	0.49	0.56	0.69	0.50	0.57	.	0.71	0.76	0.46	0.137	0.74
BAM S005A	(1.1)	0.0132	0.0115	(10.5)	0.0062	0.0105	0.0247	0.00494	0.00156	0.0112	.	0.0422	(0.7)	(2.3)	0.0124	0.0343	(13.7)
BAM S005B	(1.1)	0.0132	0.0115	(10.5)	0.0062	0.0105	0.0247	0.00494	0.00152	0.0112	.	0.0422	(0.7)	(2.3)	0.0124	0.0343	(13.7)

continued \* estimated value based on synthesis

Number	NiO	PbO	S	SO <sub>3</sub>	Sb <sub>2</sub> O <sub>3</sub>	Se	SiO <sub>2</sub>	SnO	SnO <sub>2</sub>	SrO	TiO <sub>2</sub>	Ti <sub>2</sub> O <sub>3</sub>	V <sub>2</sub> O <sub>5</sub>	ZnO	ZrO <sub>2</sub>
BR 8	0.66	0.108	0.43	.	0.11997	0.20*	1.31	0.106	.	0.743	0.63	0.112*	0.143	0.137	0.547
BAM S005A	0.00590	0.0202	.	0.1942	0.0132	0.00196	(71)	.	0.0100	0.0151	0.0164	.	0.0350	0.0203	0.0842
BAM S005B	0.00590	0.0202	.	0.1942	0.0132	0.00196	(71)	.	0.0100	0.0151	0.0163	.	0.0349	0.0203	0.0842

analysis listing continued for BR 8 \* estimated value based on synthesis

Number	Ag <sub>2</sub> O	BeO	Bi <sub>2</sub> O <sub>3</sub>	Br	Cs <sub>2</sub> O	F	Ga <sub>2</sub> O <sub>3</sub>	Gd <sub>2</sub> O <sub>3</sub>	GeO <sub>2</sub>	Hf <sub>2</sub> O <sub>3</sub>	I	In <sub>2</sub> O <sub>3</sub>	La <sub>2</sub> O <sub>3</sub>	Nb <sub>2</sub> O <sub>5</sub>	Nd <sub>2</sub> O <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>
BR 8	0.118	0.277*	0.095	0.098	0.012	0.51	0.010	0.012	0.11	0.0153	0.39*	0.0066	0.101	0.186	0.115*	1.145

  

Number	Pr <sub>2</sub> O <sub>3</sub>	Rb <sub>2</sub> O	Ru <sub>2</sub> O <sub>3</sub>	S	Sc <sub>2</sub> O <sub>3</sub>	Sm <sub>2</sub> O <sub>3</sub>	Ta <sub>2</sub> O <sub>5</sub>	Tb <sub>2</sub> O <sub>3</sub>	TeO <sub>2</sub>	ThO <sub>2</sub>	UO <sub>3</sub>	WO <sub>3</sub>	Y <sub>2</sub> O <sub>3</sub>
BR 8	0.117*	0.01095	0.0124*	0.43	0.0117	0.00812	0.111	0.0105	0.475*	0.102	0.1002	0.0064	0.0064

**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)

**RM OXIDES**

analysis listed in mass % continued analysis listed in mg/kg 100 g units

Number	CaO	CO <sub>2</sub>	MnO <sub>2</sub>	Mn <sub>3</sub> O <sub>4</sub>	Al <sub>2</sub> O <sub>3</sub>	BaO	C tot	CaO	Cl (H <sub>2</sub> O)	Cl tot	CO <sub>2</sub>	Co <sub>3</sub> O <sub>4</sub>	Cr <sub>2</sub> O <sub>3</sub>	CuO
DH P0101	55.96	43.95	.	.	.	5.7	.	.	.	.	.	.	.	1.2
DH P0301	.	.	99.947	.	15.9	11.3	.	2.2	.	.	.	59.2	32.7	.
DH P0302	.	.	.	99.986	21	12.3	.	3.2	.	.	.	.	37.9	.
DH P0401	Iron Oxide	.	.	.	22.1	3.1	.	4.6	.	.	70.0	30.7	23.4	.
DH P0402	Iron Oxide	.	.	.	805	.	107	41	957	.	117	575	133	.
DH P0403	Iron Oxide	.	.	.	924	.	(113)	46	1360	1373	.	112	591	132

Number	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	Mn <sub>3</sub> O <sub>4</sub>	MoO <sub>3</sub>	Na <sub>2</sub> O	NiO	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	SO <sub>3</sub>	SrO	TiO <sub>2</sub>	WO <sub>3</sub>	ZnO	-H <sub>2</sub> O(900°C)
DH P0101	5.6	.	165.7	.	.	78	.	.	(<20)	(100)	164	.	.	.	.
DH P0301	112.5	.	1.2	.	.	13.3	2	.	76.2	.	1.8	.	.	.	.
DH P0302	129.4	.	1.5	.	.	10.9	2.4	.	81.3	.	1.9	.	.	.	.
DH P0401	.	.	3.7	11.9	5.3	<7	.	2.9	.	16.5	0.12	.	12.6	9.5	173
DH P0402	.	12	12	3226	.	(27)	301	176	138	32	.	89	.	.	.
DH P0403	.	20	13	3522	.	(203)	301	195	376	62	.	87	.	.	.

**RM HALFNIUM DIOXIDE**

analysis listed in mass								30 g units
Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	MgO	SiO <sub>2</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	
OSO HFO-4-95	0.030	0.090	0.028	0.019	0.11	0.20	0.070	
OSO HFO-3-95	0.015	0.056	0.016	(0.010)	0.046	0.11	1.03	
OSO HFO-2-95	0.0045	0.012	0.0065	0.0031	0.013	0.021	0.44	
OSO HFO-1-95	0.0030	0.0023	0.0045	0.0024	0.0035	0.0022	2.12	

**CRM IRON OXIDE**

analysis listed in mass %													75 g units	
Number	Fe2O3	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	(0.006)	(<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 <sup>-</sup>	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 (<0.0002) of As, Bi, Ca, Co, Cu, K, Na, P, Pb, Sn, Ti, V, and Zn.

**RM MOLYBDENUM OXIDE**

analysis listed in mass %													100 g units	
Number	Mo	Al <sub>2</sub> O <sub>3</sub>	Tot.C	CaO	CuO	Fe <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	MgO	MnO	Na <sub>2</sub> O	PbO	S	SiO <sub>2</sub>	TiO <sub>2</sub>
DH 4706	57.55	1.178	0.016	0.644	0.106	3.83	0.407	0.207	0.036	1.009	0.053	0.050	7.52	0.092

**CRM NICKEL OXIDE**

certified analysis listed in mass % except * which is mg/kg													25 g units
Number	NiO	Al	Co	Cr	Cu	Fe	Mg	Mn	Si	Ti	Bi*	Pb*	Se*
SRM 673	77.7	0.001	0.016	0.0003	0.002	0.029	0.003	0.0037	0.006	0.003	0.06	3.5	0.2
SRM 672	77.1	0.004	0.55	0.003	0.018	0.079	0.020	0.095	0.11	0.009	0.3	38	0.40
SRM 671	76.6	0.009	0.31	0.025	0.20	0.39	0.030	0.13	0.047	0.024	0.07	16	2.0

continued informational analysis in mg/kg

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
SRM 672	0.3	74, 45	1.7	0.4	0.5	4	<0.2	<0.1	140
SRM 671	0.5	59, 45	0.7	0.8	0.4	2.7	<0.2	<0.1	160

Certified values show concentrations in nickel oxide. To convert values to the percent concentration in total metal present, multiply the values by 1.28 for SRM 671 and 672; for SRM 673 multiply by 1.29.

Where As has two values, the first is atomic absorption and the second is photometric (extraction and distillation.)

**CRM TITANIUM DIOXIDE SET**

Number	analysis listed in mass %					available in SET/8 ONLY				20 g units
	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	.	0.0280	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**

Number	analysis listed in mass %													NCS: 50 g units		SARM, VS: 100 g units		
	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 HC26612	98.09	.	.	.	.	.	0.16	.	.	0.15	.	1.11	0.027	0.014	0.17	.	.	As: 0.016
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	Al <sub>2</sub> O <sub>3</sub>	As	CaO	Cd	Cl	Co	F	Fe	MgO	Ni	Pb	S	Sb	SiO <sub>2</sub>	Units
IMN TC/P10	60.6	0.14	.	2.54	.	.	.	.	6.7	1.38	.	2.31	3.07	.	0.56	240 g
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 YTTRIUM OXIDE**

Number	analysis listed in mg/kg											10 g units		
	CeO <sub>2</sub>	Dy <sub>2</sub> O <sub>3</sub>	Er <sub>2</sub> O <sub>3</sub>	Eu <sub>2</sub> O <sub>3</sub>	Gd <sub>2</sub> O <sub>3</sub>	Ho <sub>2</sub> O <sub>3</sub>	La <sub>2</sub> O <sub>3</sub>	Lu <sub>2</sub> O <sub>3</sub>	Nd <sub>2</sub> O <sub>3</sub>	Pr <sub>6</sub> O <sub>11</sub>	Sm <sub>2</sub> O <sub>3</sub>	Tb <sub>4</sub> O <sub>7</sub>	Tm <sub>2</sub> O <sub>3</sub>	Yb <sub>2</sub> O <sub>3</sub>
NCS DC93001	2.16	2.14	2.11	2.48	2.15	2.31	2.88	2.02	2.44	2.12	2.16	2.05	2.06	2.21
NCS DC93002	17.22	21.25	21.62	22.6	21.22	21.25	17.54	20.17	21.52	18.84	21.07	20.85	20.34	21.04

**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 µm

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, µm	Uncertainty, µm	Material	Units
SRM 1691	0.269	± 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	± 0.1	± 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 Seiving Alpine Test NF X11-640	Units
TL 1BGa	3.11 g/cm <sup>3</sup>	3396 cm <sup>3</sup> /g	11.4% @ 2.0µm - 99.9% @ 160µm	71.4% @ 31.5µm - 100% @ 160µm	40 g

**CRM POROUS MATERIALS and SURFACE AREA**

Number	Description	Units	A <sub>BET</sub> (m <sup>2</sup> /g)	V <sub>p</sub> (cm <sup>3</sup> /g)	D <sub>1</sub> (nm)	D <sub>2</sub> (nm)	D <sub>3</sub> (nm)	(nm)		
			BET Specific Surface Area	Specific Pore Volume	Hydraulic Pore Diameter	Most Frequent Pore Diameter	Most Frequent Pore Diameter	Median Pore Width		
BAM P 109	Activated Carbon	10g	1396	.	.	.	.	.	.	
BAM P 108	Activated Carbon	10g	550	.	.	.	.	.	.	
BAM P 105	Porous glass	10g	198.5	0.2327	4.69	4.38	5.80	.	.	
BAM FD107	Faujasite Zeolite	10g	.	0.217 cm <sup>3</sup> /g <sup>-1</sup>	.	.	.	0.86	.	
Number	Description	Units	(nm)	(nm)	(cm <sup>2</sup> /g)	(mm <sup>3</sup> /g)	(mm <sup>3</sup> /g)	(mm <sup>3</sup> /g)	(mm <sup>3</sup> /g)	
			Mean Pore Radius	Most Frequent Pore Radius	Specific Surface Area	Specific Pore Volume	Pore Volume 100 Mpa	Pore Volume 195 Mpa	Pore Volume 200 Mpa	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 PM 104	Al <sub>2</sub> O <sub>3</sub> Type 150	10g	5.31	3.23	79.8	0.210	.	.	.	.
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

**CRM      RoHS/WEEE SAMPLES**

analysis listed in mg/kg

T = total

Number	As	Br	Cd	Cl	Cr	Hg	Pb	S	Material	Units
ERM EC681k	29.1	770	137	800	100	237	98	630	LDPE granule	Pellets 100 g
ERM EC680k	4.1	96	19.6	102.2	20.2	4.64	13.6	76	LDPE granule	Pellets 100 g
JSAC 0602-3	.	.	50.6	.	112.5	12.1	112.1	.	Polyester	Chips 50 g
JSAC 0601-2	.	.	5.2	.	10.8	1.3	11.6	.	Polyester	Chips 50 g
JSAC 0403	199	.	183	.	257 T	11.1	224	.	Soil	Powder 50 g
JSAC 0402	41.6	.	18.5	.	90.5 T	1.3	45.2	.	Soil	Powder 50 g

**CRM      RoHS/WEEE ABS**

analysis listed in mg/kg

Number	Br	Cd	Cr	Hg	Pb	Units
BAM H010 gran	240	93	470	(415)	479	Granules 100g
BAM H010 1mm	240	93	470	(415)	479	Disc 40 mm Ø x 1 mm
BAM H010 2mm	240	93	470	(415)	479	Disc 40 mm Ø x 2 mm
BAM H010 6mm	240	93	470	(415)	479	Disc 40 mm Ø x 6 mm
BAM H010 set	240	93	470	(415)	479	Discs 40 mm Ø x 1, 2, and 6 mm

**RoHS/WEEE SETS**

sold in sets only, as grouped

analysis listed in mass %

Number	As	Br	Cd	Cr	Hg	Pb	Se	Units
CRM plastic set								
JSAC 0631	.	.	0.00225	0.00258	0.00197	0.00245	.	40 mm Ø x 4 mm
JSAC 0632	.	.	0.00461	0.00933	0.00594	0.00929	.	
CRM soil set								
JSAC 0466	0.01093	.	0.01199	0.1483	0.01135	0.1214	0.1175	Powder 25 g
JSAC 0465	0.0550	.	0.06074	0.0738	0.00578	0.6124	0.0587	
JSAC 0464	0.02711	.	0.03010	0.0499	0.00286	0.03027	0.02919	
JSAC 0463	0.01376	.	0.01468	0.0244	0.001476	0.01516	0.01415	
JSAC 0462	0.00715	.	0.00742	0.01496	0.000727	0.00737	0.00716	
JSAC 0461	0.002153	.	(0.000030)	0.00972	0.0000075	0.00244	(0.000044)	
RM polyethylene set								
PE High	.	0.1100	0.0300	0.1003	0.1100	0.1199	.	31 mm Ø x 12 mm
PE Low	.	0.0500	0.0100	0.0400	0.0200	0.0403	.	
PE Blank	.	0	0	0	0	0	.	
RM polyvinyl chloride set								
PVC High	.	0.1101	0.0300	0.1001	0.1101	0.1201	.	31 mm Ø x 12 mm
PVC Low	.	0.0500	0.0100	0.0400	0.0200	0.0400	.	
PVC Blank	.	0	0	0	0	0	.	
RM polyethylene packaging set								
PACK High	.	.	0.0100	0.0101	0.0100	0.0101	.	31 mm Ø x 12 mm
PACK Low	.	.	0.0060	0.0031	0.0031	0.0031	.	
PACK Blank	.	.	0	0	0	0	.	

**CRM      ZINC RoHS/WEEE SAMPLES**

cast      mass %      50 mm Ø x 20 mm

Number	Cd	Cr	Hg	Pb
41X ZSC6	0.215	<0.0002	0.029	0.0077
41X ZSC3	0.119	0.0148	0.0021	0.0273
41X ZSC1	0.0288	0.0039	0.026	0.06
41X ZSC4	0.0131	0.0299	0.050	0.156
41X ZSC2	0.0016	0.0036	0.0053	0.111

## REFRACTORIES

# = class, where 1 = CRM and 2 = RM      T = Total      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>	-H <sub>2</sub> O
1	ASMW FF10	69.66	24.04	.	.	0.36	1.70	1.73	0.31	.	.	0.12	.	.	.	1.49	.	.
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
1	ASMW FF8	53.79	36.91	.	.	0.36	2.93	1.69	0.54	.	.	0.09	.	.	.	2.54	.	.
2	FQZ 2610	43.75	40.21	0.020	T	0.008	11.55	0.94	1.44	0.39	0.025	0.141	0.051	<0.001	.	1.01	0.049	0.124
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	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	CuO	Cr <sub>2</sub> O <sub>3</sub>	NiO	V <sub>2</sub> O <sub>5</sub>
ASMW FF10	.	.	.	.
DH 2611	.	.	.	.
ASMW FF8	.	.	.	.
FQZ 2610	.	.	.	.
DH 2612	.	0.385	0.032	0.027
DH 2602	.	.	.	.
DH 2613	0.004	0.140	.	0.020
DH 2609	.	.	.	.
VS K6/4	.	.	.	.
VS K10/3	.	.	.	.

## CRM ALUMINA REFRACTORY SET

SOLD IN SET/10 ONLY

20 g units

Number	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	B <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 310	94.7	0.41	.	0.03	0.02	1.32	0.97	0.04	0.08	2.06
JRRM 309	89.8	2.12	.	1.02	1.27	0.92	0.28	0.00	0.42	3.85
JRRM 308	86.5	10.2	.	0.09	0.41	0.10	0.05	0.11	0.26	1.79
JRRM 307	80.1	10.8	.	0.15	2.97	2.36	0.61	0.01	1.08	1.22
JRRM 306	74.1	17.3	.	0.62	1.95	1.75	0.10	0.01	0.99	2.68
JRRM 305	68.6	20.0	.	0.65	2.81	3.11	0.30	0.01	0.80	3.30
JRRM 304	63.0	27.5	.	0.18	3.46	0.38	0.37	0.05	0.27	4.34
JRRM 303	59.2	36.1	.	1.03	1.47	0.20	0.85	0.00	0.69	0.16
JRRM 302	53.9	37.7	.	0.87	4.49	0.66	0.69	0.20	0.56	0.59
JRRM 301	46.8	43.9	(0.87)	0.79	3.52	2.00	0.69	0.01	0.17	1.03

## CRM ALUMINA-MAGNESIA REFRACTORY SET

SOLD IN SET/10 ONLY

certified values

20 g units

informational values

Number	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

SOLD IN SET/10 ONLY

certified values

20 g units

informational values

Number	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 REFRACTORY 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 REFRACTORY 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 REFRACTORY 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>					
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					
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					
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					
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					
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					
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					
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					
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					
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					
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					

**CRM SILICA REFRACTORY**

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	Li <sub>2</sub> O	Na <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	LOI	Units
IPT 63	96.28	0.48	2.21	0.52	0.043	0.18	0.008	(0.0005)	0.013	0.013	0.030	(0.002)	0.17	80 g

**CRM SILICA REFRACTORY SET**

Number	SOLD IN SET/10 ONLY					20 g units			
	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 210	97.69	0.16	0.30	0.83	0.00	0.78	0.00	0.02	0.00
JRRM 209	96.22	0.87	1.89	0.37	0.17	0.10	0.06	0.03	0.05
JRRM 208	94.43	0.46	4.19	0.06	0.02	0.05	0.00	0.63	0.00
JRRM 207	94.05	1.70	2.51	0.96	0.21	0.16	0.04	0.04	0.07
JRRM 206	92.88	1.77	1.20	3.20	0.50	0.07	0.01	0.18	0.01
JRRM 205	90.40	3.08	3.11	1.24	0.50	0.09	0.06	0.93	0.32
JRRM 204	89.64	4.49	1.79	2.08	0.90	0.31	0.10	0.31	0.15
JRRM 203	87.33	5.09	3.97	1.78	0.24	0.47	0.11	0.61	0.18
JRRM 202	85.72	7.59	0.81	3.97	0.02	0.02	0.00	1.01	0.56
JRRM 201	84.36	9.71	2.77	1.46	0.14	0.73	0.14	0.31	0.03

**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>
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
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
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
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
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
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
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
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
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
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

**RM RICE STRAW ASH - THERMOSTIL**

Number	typical analysis													100 g units	
	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 5706	87.92	0.073	3.62	0.056	1.04	0.125	3.10	0.526	0.271	0.124	0.755	0.593	0.231	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 5707	82.15	0.223	4.03	0.158	1.78	1.50	1.89	5.09	0.259	0.117	0.443	0.524	0.223	1.82	
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 4505	58.23	6.62	0.659	0.031	18.41	11.30	0.502	3.98	0.096	0.059	0.045	<0.01	0.022	0.242	0.139	0.114	0.003	.	.
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 % CERAM: 25 or 100g 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	NH 8-2-03	98.05	0.18	.	.	0.25	.	.	.	.	.	.	.	.	0.85	.
1	VS K1/2	96.0	0.6	.	1.37	.	1.2	.	.	0.05	0.03	.	0.010	.	.	.
1	NH 8-2-02	95.29	0.21	.	1.93	.	0.48	.	.	.	.	.	.	.	0.68	.
1	ECRM 777-1	95.06	0.795	.	2.826	.	0.330	0.154	.	0.071	.	0.02	.	.	0.444	.
1	NH 8-2-01	93.69	0.40	.	2.73	.	0.82	.	.	.	.	.	.	.	0.80	.
1	NH 8-2-06	92.59	0.82	.	2.53	.	1.11	.	.	.	.	.	.	.	0.70	.
1	NH 8-2-04	92.55	0.87	.	3.11	.	0.90	.	.	.	.	.	.	.	0.79	.
1	ASMW FF11	92.24	4.14	.	0.10	.	0.49	0.46	.	0.11	.	0.04	.	.	0.40	.
1	NH 8-2-05	91.90	1.24	.	3.81	.	0.76	.	.	.	.	.	.	.	0.62	.
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	.
2	CERAM 2CAS7	49.9	44.4	0.08	0.36	.	2.58	0.54	0.07	0.4	.	0.13	.	.	1.35	0.07
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 and 2 = RM analysis listed in mass % T = Total

#	Number	Type	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 313/1	High Si	99.78	0.036	0.006	<0.001	0.012	0.005	0.0013	0.0013	0.003	.	0.017	.	100 g	.
1	GBW 03112	High Si	98.51	0.84	0.077	0.00034	0.093	0.061	0.066	(0.0016)	0.021	(0.0041)	0.020	0.24	60 g	.
1	CMSI 1781	High Si	98.38	0.57	0.009	.	0.45	.	0.021	.	.	.	0.20	.	100 g	.
1	GBW 03113	High Si	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	Si Fume	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	GBW 03114	High Si	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	.
1	GBW 03117	Si Glass	71.25	2.56	6.37	.	0.18	1.10	3.98	.	13.77	.	0.057	0.44	50 g	.
1	SARM 69 *	Ceramic	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	.
2	CERAM CEB1	Earthenware	74.0	16.2	0.52	<0.01	0.48	1.75	0.16	.	0.71	0.14	0.34	5.60	25 or 100g	BaO: 0.05

\* 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 100 g units listed in mg/kg

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 07707	2.0	200	200	2000	20	20	2.0	200	200	200	200	200	213	2000
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 07707	20	200	200	200	20	20	203	2000	200	20	200	20	200	200
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	.

**CRM SILICON CARBIDE**

in the chart below, (F) = Free and (T) = Total analysis listed in mass %

Number	SiC	Si (F)	C (T)	C (F)	Al	Al <sub>2</sub> O <sub>3</sub>	Ca	Fe	Fe <sub>2</sub> O <sub>3</sub>	Mg	N	O	Ti	Units
VS K9/2	99.6	.	.	.	(0.002)	.	.	(0.06)	.	.	.	.	.	150 g
JRRM 1001	99.58	0.06	29.81	0.04	0.008	.	<0.001	0.044	.	<0.001	0.030	0.048	0.0035	50 g
NCS DC93021	98.73	.	.	0.11	.	0.11	.	.	0.45	.	.	.	.	100 g
NCS DC93022	88.76	.	.	2.14	.	1.65	.	.	2.14	.	.	.	.	100 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 S003	29.89	0.0493	.	(0.0481)	(0.0600)	0.0372	0.0063	0.00294	0.00035	0.00015	0.0149	.	0.00063
JRRM 1001	29.81	0.04	.	0.06	.	0.008	.	<0.001	.	.	0.044	.	<0.001
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
JCRM R022	30.4	1.62	68.1	0.31	.	0.058	.	0.025	0.006	.	0.051	.	0.005
JCRM R021	29.9	0.86	68.8	0.57	.	0.039	.	0.007	0.004	.	0.018	.	0.0021
JCRM R023	29.6	0.39	69.3	0.20	.	0.003	.	0.003	0.001	.	0.015	.	0.001

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)	Chips 100 g
NMIJ 8002a	0.000160	0.0109	.	.	.	.	0.00477	.	0.58	.	Beta Phase	Powder 50 g
BAM S003	0.000144	.	(0.0093)	0.00177	0.00329	0.0910	0.0079	0.00414	.	0.00252	green micro F800	Powder 50 g
JRRM 1001	.	.	0.030	.	.	0.048	0.0035	.	.	.	after HF treatment SiC: 99.58%	Chips 50 g
NMIJ 8001a	.	.	.	.	.	.	0.000637	.	0.31	.	Alpha Phase	Powder 50 g
ECRM 780-1	0.029	.	0.325	(0.0502)	.	.	.	.	.	.	n/a	Chips 100 g
JCRM R022	0.001	.	.	.	0.001	0.98	0.003	<0.001	.	0.001	set JCRM R021 - R023 only	Powder 50 g
JCRM R021	<0.001	.	.	.	0.001	1.08	0.010	0.002	.	0.001	set JCRM R021 - R023 only	Powder 50 g
JCRM R023	<0.001	.	.	.	0.001	0.86	<0.001	<0.001	.	<0.001	set JCRM R021 - R023 only	Powder 50 g

**CRM SILICON NITRIDE**

Number	analysis listed in mass %								analysis listed in mg/kg								Units
	Si	N	Al	C	Ca	Fe	Mg	O	Co*	Mn*	Na*	Ni*	Ti*	W*	Zr*	̑-phase of Si <sub>3</sub> N <sub>4</sub>	
SRM 8983	.	39.23	.	0.107	.	.	.	1.20	.	.	.	.	.	.	.	.	4.5 g
NMIJ 8004a	59.226	38.485	0.07397	.	0.00727	0.01969	0.001029	.	.	2.987	.	2.485	8.519	.	2.146	.	25 g
BAM ED101	.	38.1	0.0469	0.162	0.00141	0.00795	0.00043	(1.91)	43.5	.	7.59	.	.	41.3	.	7.43	50 g

**CRM SILICON NITRIDE**

Number	Powder	analysis listed in mass %			SRM 656 is two 10 g powder units, one ̑ and one ̒ phase powder			Amorphous	Uncertainty ±	Units
		Mass ̑	Uncertainty ±	Mass ̒	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 SILICOALUMINUM**

Number	analysis listed in mass %													Units
	Al	Si	Fe	Ba	C	Ca	Cr	Cu	Mg	Mn	Ni	P	S	
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	
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	
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	
NCS HC13602	32.55	32.01	20.59	7.41	0.27	1.17	.	.	0.85	0.197	.	0.017	0.0096	
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	
NCS HC14601	1.55	59.24	9.71	16.54	0.21	9.89	0.035	0.13	.	0.067	0.012	0.024	0.051	

**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
2	BS 119	32.3	62.3	0.46	.	0.30	.	3.0	.	.	.	.	.	0.033	0.01	.	100 g
2	DH 0406	30.48	60.79	0.333	.	0.61	<0.009	<0.010	5.17	0.010	0.056	<0.021	<0.007	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 F26/2	29.9	59.5	1.52	.	.	.	.	6.29	.	.	.	.	0.024	0.030	0.156	100 g
2	DH 0403	28.60	60.12	1.59	.	0.40	0.018	0.016	5.56	0.188	0.611	0.003	0.008	0.014	.	0.169	50 g
2	DH 0402	28.48	58.68	1.13	.	.	0.009	0.014	6.74	0.047	0.051	.	.	0.013	.	0.055	50 g
2	DH 0404	26.79	62.53	1.74	.	0.533	0.016	0.020	5.03	0.036	0.094	0.026	0.007	0.011	.	0.238	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	.	70 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

**SILICOMANGANESE**

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

#	Number	Mn	Si	Fe	Al	B	C	Ca	Co	Cr	Cu	Ni	P	S	Ti	V	Units
2	DH 0107	77.82	17.36	2.64	.	.	1.65	.	0.030	.	0.012	0.021	0.135	.	0.122	0.015	50 g
1	VS F23/2	73	18.08	.	.	.	1.43	.	.	.	.	.	0.488	0.022	.	.	100 g
1	NCS HC18603	66.70	17.21	.	.	.	1.70	.	.	.	.	.	0.183	0.025	.	.	50 g
1	NCS HC25605a	66.30	18.28	.	.	.	0.0063	1.09	.	.	.	.	0.145	0.010	0.18	.	50 g
1	MHCX03	65.5	29.2	4.92	(0.013)	(0.009)	0.04	.	.	0.20	0.13	0.11	0.047	0.004	0.49	.	100 g
1	NCS HC25654	65.29	19.26	.	.	.	0.022	0.876	.	.	.	.	0.109	0.0122	0.19	.	50 g
1	ECRM 586-1	62.48	33.96	2.887	0.218	.	0.0252	0.0386	0.0069	0.0440	.	.	0.040	.	.	0.0408	100 g
1	NCS HC25646	59.34	32.90	.	.	.	0.048	0.018	.	.	.	.	0.043	0.0034	0.24	.	50 g
2	DH 0301	59.06	30.16	9.91	0.016	0.0048	0.015	.	0.028	0.035	0.019	0.033	0.050	.	0.471	0.015	50 g

**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	.

**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	37.0	10.3	0.20	0.23	.	0.17	5.87	0.19	0.16	.	1.14	0.20	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
2	BS 100A	37.6	35.2	10.13	0.07	0.30	.	0.49	12.9	0.35	0.18	.	1.2	0.50	100 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	37.3	37.44	12.9	0.03	0.25	.	0.81	8.3	1.72	0.26	.	0.81	0.63	50 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	30.2	36.7	18.5	0.07	0.28	.	0.36	11.01	1.11	0.20	.	1.8	0.42	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

GBW: 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>
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	53.7	.	.	18.8	1.47	.	.	11.0	(0.006)	.	3.1	5.2	(0.028)	0.77	.	0.19	0.92	.
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	52.4	.	.	23.7	0.61	.	.	6.3	(0.003)	.	9.2	3.45	0.009	0.78	.	0.18	0.8	.
2	BS 101/4	51.9	.	.	16.5	0.87	.	.	13.4	(0.007)	.	4.6	4.7	(0.023)	0.80	.	0.15	1.21	.
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	47.0	.	.	16.8	0.9	.	.	15.2	(0.006)	.	8.1	4.8	0.031	0.70	.	0.23	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	46.0	.	.	14.9	0.57	.	.	19.2	(0.005)	.	5.5	5.7	(0.043)	0.71	.	0.12	1.1	.
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 147	40.29	.	.	12.87	4.40	0.48	.	19.59	16.11	.	5.20	5.45	.	2.44	.	0.146	0.50	.
1	NH 148	39.76	.	.	6.52	1.62	0.86	.	18.44	0.29	.	4.94	3.78	.	10.84	.	0.112	0.25	.
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	NH 155	34.35	.	.	19.19	10.20	0.68	.	13.17	0.11	.	4.70	3.91	.	4.26	.	0.124	0.38	.
1	NH 142	29.56	.	.	22.16	3.13	0.55	.	16.52	16.89	.	5.38	12.09	.	2.08	.	0.067	0.69	.
1	CMSI 1744	26.73	.	.	8.91	3.92	.	.	34.33	36.55	.	12.15	2.01	.	0.87	.	0.107	0.32	.
1	NH 141	26.22	.	.	22.47	2.74	(0.85)	.	21.37	22.99	.	(4.02)	10.85	.	2.14	.	0.081	0.63	.
1	VS W4/1	25.7	.	.	16.80	3.62	.	.	22.9	24.6	.	17.8	4.23	.	P: 0.265	.	0.036	1.05	.
1	VS W4/4	25.5	.	.	16.7	3.62	.	.	23.2	25.5	.	18.3	4.37	.	P: 0.259	.	0.037	1.02	.
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 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 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 144	20.50	.	.	22.18	2.42	1.32	.	28.47	31.61	.	2.85	9.72	.	2.02	.	0.091	0.55	.
1	NH 153	15.17	.	.	12.12	3.37	36.50	.	7.09	8.05	.	16.68	4.47	.	(0.01)	.	0.036	2.26	.
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

**BLAST FURNACE SLAG**

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

JSS: 70 g units

all others: 100 g units

Number	CaO	Ca	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	MgO	Fe	FeO	K <sub>2</sub> O	Mn	MnO	Na <sub>2</sub> O	P	P <sub>2</sub> O <sub>5</sub>	S	TiO <sub>2</sub>
1 IMZ 278	51.70	.	17.43	1.49	3.24	12.37	10.96	(0.013)	4.47	.	(0.026)	0.451	.	0.139	(0.178)
1 IMZ 275	44.35	.	40.99	4.71	5.18	0.548	.	1.01	0.598	.	(0.823)	(0.0097)	.	0.368	0.160
1 IMZ 272	43.85	.	41.80	4.74	5.26	(0.93)	.	(0.423)	0.608	.	(0.342)	0.010	.	0.534	(0.170)
1 IMZ 271	43.81	.	41.35	4.76	5.03	1.57	.	0.426	0.615	.	0.350	(0.011)	.	0.535	(0.188)
1 IMZ 273	43.45	.	42.50	7.09	1.98	1.08	.	0.674	0.882	.	0.620	(0.0097)	.	0.572	0.258
1 IMZ 274	43.37	.	38.91	5.25	4.67	3.36	.	0.456	0.635	.	0.331	(0.011)	.	0.563	0.205
1 JSS 905-1	42.1	.	34.2	14.2	6.8	0.17	.	K: 0.308	.	0.22	Na: 0.143	0.008	.	0.558	0.56
2 DH 3227	41.07	.	37.50	12.09	6.314	0.196	.	0.527	0.433	.	.	.	.	0.989	0.700
2 DH 3231	40.85	.	37.31	12.5	6.225	0.252	.	0.43	0.362	.	.	.	.	1.069	0.776
2 DH 3229	40.68	.	37.35	12.53	6.15	0.193	.	0.529	0.365	.	.	.	0.008	1.05	0.742
2 DH 3221	40.54	28.97	35.69	10.99	10.00	0.230	.	0.525	0.161	.	0.428	.	.	1.55	0.572
1 DH 3230	40.42	.	37.24	12.64	5.94	0.667	.	0.431	0.402	.	.	.	.	1.044	0.729
2 DH 3225	.	28.59	38.06	12.80	7.63	0.385	.	0.115	0.129	.	0.092	.	.	1.55	0.247
2 DH 3218	.	28.35	36.86	12.38	7.63	0.358	.	0.557	0.292	.	0.364	.	0.006	1.32	0.480
2 DH 3219	.	28.24	39.26	10.00	7.47	0.383	.	0.744	0.981	.	0.303	.	0.026	0.818	0.533
1 VS W1/2	38.8	.	37.9	8.48	9.35	.	0.47	.	.	0.22	.	.	.	0.69	.
1 NCS HCl3810	38.57	.	34.08	7.08	16.97	0.64	0.58	.	.	0.089	.	.	0.037	0.536	0.36
1 IMZ 276	38.57	.	10.92	1.02	5.75	25.12	22.11	(0.0062)	4.88	.	(0.017)	0.416	.	0.076	(0.172)
2 DH 3223	.	27.21	38.07	9.39	9.53	0.662	.	1.62	0.726	.	0.391	.	0.012	1.08	0.393
2 DH 3224	.	27.10	37.88	12.86	7.03	2.53	.	0.170	0.145	.	0.102	.	.	1.55	0.265
2 DH 3207	.	26.62	42.09	7.29	9.35	0.872	.	0.600	0.754	.	0.192	.	.	0.65	0.471
1 NCS HCl3809	36.50	.	30.95	7.84	20.77	0.78	0.60	.	.	0.077	.	.	0.049	0.535	0.84
1 IMZ 277	35.65	.	16.32	1.61	6.39	23.63	(21.69)	(0.019)	4.04	.	(0.032)	0.392	.	0.065	(0.177)
1 NH 7-1-006	32.7	.	38.5	7.05	16.8	0.59	.	(0.61)	.	1.24	(0.35)	.	.	(0.56)	0.34
1 VS W3/2	31.7	.	30.1	14.5	12.1	.	.	.	.	0.58	.	.	.	0.51	9.62
1 NH 7-1-012	0.57	.	51.4	45.2	(0.21)	1.02	.	(0.02)	.	0.06	(0.52)	.	.	(0.009)	(0.09)

Number	BaO	C tot.	CO <sub>2</sub>	Cr <sub>2</sub> O <sub>3</sub>	Sr	SrO	V <sub>2</sub> O <sub>5</sub>	Zn	Zr	ZrO <sub>2</sub>	-H <sub>2</sub> O 900°C
IMZ 278	.	.	.	.	.	.	(0.003)	.	.	.	.
IMZ 275	.	.	.	.	.	.	(0.0026)	.	.	.	.
IMZ 272	.	.	.	.	.	.	(0.050)	.	.	.	.
IMZ 271	.	.	.	.	.	.	(0.036)	.	.	.	.
IMZ 273	.	.	.	.	.	.	(0.0026)	.	.	.	.
IMZ 274	.	.	.	.	.	.	0.051	.	.	.	.
JSS 905-1	.	.	.	.	.	.	.	.	.	.	.
DH 3227	0.094	.	.	.	.	0.054	.	.	0.039	.	.
DH 3231	.	.	.	.	.	0.055	.	.	0.044	.	.
DH 3229	.	.	.	.	.	0.055	.	.	0.045	.	.
DH 3221	.	.	.	.	.	0.066	.	.	.	.	.
DH 3230	0.090	.	.	.	.	0.054	.	.	0.042	.	.
DH 3225	0.086	.	.	.	.	0.053	.	.	0.046	.	.
DH 3218	0.093	.	.	0.008	.	0.086	.	.	0.041	.	.
DH 3219	.	0.028	0.060	.	.	0.045	.	.	.	.	0.07
VS W1/2	.	.	.	.	.	.	.	.	.	.	.
NCS HCl3810	.	.	.	.	.	.	.	.	.	.	.
IMZ 276	.	.	.	.	.	.	(0.009)	.	.	.	.
DH 3223	.	.	.	.	.	0.120	.	.	.	.	.
DH 3224	0.083	.	.	.	.	0.052	.	.	0.043	.	.
DH 3207	.	.	.	.	0.030	.	.	.	0.016	.	.
NCS HCl3809	.	.	.	.	.	.	.	.	.	.	.
IMZ 277	.	.	.	.	.	.	(0.012)	.	.	.	.
NH 7-1-006	.	.	.	.	.	.	.	.	.	.	.
VS W3/2	.	.	.	.	.	.	0.25	.	.	.	.
NH 7-1-012	.	.	.	.	.	.	.	.	.	.	.

**CRM COPPER CONVERTER SLAG**

Number	Ag	Co	Cu	Fe	Ni	Mo	S	V	Units
IMN ZM6	0.0031	0.39	2.12	46.72	0.080	0.021	1.04	0.006	250 g

**CONVERTER SLAG**

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

#	Number	CaO	Ca	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	F	Fe	FeO	K <sub>2</sub> O	MgO	Mn	MnO	Na <sub>2</sub> O	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 3917	59.02	.	14.86	1.304	.	10.15	.	.	1.907	2.994	.	.	.	1.89	0.206	0.47	0.54
2	DH 3913	56.31	.	9.87	0.76	.	14.61	.	.	1.07	4.40	.	.	0.077	2.29	0.152	0.423	0.553
2	DH 3918	56.02	.	13.47	1.25	.	12.71	.	.	2.21	3.11	.	.	0.045	1.88	0.218	0.421	0.538
2	DH 3919	52.95	.	11.94	0.974	.	16.08	.	.	2.235	3.167	.	.	0.044	1.766	0.213	0.368	0.508
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 3921	50.05	.	10.56	4.79	0.500	16.92	.	0.013	2.99	2.31	.	0.020	0.030	1.36	0.196	0.780	0.422
1	VS SH5/3	48.3	.	16.0	1.25	.	17.1	3.01	.	3.14	.	4.89	.	.	.	0.209	.	.
1	NCS HC19809	47.6	.	15.74	9.92	0.297	7.64	.	.	3.9	.	3.57	.	.	.	0.244	3.04	2.9
2	DH 3923	46.50	.	11.52	1.27	0.030	20.33	.	0.013	3.23	2.74	.	0.014	0.046	1.73	0.288	1.21	0.522
1	NCS HC13813	.	34.55	18.85	1.55	.	12.96	9.75	.	9.27	.	3.10	.	.	0.98	0.096	0.46	.
1	CMSI 1755	.	25.90	12.20	3.08	0.85	18.82	.	0.052	11.67	.	1.64	0.030	.	0.95	0.089	0.781	.

Number	CaF	Cr	Cr <sub>2</sub> O <sub>3</sub>	CuO	MoO <sub>3</sub>	SrO	Zn	ZnO	Units
DH 3917	.	0.108	.	.	.	.	0.002	.	100 g
DH 3913	.	0.168	.	0.009	0.007	.	.	.	100 g
DH 3918	.	0.120	.	.	.	0.030	.	.	100 g
DH 3919	.	0.141	.	.	.	0.028	.	.	100 g
DH 3911	.	0.154	.	0.007	.	.	0.003	.	100 g
DH 3921	.	0.196	.	0.007	.	.	.	.	100 g
VS SH5/3	.	.	.	.	.	.	.	.	100 g
NCS HC19809	.	.	.	.	.	.	.	.	80 g
DH 3923	.	.	0.216	.	.	.	.	.	100 g
NCS HC13813	1.03	.	.	.	.	.	.	.	100 g
CMSI 1755	.	.	.	.	.	.	.	.	50 g

**CRM ELECTRIC FURNACE SLAG**

100 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	8.73	0.82	1.89	2.25	15.67	2.39	0.030	0.25	24.77	0.25
CMSI 1756	16.19	4.00	0.17	15.27	13.12	21.18	13.16	0.125	0.036	21.35	0.18
NCS HC13812	15.53	4.10	0.52	24.03	21.08	14.06	5.11	0.41	0.085	23.49	0.44

**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	.	.
JK S9	17.3	35.5	39.0	29.1	31.5	0.042	0.04	2.2	0.04	0.005	1.4	0.05	0.11
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	.	.

**RM LADLE SLAG**

100 g units

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	F	Fe	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>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	-H <sub>2</sub> O @ 1000°C
FQZ 0107	35.86	41.99	0.161	0.190	4.04	0.021	4.92	4.47	0.119	0.710	0.059	4.29	0.540	0.380	(0.09)
FQZ 0207	35.98	47.40	0.053	0.50	2.72	0.013	5.35	2.09	0.035	0.178	0.114	3.72	0.287	0.119	(0.11)
FQZ 0298	20.93	43.08	0.360	0.128	13.16	0.011	5.69	4.96	0.007	0.59	0.079	4.23	0.251	0.204	0.120
FQZ 0398	1.24	48.58	0.243	0.098	16.69	0.021	1.54	3.76	0.066	1.82	0.068	16.19	0.96	0.91	0.064

Number	Tot. C	CO <sub>2</sub>	Nb <sub>2</sub> O <sub>5</sub>	SrO	ZrO <sub>2</sub>
FQZ 0107	0.01	0.018	0.020	.	.
FQZ 0207	0.01	0.018	0.010	.	.
FQZ 0298	0.029	<0.01	0.007	0.018	0.004
FQZ 0398	0.027	<0.01	0.005	0.018	<0.001

**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 OPEN HEARTH SLAG**

Number	Al <sub>2</sub> O <sub>3</sub>	CaO	FeO	T.Fe	MgO	MnO	P <sub>2</sub> O <sub>5</sub>	TiO <sub>2</sub>	S	SiO <sub>2</sub>	Units
NCS HC13811	4.47	18.11	35.40	29.44	13.19	2.32	0.91	0.51	0.050	23.35	100 g

**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 %											100 g units	
Number	Al <sub>2</sub> O <sub>3</sub>	Ca	CaO	Fe	MgO	MnO	P <sub>2</sub> O <sub>5</sub>	S	SiO <sub>2</sub>	TiO <sub>2</sub>		
NCS HC18806	14.11	.	38.84	0.60	8.45	0.30	0.008	1.13	32.75	2.63		
NCS HC18807	16.48	.	35.77	1.10	8.77	0.74	0.009	0.90	33.04	0.73		
NCS HC18808	1.25	24.10	.	25.55	11.66	3.34	2.00	0.13	13.44	2.22		
NCS HC18809	21.94	35.21	.	0.30	6.55	0.18	0.024	0.69	16.50	1.03		

**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**

analysis listed in mass %													100 g units	
Number	TiO <sub>2</sub>	Ti <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Cr <sub>2</sub> O <sub>3</sub>	T.Fe	Fe <sub>2</sub> O <sub>3</sub>	MgO	MnO	S	SiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	LOI	
SARM 57	85.4	(27.1)	1.23	0.16	0.16	.	11.8	0.98	1.76	.	1.72	0.39	(3.92)	
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	.	

**RM TITANIUM SLAG SET**

available in SET/9 ONLY									20 g units	
Number	Al	Ca	Cr	Fe	Mg	MnO	Si	V		
OSO 6-88	1.44	0.29	0.64	4.38	0.44	0.70	0.89	0.21		
OSO 7-88	1.80	0.26	0.69	3.72	0.30	0.71	1.29	0.22		
OSO 8-88	1.91	0.34	0.70	9.10	0.76	0.97	1.96	0.35		
OSO 9-88	2.22	0.43	1.19	10.04	1.23	1.27	2.50	0.64		
OSO 10-88	2.99	0.67	1.58	8.86	1.59	1.83	1.68	0.53		
OSO 11-88	3.18	1.11	1.64	6.68	0.88	2.31	2.03	0.93		
OSO 12-88	2.14	1.23	1.95	9.32	2.29	1.14	1.10	1.00		
OSO 13-88	3.93	1.23	2.17	2.33	1.07	1.27	2.23	1.21		
OSO 14-88	3.95	1.76	3.75	4.50	2.98	1.41	2.82	1.47		



**RM SLUDGE**

typical analysis listed in mass % unless otherwise noted

Number	Type of Sludge	pH	Tot.Residue	Tot.Org.C	Kjeldahl N(TKN)	N as NH <sub>3</sub>	Tot.P	Oxygen Demand	Units
RT 006	Paint Sludge	10.84	.	.	.	.	.	.	50 g dry
RT 005	Sewage Sludge	7.59	.	.	.	.	(1.01)	.	50 g dry
RT 009	Electroplating	7.99	.	.	.	.	.	.	100 g wet
RT 010	Electroplating	3.86	.	.	.	.	.	.	100 g wet
RT 011	Electroplating	3.46	.	.	.	.	.	.	100 g wet
RT 018	Residential/Industrial	8.07	(55.3)	(15.4)	(2.6)	(0.7170)	(2.29)	.	50 g wet
RT 055	Residential/Industrial	7.61	(92.1)	.	4.11	(0.242)	2.31	0.0771	50 g dry
RT 029	Residential/Industrial	7.2	88.2	(12.3)	2.33	(0.623)	2.04	.	50 g dry
RT 031	Residential/Industrial	6.53	(93)	(15.3)	(4.1)	(0.6950)	(3.51)	.	40 g dry

continued analysis listed in mass %

Number	Al	B	Ba	Ca	Cr	Cu	Fe	K	Na	Ni	Pb	Sn	Zn
RT 006	0.00734	.	0.9970	0.0111	0.00111	.	0.00644	0.8710	0.00913	.	0.0753	.	73.700
RT 005	1.5300	.	0.0853	11.9000	0.00413	0.0465	1.2700	0.6230	0.2490	0.00260	0.00892	.	0.0625
RT 009	(0.0890)	(0.0150)	(0.0050)	(0.1100)	0.00503	12.1000	(0.3800)	(0.0640)	(1.8000)	0.0343	1.4200	(3.8000)	(0.0040)
RT 010	0.0693	.	0.0173	0.0563	0.00795	6.3200	0.2700	.	(0.1580)	0.0194	11.9000	.	0.0183
RT 011	(0.0020)	(1.8000)	(0.0005)	(0.0180)	5.9200	0.0108	(0.4700)	(4.9000)	(2.3000)	4.2000	0.0269	(0.0120)	.
RT 018	2.2400	(0.00258)	0.1100	4.9100	0.00401	0.0840	0.9900	0.2660	0.1000	0.00204	0.0126	.	0.1120
RT 055	1.3200	.	0.0347	4.8000	0.00404	0.0402	2.2500	.	(0.0715)	0.00192	0.00254	.	0.0563
RT 029	1.8200	(0.00166)	0.0806	3.7300	0.0325	0.0665	0.8640	0.2340	0.1110	0.0150	0.0277	.	0.0847
RT 031	2.1700	(0.00175)	0.0906	4.5900	0.00372	0.0805	0.9810	0.2420	0.0880	0.00196	0.0119	0.0134	0.1060

continued analysis listed in mg/kg

Number	Ag	As	Be	Cd	Co	Hg	Mg	Mn	Mo	Sb	Se	Si	Sr	Tl	V
RT 006	.	.	.	32.4	.	.	47.0	.	.	.	.	.	.	.	.
RT 005	36.3	6.91	0.610	13.7	6.18	3.23	6700	172	14.2	.	19.9	.	.	(2.99)	109
RT 009	8.90	(20)	.	(1)	(7)	(1)	(150)	(40)	(20)	(9)	.	.	(30)	(30)	(1)
RT 010	56.4	.	.	.	.	(1.4)	(80)	17.5	.	.	.	.	.	.	.
RT 011	(1)	(20)	.	(4)	(10)	(10)	(50)	(30)	.	(10)	(4)	.	(1)	(20)	(20)
RT 018	72.1	6.63	0.300	5.57	3.22	4.78	4300	200	10.5	(<2)	8.38	(609)	420	(<1)	39.2
RT 055	18	3.3	(1.17)	1.74	2.97	(1.71)	.	232	10.4	3.33	(6.21)	.	.	.	12
RT 029	54	26.5	4.35	537	3.07	4.17	3900	165	8.77	(2.41)	19.0	(782)	(372)	.	30.9
RT 031	101	6.45	88.3	5.74	2.96	5.18	4290	199	11.4	38.4	8.23	.	.	85.9	114

**CRM RED SLURRY**

analysis listed in mass % 50 g units

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

**CRM SULFUR**

Number	Recommended S Value (%)	95% Confidence Limits		Standard Deviation of Laboratories (%)		Number of Sets	Results	Units
		Low%	High%	Between	Within			
CAN HCC-1	33.92	33.80	34.03	0.14	0.095	9	53	50 g
CAN INM-1	22.17	21.97	22.37	0.24	0.051	9	53	50 g

**CRM SURFACE AREA**

data listed in m<sup>2</sup>/g

Number	Multipoint +/-		Single Point +/-		Units
SRM 1899	10.67	0.19	10.52	0.62	4 g silicon nitride powder
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	$72 \times 10^{-6} \text{h}^{-1} \pm 5$	278 h $\pm$ 16	557 h $\pm$ 30	3 rods 14 mm $\varnothing$ x 150 mm

**CRM TENSILE STRENGTH**

data shows estimates of (material, measurement) uncertainty

Number	ksi Tensile Strength	ksi Yield Strength	% Total Elongation	% Reduction	Material	Units
BS TRM-2	136.3 (0.3, 2.0)	128.9 (0.6, 3.9)	16.1 (0.4, 2.5)	54.6 (0.3, 1.7)	1018 steel	rod 25 mm $\varnothing$ x 158 mm
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 $\varnothing$ 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)	600 nickel	rod 25 mm $\varnothing$ x 158 mm

**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 661A	300 $\pm$ 7	318 $\pm$ 7	750 $\pm$ 13	40.9 $\pm$ 0.9	60 $\pm$ 4	3 rods 14 mm $\varnothing$ x 150 mm
BCR 661B	300 $\pm$ 7	318 $\pm$ 7	750 $\pm$ 13	40.9 $\pm$ 0.9	60 $\pm$ 4	1 rod 14 mm $\varnothing$ 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 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	.	.	.	.	.
BCS 352/1	W94-C6	6.154	0.036	.	0.0029	.	.	.	.	.
SRM 276b		6.10	.	.	.	.	.	.	.	.
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 ZIRCON CONCENTRATE**

analysis listed in mass %

DSU: 20 or 50 g units

all others: 100 g units

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

\* SARM 62 lists Total Fe as Fe<sub>2</sub>O<sub>3</sub> and Ti as TiO<sub>2</sub>