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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 ₂ | CO ₃ | Ca | Fe | K | Mg | Mn | Na | P | S as SO ₄ | 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 kgCaCO₃/t

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

CRM AIR PARTICULATE ON FILTER MEDIA

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

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

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

CRM ATTRITION INDEX

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

RM CALCIUM ALUMINATE

typical analysis

100 g

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

CRM CALCIUM CARBONATE

certified analysis in mass % and mg/kg

analysis in mg/kg

BAM: 100 g

SRM: 20 g units

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

CRM CASTING POWDER

analysis listed in mass %

powder 30 g

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

RM PORTLAND CEMENT WITH EXTENSIVE ANALYSIS analysis listed in mass %

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

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

| # | Number | CaO | SiO ₂ | Al ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | MgO | Na ₂ O | P ₂ O ₅ | SO ₃ | SrO | TiO ₂ | 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 |
| 2 | FLX 138 | 68.6 | 19.0 | 4.39 | 1.78 | 0.77 | 1.09 | 0.15 | 0.114 | 3.44 | 0.189 | 0.220 | . | 30 g |
| 1 | FLX CRM110 | 68.13 | 22.01 | 4.70 | 0.18 | 0.94 | 0.65 | 0.05 | 0.037 | 2.88 | 0.041 | 0.170 | (3.46) | 30 g |
| 1 | SRM 1886a | 67.87 | 22.38 | 3.875 | 0.152 | 0.093 | 1.932 | 0.021 | 0.022 | 2.086 | (0.018) | 0.084 | (1.56) | 4 x 5 g |
| 1 | FLX CRM107 | 67.19 | 21.81 | 4.23 | 1.29 | 0.70 | 0.70 | 0.18 | 0.160 | 3.13 | 0.151 | 0.194 | (6.59) | 30 g |
| 1 | FLX CRM109 | 66.45 | 20.39 | 4.25 | 2.32 | 1.06 | 1.59 | 0.18 | 0.052 | 3.11 | 0.144 | 0.203 | (5.96) | 30 g |
| 2 | JCA RM 611 | 66.25 | 21.84 | 5.41 | 3.20 | 0.34 | 1.08 | 0.40 | 0.59 | 0.25 | 0.28 | 0.30 | (0.51) | 30 g |
| 1 | SRM 1886b | 66.05 | 22.08 | 3.903 | 0.297 | 0.0164 | 1.526 | 0.01682 | 0.0413 | 2.757 | 0.0886 | 0.2054 | (2.174) | 5 x 5 g |
| 1 | FLX CRM106 | 66.05 | 20.29 | 5.70 | 1.98 | 0.86 | 0.96 | 0.12 | 0.111 | 3.01 | 0.206 | 0.271 | (2.06) | 30 g |
| 1 | NCS DC62103h | 65.78 | 22.07 | 4.56 | 3.22 | 0.69 | 2.11 | 0.16 | . | 0.32 | . | 0.37 | 0.60 | 20 g |
| 2 | TL 1Ca | 65.77 | 20.23 | 5.24 | 2.00 | 0.28 | 1.13 | 0.19 | 0.57 | 3.06 | 0.05 | 0.20 | (1.39) | 40 g |
| 1 | NCS DC62117 | 65.71 | 20.49 | 4.61 | 0.26 | 0.05 | 0.14 | 0.05 | . | 1.9 | . | 0.12 | 6.43 | 20 g |
| 1 | FLX CRM105 | 65.24 | 20.84 | 4.27 | 2.50 | 1.24 | 1.57 | 0.21 | 0.053 | 3.37 | 0.146 | 0.179 | (2.174) | 30 g |
| 1 | JCA CRM-1 | 65.21 | 20.99 | 5.26 | 2.67 | 0.56 | 2.13 | 0.26 | 0.28 | 2.05 | 0.05 | 0.35 | (0.63) | 60 g |
| 1 | FLX CRM108 | 65.15 | 20.06 | 4.66 | 2.97 | 0.74 | 2.15 | 0.09 | 0.169 | 3.31 | 0.083 | 0.186 | (2.68) | 30 g |
| 1 | SRM 634a | 65.07 | 20.493 | 5.015 | 3.362 | 0.3572 | 1.0057 | 0.0842 | 0.1767 | 2.780 | (0.0735) | 0.2463 | (1.66) | 100 g |
| 1 | BCS 353 | 64.8 | 20.5 | 3.77 | 4.82 | 0.49 | 2.42 | 0.10 | 0.077 | 2.25 | 0.23 | 0.16 | . | 100 g |
| 2 | FLX 137 | 64.77 | 20.78 | 4.99 | 3.07 | 0.769 | 1.64 | . | 0.171 | 3.17 | 0.076 | 0.221 | . | 30 g |
| 1 | FLX CRM100 | 64.51 | 20.89 | 5.54 | 2.62 | 0.82 | 1.47 | 0.23 | 0.166 | 2.97 | 0.286 | 0.283 | 2.37 | 50 g |
| 1 | CCRL 205 | 64.44 | 20.91 | 4.32 | 3.00 | 0.545 | 1.50 | 0.169 | 0.071 | 2.97 | 0.171 | 0.24 | 1.51 | 30 g |
| 2 | JCA 211S | 64.25 | 20.57 | 5.60 | 2.51 | 0.40 | 1.26 | 0.27 | 0.14 | 2.10 | . | 0.30 | 2.19 | 40 g |
| 1 | SRM 1880b | 64.16 | 20.42 | 5.183 | 3.681 | 0.646 | 1.176 | 0.0914 | 0.2443 | 2.710 | (0.0272) | 0.236 | (1.666) | 4 x 5 g |
| 1 | SRM 633a | 64.129 | 22.38 | 2.911 | 3.738 | 0.391 | 1.1532 | 0.203 | 0.14263 | 2.178 | (0.0507) | 0.2157 | (2.460) | 4 x 5 g |
| 1 | FLX CRM113 | 63.63 | 20.98 | 5.06 | 2.75 | 0.619 | 2.49 | (0.092) | 0.135 | 2.47 | 0.064 | 0.231 | (1.53) | 30 g |
| 1 | SRM 1888b | 63.13 | 20.42 | 4.277 | 3.062 | 0.658 | 3.562 | 0.1364 | 0.07307 | 2.634 | 0.1099 | 0.2316 | (various) | 4 x 5 g |
| 2 | JCA RM 613 | 63.00 | 19.51 | 5.36 | 2.78 | 1.20 | 1.07 | 0.23 | 0.15 | 6.07 | 0.15 | 0.35 | (3.45) | 30 g |
| 2 | JCA RM 612 | 62.95 | 20.12 | 5.19 | 2.81 | 0.90 | 1.52 | 0.52 | 1.02 | 4.51 | 0.045 | 0.28 | (2.52) | 30 g |
| 2 | CCRL 173 | 62.45 | 20.01 | 4.49 | 2.62 | 0.447 | 3.03 | 0.309 | 0.192 | 4.10 | . | 0.27 | 2.02 | 30 g |
| 2 | CCRL 174 | 62.43 | 20.75 | 3.71 | 3.62 | 0.430 | 4.83 | 0.189 | 0.067 | 2.64 | . | 0.21 | 1.14 | 30 g |
| 1 | NCS DC62101c | 62.23 | 20.41 | 4.68 | 3.20 | 0.71 | 2.66 | 0.12 | . | 3.16 | . | 0.27 | 2.18 | 20 g |
| 1 | CCRL 206 | 61.90 | 19.64 | 5.16 | 3.37 | 0.653 | 3.84 | 0.148 | 0.044 | 3.47 | 0.087 | 0.28 | 1.55 | 30 g |
| 1 | SRM 1885b | 61.87 | 20.05 | 4.70 | 3.044 | 0.497 | 3.86 | 0.293 | 0.0737 | 2.832 | 0.0795 | 0.2361 | (2.310) | 5 x 5 g |
| 2 | CCRL 172 | 61.78 | 19.30 | 4.66 | 2.93 | 0.935 | 4.74 | 0.267 | 0.111 | 3.21 | . | 0.26 | 2.09 | 30 g |

| Number | CO ₂ | Free CaO | Cl | Cr ₂ O ₃ | F | Mn | MnO | Mn ₂ O ₃ | S | ZnO | Ins. Res. |
|--------------|-----------------|----------|----------|--------------------------------|----------|--------------|-------|--------------------------------|----------|-----------|-------------------------------|
| BCS 354 | . | . | . | . | . | . | . | 0.058 | . | . | . |
| FLX 138 | . | . | . | . | . | . | . | 0.095 | . | 0.017 | . |
| FLX CRM110 | . | . | (0.008) | 0.004 | . | . | 0.029 | . | . | 0.003 | . |
| SRM 1886a | . | . | (0.0042) | 0.0024 | (0.02) | . | . | 0.0073 | . | (0.001) | (0.23) |
| FLX CRM107 | . | . | 0.043 | 0.006 | . | . | 0.040 | . | . | 0.013 | . |
| FLX CRM109 | . | . | 0.049 | 0.008 | . | . | 0.051 | . | . | 0.042 | . |
| JCA RM 611 | . | . | . | . | . | . | 0.06 | . | . | . | . |
| SRM 1886b | . | (0.24) | 0.00399 | 0.00404 | (0.0118) | . | . | 0.02639 | . | (0.00058) | (0.13) |
| FLX CRM106 | . | . | 0.055 | 0.008 | . | . | 0.161 | . | . | 0.012 | . |
| NCS DC62103h | . | . | . | . | . | . | . | . | . | . | 0.12 |
| TL 1Ca | . | (0.83) | . | . | . | . | . | . | . | . | (0.21) |
| NCS DC62117 | . | . | . | . | . | . | . | . | . | . | . |
| FLX CRM105 | . | . | 0.049 | 0.008 | . | . | 0.040 | . | . | 0.054 | . |
| JCA CRM-1 | . | . | . | . | . | 0.06 | . | . | . | . | . |
| FLX CRM108 | . | . | 0.042 | 0.007 | . | . | 0.219 | . | . | 0.036 | . |
| SRM 634a | . | (1.86) | . | (0.0114) | . | . | . | (0.0229) | . | (0.0222) | (0.21) |
| BCS 353 | . | . | . | . | . | . | . | 0.23 | . | . | . |
| FLX 137 | . | . | . | . | . | . | . | 0.266 | . | 0.029 | . |
| FLX CRM100 | . | . | (0.09) | 0.009 | . | . | . | 0.066 | . | 0.051 | . |
| CCRL 205 | . | 0.74 | 0.008 | 0.011 | . | . | . | 0.121 | . | 0.010 | 0.34 |
| JCA 211S | . | . | 0.022 | . | . | . | 0.05 | . | . | . | 0.23 |
| SRM 1880b | . | (2.227) | 0.01830 | 0.01927 | (0.0539) | . | . | 0.1981 | (0.0131) | (0.01054) | (0.487) |
| SRM 633a | . | (1.60) | 0.0087 | (0.0124) | (0.038) | BaO: (0.256) | . | 0.1176 | (0.049) | 0.123 | (0.23) |
| FLX CRM113 | . | . | . | (0.007) | . | . | . | 0.233 | (0.137) | 0.030 | . |
| SRM 1888b | . | (1.42) | 0.0143 | (0.01021) | (0.048) | . | . | 0.0652 | (0.15) | (0.01253) | (0.32) |
| JCA RM 613 | . | . | . | . | . | . | 0.08 | . | . | . | . |
| JCA RM 612 | . | . | . | . | . | . | 0.06 | . | . | . | . |
| CCRL 173 | 0.6 | 1.65 | 0.023 | 0.009 | . | . | . | 0.060 | . | 0.024 | 0.36 last, expires 12/31/2014 |
| CCRL 174 | . | 1.04 | 0.005 | 0.006 | . | . | . | 0.073 | . | 0.014 | 0.26 last, expires 12/31/2014 |
| NCS DC62101c | . | . | . | . | . | . | . | . | . | . | 1.20 |
| CCRL 206 | . | 0.97 | 0.014 | 0.011 | . | . | . | 0.029 | . | 0.020 | 0.22 |
| SRM 1885b | . | (0.27) | (0.0021) | 0.02709 | (0.0524) | . | . | 0.1282 | (0.042) | 0.0354 | (0.36) BaO: 0.0149 |
| CCRL 172 | 1.38 | 1.04 | 0.008 | 0.009 | . | . | . | 0.088 | . | 0.004 | 0.44 last, expires 12/31/2014 |

Hg: 0.02470 mg/kg
SO₄ as SO₃: 2.40

CEMENT chart 2 of 2

= class, where 1 = CRM and 2 = RM

analysis listed in mass %

| # | Number | CaO | Ca | SiO ₂ | Al ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | MgO | Na ₂ O | P ₂ O ₅ | SO ₃ | SrO | TiO ₂ | LOI | Units |
|---|--------------|-------|-------|------------------|--------------------------------|--------------------------------|------------------|-------|-------------------|-------------------------------|-----------------|---------|------------------|-----------|-----------|
| 1 | SRM 1884b | 61.31 | . | 19.30 | 4.851 | 2.937 | 0.957 | 4.74 | 0.278 | 0.0965 | 4.034 | 0.0258 | 0.2651 | (various) | 4 x 4.5 g |
| 1 | SRM 1887b | 61.15 | . | 19.59 | 4.911 | 2.471 | 0.961 | 3.624 | 0.288 | 0.1540 | 4.599 | 0.2625 | 0.2034 | 2.121 | 5 x 4 g |
| 1 | NCS DC62118 | 60.99 | . | 21.73 | 4.75 | 4.12 | 0.43 | 4.37 | 0.12 | 2.27 | . | . | 0.23 | 0.81 | 20 g |
| 1 | SRM 1889b | 60.11 | . | 18.39 | 5.79 | 2.891 | 1.115 | 2.82 | 0.36 | 0.297 | 4.3721 | 0.284 | 0.260 | (3.117) | 5 x 5 g |
| 1 | FLX CRM122 | 59.00 | . | 21.94 | 5.60 | 1.67 | 0.900 | 2.02 | 0.204 | 0.066 | (3.27) | 0.131 | 0.353 | (4.86) | 30 g |
| 1 | NCS DC62102d | 57.25 | . | 23.54 | 6.60 | 3.25 | 0.71 | 1.88 | 0.15 | . | 2.74 | . | 0.39 | 3.13 | 20 g |
| 2 | TL 203Ca | 57.09 | . | 18.75 | 4.78 | 2.34 | 0.93 | 4.80 | 0.21 | (0.13) | 3.28 | (0.06) | 0.24 | (7.24) | 40 g |
| 1 | FLX CRM130 | 56.60 | . | 14.35 | 11.62 | 2.88 | 0.682 | 1.84 | 0.277 | 0.067 | 10.91 | 0.052 | 0.563 | (5.12) | 30 g |
| 1 | JCA CRM-2 | 56.33 | . | 25.66 | 8.94 | 2.08 | 0.31 | 3.05 | 0.24 | 0.07 | (2.59) | 0.07 | 0.50 | (0.47) | 60 g |
| 1 | FLX CRM118 | 55.47 | . | 21.57 | 6.94 | 3.88 | 0.983 | 2.08 | 0.181 | 0.163 | (2.97) | 0.087 | 0.301 | (5.02) | 30 g |
| 1 | FLX CRM103 | 54.90 | . | 26.95 | 7.75 | 1.78 | 0.77 | 4.44 | 0.33 | 0.09 | 2.73 | 0.070 | 0.372 | (0.59) | 50 g |
| 1 | TL 201C | 54.48 | . | 25.63 | 6.81 | 2.08 | 0.73 | 3.35 | 0.32 | . | 3.16 | . | . | 1.96 | 40 g |
| 1 | FLX CRM117 | 54.22 | . | 28.05 | 7.68 | 1.37 | 0.916 | 2.95 | 0.223 | (0.035) | (3.49) | 0.098 | 0.564 | (0.402) | 30 g |
| 1 | FLX CRM115 | 53.93 | . | 27.29 | 8.13 | 0.972 | 0.612 | 2.93 | 0.194 | 0.073 | (3.90) | 0.117 | 0.610 | (1.56) | 30 g |
| 1 | FLX CRM119 | 53.78 | . | 24.04 | 7.36 | 3.04 | 1.23 | 1.34 | 0.292 | 0.153 | (2.43) | 0.158 | 0.347 | (6.42) | 30 g |
| 1 | FLX CRM120 | 53.63 | . | 26.51 | 7.64 | 1.11 | 0.692 | 3.55 | 0.184 | 0.086 | (4.35) | 0.124 | 0.598 | (1.71) | 30 g |
| 1 | FLX CRM114 | 51.29 | . | 28.61 | 6.94 | 1.37 | 0.954 | 4.93 | 0.277 | 0.027 | (4.07) | 0.108 | 0.525 | (1.28) | 30 g |
| 1 | FLX CRM116 | 50.05 | . | 30.81 | 9.11 | 0.86 | 0.693 | 4.47 | 0.201 | 0.034 | (3.14) | 0.091 | 0.690 | (-0.394) | 30 g |
| 1 | TL 200Ca | 49.97 | . | 26.55 | 8.72 | 4.07 | 1.10 | 2.06 | 0.21 | 0.45 | 2.84 | 0.13 | 0.46 | (3.30) | 40 g |
| 1 | SRM 1881b | 49.27 | . | 29.045 | 8.812 | 3.365 | 0.721 | 2.741 | 0.790 | 0.0510 | 2.72 | 0.0836 | 0.3011 | (1.699) | 4 x 5 g |
| 1 | FLX CRM101 | 48.43 | . | 30.29 | 8.86 | 3.54 | 2.10 | 1.72 | 0.657 | 0.189 | 3.12 | 0.248 | 0.463 | (5.13) | 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 DC62116a | 44.73 | . | 27.12 | 10.99 | 3.43 | 1.10 | 2.82 | 0.23 | . | 2.49 | . | 0.57 | 6.00 | 20 g |
| 1 | FLX CRM121 | 44.45 | . | 30.81 | 8.78 | 3.04 | 2.73 | 1.41 | 1.23 | 0.112 | 2.55 | 0.140 | 0.344 | (4.24) | 30 g |
| 1 | FLX CRM131 | 42.89 | . | 8.73 | 23.10 | 3.24 | 0.287 | 1.62 | 0.466 | 0.060 | 18.19 | 0.067 | 1.15 | (2.03) | 30 g |
| 1 | NCS DC62105g | 42.40 | . | 13.76 | 3.12 | 2.13 | 0.50 | 2.11 | 0.14 | . | 0.21 | . | 0.18 | 34.94 | 20 g |
| 1 | NCS DC62104b | 39.65 | . | 12.77 | 3.66 | 2.02 | 0.93 | 1.20 | 0.18 | . | 0.72 | . | 0.18 | 38.32 | 20 g |
| 1 | SRM 1882a | 39.29 | . | 4.01 | 39.14 | 14.67 | 0.051 | 0.51 | 0.021 | (0.070) | . | (0.024) | 1.786 | (0.20) | 4 x 5 g |
| 1 | SRM 1883a | 29.52 | . | 0.24 | 70.04 | 0.078 | 0.014 | 0.19 | 0.30 | (0.003) | . | (0.019) | (0.020) | (0.59) | 4 x 5 g |
| 2 | DH X0209 | . | 48.78 | 21.95 | 4.63 | 0.204 | 1.01 | 0.717 | 0.078 | 0.043 | . | 0.051 | 0.095 | . | 100 g |
| 2 | DH X0212 | . | 46.48 | 21.16 | 4.41 | 3.94 | 0.495 | 0.945 | 0.084 | 0.191 | . | 0.086 | 0.242 | . | 100 g |
| 2 | DH X0211 | . | 40.63 | 25.04 | 6.86 | 2.98 | 0.524 | 2.79 | 0.156 | 0.137 | . | 0.083 | 0.319 | . | 100 g |

| Number | BaO | Free CaO | Cl | Cr ₂ O ₃ | F | Mn | Mn ₂ O ₃ | S | Unignited SO ₃ | V ₂ O ₅ | ZnO | Ins. Res. |
|--------------|---------|----------|----------|--------------------------------|----------|----|----------------------------------|---------|--|-------------------------------|---------|-----------|
| SRM 1884b | . | (0.418) | (0.0065) | 0.00791 | (0.0394) | . | 0.0750 | . | . | . | . | (0.159) |
| SRM 1887b | (0.022) | 0.21 | 0.01001 | 0.01551 | 0.101 | . | 0.0957 | 0.025 | . | . | 0.01560 | 0.26 |
| NCS DC62118 | . | . | . | . | . | . | . | . | . | . | . | 1.18 |
| SRM 1889b | . | (0.52) | 0.0101 | 0.0083 | (0.10) | . | 0.084 | . | . | . | 0.0770 | (0.30) |
| FLX CRM122 | . | . | . | (0.004) | . | . | 0.111 | (0.288) | SO ₄ as SO ₃ : 2.62 | . | 0.027 | . |
| NCS DC62102d | . | . | . | . | . | . | . | . | . | . | . | . |
| TL 203Ca | . | (1.23) | . | . | . | . | . | . | . | . | . | (0.58) |
| FLX CRM130 | . | . | . | 0.021 | . | . | 0.062 | . | SO ₄ as SO ₃ : (10.18) | . | 0.018 | . |
| JCA CRM-2 | . | . | . | . | 0.15 | . | (0.32) | . | (1.91) | . | . | . |
| FLX CRM118 | . | . | . | 0.009 | . | . | 0.176 | (0.131) | SO ₄ as SO ₃ : 2.89 | . | 0.053 | . |
| FLX CRM103 | . | . | (0.040) | 0.007 | . | . | 0.170 | . | . | . | 0.014 | . |
| TL 201C | . | . | 0.06 Cl- | . | . | . | 0.31 S ₂ ⁻ | . | . | . | . | . |
| FLX CRM117 | . | . | . | (0.004) | . | . | 0.193 | (0.602) | SO ₄ as SO ₃ : 1.80 | . | 0.024 | . |
| FLX CRM115 | . | . | . | (0.004) | . | . | 0.214 | (0.611) | SO ₄ as SO ₃ : 2.41 | . | 0.008 | . |
| FLX CRM119 | . | . | . | 0.008 | . | . | 0.040 | (0.029) | SO ₄ as SO ₃ : 2.38 | . | 0.040 | . |
| FLX CRM120 | . | . | . | (0.005) | . | . | 0.188 | (0.632) | SO ₄ as SO ₃ : 3.18 | . | 0.008 | . |
| FLX CRM114 | . | . | . | (0.005) | . | . | 0.154 | (0.676) | SO ₄ as SO ₃ : 2.50 | . | 0.022 | . |
| FLX CRM116 | . | . | . | (0.005) | . | . | 0.238 | (0.737) | SO ₄ as SO ₃ : 1.22 | . | 0.015 | . |
| TL 200Ca | . | (0.34) | . | . | . | . | . | . | . | . | . | (17.42) |
| SRM 1881b | 0.191 | (1.16) | 0.0081 | 0.00949 | (0.09) | . | 0.1175 | . | . | . | 0.1198 | (16.4) |
| FLX CRM101 | . | . | . | 0.011 | . | . | 0.116 | . | . | . | 0.046 | . |
| DH X0210 | 0.071 | . | . | . | . | . | 0.327 | 1.77 | . | 0.011 | . | . |
| TL 202C | . | . | 0.01 Cl- | . | . | . | 0.20 S ₂ ⁻ | . | . | . | . | . |
| NCS DC62116a | . | . | . | . | . | . | . | . | . | . | . | . |
| FLX CRM121 | . | . | . | 0.008 | . | . | 0.111 | (0.025) | SO ₄ as SO ₃ : 2.37 | . | 0.031 | . |
| FLX CRM131 | . | . | . | 0.038 | . | . | 0.029 | . | SO ₄ as SO ₃ : (17.85) | . | 0.006 | . |
| NCS DC62105g | . | . | . | . | . | . | . | . | . | . | . | . |
| NCS DC62104b | . | . | . | . | . | . | . | . | . | . | . | . |
| SRM 1882a | . | . | . | (0.113) | . | . | (0.060) | . | . | . | (0.004) | . |
| SRM 1883a | . | . | . | (0.006) | . | . | (0.003) | . | . | . | . | . |
| DH X0209 | 0.028 | . | . | . | . | . | 0.025 | 1.19 | . | . | . | . |
| DH X0212 | . | . | . | . | . | . | 0.062 | 1.18 | . | . | . | . |
| DH X0211 | 0.041 | . | . | . | . | . | 0.172 | 1.48 | . | 0.014 | . | . |

RM CEMENT SET JCA 601B

available in set/15 only

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

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

CRM CHLORINE and FLUORINE in CEMENT

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

CRM PORTLAND CEMENT HEAT OF HYDRATION

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

CRM COMPRESSIVE STRENGTH N/mm²

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

CRM CLASSIC CEMENT CHEMISTRIES

20 g units

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

CRM CEMENT CLINKER PHASE ABUNDANCE

| Number | Alite | Alkali Sulfates | Aluminate | Aphthitalite | Arcanite | Belite | Ferrite | Periclase | Units |
|-----------|-------|-----------------|-----------|--------------|----------|--------|---------|-----------|----------|
| SRM 2686a | 63.53 | 0.86 | 2.46 | (0.74) | (0.27) | 18.80 | 10.80 | 3.40 | 3 x 10 g |
| SRM 2687a | 57.88 | . | 9.56 | . | . | 24.70 | 6.27 | . | 5 x 8 g |
| SRM 2688 | 64.95 | . | 4.99 | . | . | 17.45 | 12.20 | . | 3 x 10 g |

CRM PORTLAND CEMENT FINENESS AND BLAINE STANDARD

| Number | Remaining after passing through 80 micron sieve | Blaine | Density g/cm ³ | Units |
|--------------|---|--------------------------|---------------------------|-------|
| NCS DC62127e | 2.68 % | 356.8 m ² /kg | (3.05) | 150 g |
| TL 201B | . | 4,231 cm ² /g | 3.03 | 40 g |
| TL 202B | . | 4,135 cm ² /g | 2.94 | 40 g |
| JCA 102N | . | 3,300 cm ² /g | . | 30 g |

CRM CEMENT FINENESS

certified analysis

informational analysis listed in mass %

46H: 10 x 5 g units

114q: powder 20 x 5 g units

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

CRM CEMENT FINENESS

particle size analysis detailed on certificates

40-100 g units

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

RM CEMENT FINENESS - SIEVING METHOD

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

CRM CEMENT COMPONENT MATERIAL

analysis listed in mass %

NCS DC61106: 50g

others: 20 g units

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

CRM MAGNETIC CENOSPHERE FROM COAL POWER PLANTS

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

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

continued analysis listed in mg/kg except

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

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

COAL chart 1 of 2

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

| # | Number | S | Ash | Volatile Matter | Heat in J/g or BTU/lb | Density | Moisture | C | Fixed C | Cl | F | H | Hg* | N | O | P |
|---|----------------------|-------|---------|-----------------|-----------------------|--------------|----------------|---------|---------|-----------|--------|--------|--------|-------------------------|---------------|--------------|
| 1 | NCS FC28143 | 6.40 | 31.80 | 14.00 | 20,650 J | 1.82 | . | 53.28 | . | . | . | 2.58 | . | 0.72 | . | . |
| 1 | <u>502-674-18191</u> | 4.89 | 8.80 | . | . | . | . | . | . | . | . | . | . | . | . | <u>17025</u> |
| 1 | <u>502-684-18321</u> | 4.77 | 0.22 | 14.1 | (15,379) BTU | . | . | 88.5 | (85.7) | . | . | 3.91 | . | 1.40 | . | <u>17025</u> |
| 1 | SRM 2685c | 4.72 | . | . | Br: (4.94*) | Mg: (0.0814) | Mn: (0.003684) | . | . | (0.05540) | . | . | 0.1494 | . | . | . |
| 1 | NCS FC28009k | 4.31 | 42.34 | 16.66 | 18,060 J | 1.84 | . | 45.40 | . | . | . | 2.63 | . | 0.80 | . | . |
| 1 | NCS FC28142 | 4.35 | 33.40 | 14.38 | 21,050 J | 1.76 | . | 53.63 | . | . | . | 2.79 | . | 0.81 | . | . |
| 1 | <u>502-686-14157</u> | 4.16 | . | . | . | . | . | . | . | . | . | . | 0.065 | . | . | <u>17025</u> |
| 1 | NCS FC28221 | 4.04 | 18.98 | 32.0 | 27,790 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | NCS FC28220 | 4.03 | 16.52 | 11.15 | 28,670 J | . | . | . | . | . | . | . | . | . | . | . |
| 2 | 502-836-10076 | 3.99 | 12.57 | (39.18) | (13,093) BTU | . | . | (70.18) | . | . | . | 4.88 | 0.097 | 1.27 | . | . |
| 2 | 502-837-10182 | 3.26 | 9.00 | (38.43) | (13,862) BTU | . | . | (72.64) | . | . | . | 4.88 | 0.058 | 1.36 | . | . |
| 1 | <u>502-673-17041</u> | 3.23 | 8.04 | . | . | . | . | . | . | . | . | . | . | . | . | <u>17025</u> |
| 1 | NCS FC280121 | 3.22 | 21.49 | 11.00 | 26,010 J | 1.66 | . | 67.71 | . | . | . | 2.73 | . | 0.99 | . | . |
| 1 | NCS FC28210 | 3.17 | 25.80 | 8.77 | 24,130 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | CZ SF-06-14 | 3.13 | 27.21 | 27.36 | 23,990 J | 10,314 BTU | . | 58.28 | . | . | . | 3.51 | . | 3.80 | . | . |
| 1 | NCS FC28141 | 2.92 | 28.64 | 11.50 | 23,040 J | 1.70 | . | 59.60 | . | . | . | 2.80 | . | 0.80 | . | . |
| 1 | ACIRS S2D | 2.877 | . | . | . | . | . | . | . | 0.010 | . | . | 0.281 | . | . | . |
| 1 | NCS FC28216 | 2.79 | 8.62 | 10.86 | 32,300 J | 1.44 | . | 81.27 | . | . | . | 3.55 | . | 1.16 | . | . |
| 1 | NCS FC28008m | 2.68 | 25.20 | 27.50 | 24,490 J | 1.57 | . | 60.26 | . | . | . | 3.74 | . | 1.06 | . | . |
| 1 | CZ SF-07-14 | 2.52 | 28.73 | 38.80 | 21,337 J | 9,173 BTU | . | 50.97 | . | . | . | 4.26 | . | 1.05 | . | . |
| 2 | ACIRS M1 | 2.39 | 18.68 | (32.8) | (28,360) J | 1.417 | . | (67.4) | . | 0.014 | 0.0160 | (4.73) | 0.122 | (1.34) | . | 0.098 |
| 2 | COCO 036 | 2.28 | 13.38 | 8.28 | 30,550 J | . | . | . | . | . | . | . | . | . | . | 0.088 |
| 1 | NCS FC28215 | 2.17 | 25.2 | 28.79 | 24,830 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | <u>502-672-17101</u> | 2.53 | 8.01 | . | . | . | . | . | . | . | . | . | . | . | . | <u>17025</u> |
| 1 | NCS FC28011j | 2.10 | 12.00 | 8.29 | 30,810 J | 1.49 | . | 78.96 | . | . | . | 3.09 | . | 1.12 | . | . |
| 1 | NCS FC28112 | 2.07 | 8.08 | 33.70 | 32,620 J | 1.33 | . | 78.64 | . | . | . | 5.01 | . | 1.31 | . | . |
| 2 | 502-687-13233 | 2.06 | . | . | . | . | . | . | . | . | . | . | 0.130 | . | . | . |
| 2 | 502-839-11060 | 2.03 | 7.72 | (37.57) | (13,586) BTU | . | (2.37) | (76.19) | . | 0.0975 | 0.0071 | 5.10 | 0.0132 | 1.46 | Se: 1.0 ppm | . |
| 1 | SRM 2683C | 1.95 | . | . | . | . | . | . | . | (0.1127) | . | . | 0.0900 | . | . | . |
| 1 | NCS FC28007p | 1.92 | 16.26 | 30.12 | 27,060 J | 1.49 | . | 67.05 | . | . | . | 4.06 | . | 1.21 | . | . |
| 2 | COCO 002 | 1.89 | 14.25 | 21.16 | 29,200 J | . | . | . | . | . | . | . | . | . | last of stock | 0.037 |
| 1 | NCS FC28217 | 1.79 | 8.68 | 36.06 | 31,330 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | NCS FC28209 | 1.76 | 27.33 | 8.21 | 23,960 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | NCS FC28144b | 1.75 | 85.72 | 9.12 | 2,280 J | 2.54 | . | 5.80 | . | . | . | 1.03 | . | 0.27 | . | . |
| 1 | SABS 062 | 1.74 | 11.46 | 5.34 | 30,170 J | . | . | 82.28 | . | . | . | 2.16 | . | 1.83 | . | 0.040 |
| 1 | NCS FC28106 | 1.70 | 8.60 | 31.81 | 32,500 J | 1.35 | . | 78.40 | . | . | . | 4.86 | . | 1.32 | . | . |
| 2 | COCO 041 | 1.67 | 29.60 | 17.96 | 22,870 J | . | . | . | . | . | . | . | . | . | . | . |
| 2 | COCO 039 | 1.67 | 14.65 | 17.89 | 30,240 J | . | . | . | . | . | . | . | . | . | . | 0.040 |
| 1 | NCS FC28214 | 1.66 | 27.85 | 29.21 | 23,630 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | NCS FC28010L | 1.66 | 19.64 | 31.33 | 27,010 J | 1.48 | . | 65.68 | . | . | . | 4.24 | . | 1.19 | . | . |
| 1 | NCS FC28005i | 1.65 | 20.68 | 8.23 | 26,240 J | 1.74 | . | 71.17 | . | . | . | 2.09 | . | 0.87 | . | . |
| 2 | 502-831-14095 | 1.57 | 6.99 | (34.30) | (12,765) BTU | FSI: 0.78 | 5.08 | (73.08) | . | 0.3545 | 0.0048 | 4.72 | 0.117 | 1.69 | Se: 0.00013 | . |
| 2 | COCO 046 | 1.49 | 16.65 | 19.36 | 29,310 J | . | . | . | . | . | . | . | . | . | . | 0.039 |
| 1 | NCS FC28002w | 1.48 | 14.85 | 30.75 | 28,840 J | 1.44 | . | 70.62 | . | . | . | 4.38 | . | 1.25 | . | . |
| 1 | NCS FC28213 | 1.46 | 9.87 | 35.24 | 30,620 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | NCS FC28138 | 1.40 | 44.13 | 11.36 | 18,400 J | 1.79 | . | 47.02 | . | . | . | 2.53 | . | 0.68 | . | . |
| 1 | NCS FC28218 | 1.35 | 14.58 | 6.16 | 29,260 J | . | . | . | . | . | . | . | . | . | . | . |
| 2 | COCO 030 | 1.34 | 25.52 | 10.06 | 24,350 J | . | . | . | . | . | . | . | . | . | . | . |
| 1 | CZ SF-01-14 | 1.33 | 44.90 | 31.72 | 14,617 J | 6,284 BTU | . | 36.40 | . | . | . | 3.31 | . | 0.60 | . | . |
| 1 | <u>502-681-19066</u> | 1.32 | 9.18 | 33.2 | (13,780) BTU | . | . | 77.5 | (57.6) | . | . | 4.99 | . | 1.45 | . | <u>17025</u> |
| 2 | COCO 044 | 1.30 | 28.20 | 20.08 | 23,000 J | . | . | . | . | . | . | . | . | . | . | 0.047 |
| 1 | NCS FC28139 | 1.30 | 22.70 | 18.37 | 27,040 J | 1.51 | . | 67.18 | . | . | . | 3.68 | . | 1.05 | . | . |
| 1 | NCS FC28140 | 1.28 | 25.88 | 30.43 | 22,500 J | 1.62 | . | 58.12 | . | . | . | 3.40 | . | 1.02 | . | . |
| 1 | NCS FC28111 | 1.26 | 25.50 | 28.50 | 23,850 J | 1.57 | . | 59.75 | . | . | . | 3.73 | . | 1.01 | . | . |
| 2 | USZ TTKN | 1.21 | 15.2 | 29.3 | 35,260 J | . | . | . | . | . | . | 4.88 | . | 80, 150, or 200 g units | . | . |
| 2 | 502-685-14005 | 1.16 | . | . | . | . | . | . | . | . | . | . | 0.040 | . | . | . |
| 1 | <u>502-685-16140</u> | 1.15 | . | . | . | . | . | . | . | . | . | . | 0.041 | . | . | <u>17025</u> |
| 2 | COCO 040 | 1.15 | 10.52 | 36.37 | 30,050 J | . | . | . | . | . | . | . | . | . | . | 0.008 |
| 1 | <u>502-671-17294</u> | 1.09 | 10.02 | . | . | . | . | . | . | . | . | . | . | . | . | <u>17025</u> |
| 1 | SRM 2692C | 1.064 | (7.499) | . | . | . | . | . | . | (0.1338*) | . | . | 0.1790 | . | . | . |

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

RM FUSIBILITY OF COAL

| analysis listed in mass % | | | | | | | | | 250 g units | | Reducing Temperature °C | | | |
|---------------------------|-------|------|------|-------|------|--------|------------|-------|-------------|-----------|-------------------------|------|--|--|
| Number | C | H | N | P | S | MJ/Kg | Volatility | Ash | Deformation | Softening | Hemisphere | Flow | | |
| COCO 005 | 81.70 | 4.57 | 1.44 | 0.015 | 1.05 | 32.90 | 27.19 | 7.49 | 1402 | 1425 | 1443 | 1473 | | |
| COCO 007 | 72.55 | 3.69 | 1.83 | 0.036 | 1.55 | 28.71 | 21.60 | 14.51 | 1329 | 1353 | 1381 | 1420 | | |
| COCO 016 | 56.64 | 2.64 | 1.53 | 0.030 | 1.86 | 21.92 | 18.26 | 31.32 | 1284 | 1317 | 1346 | 1387 | | |
| COCO 035 | 62.17 | 2.98 | 1.71 | 0.039 | 1.92 | 24.16 | 15.46 | 27.55 | 1369 | 1394 | 1419 | 1452 | | |
| COCO 051 | 55.80 | 2.91 | 1.30 | 0.075 | 1.12 | 21,520 | 21.73 | 30.98 | 1359 | 1373 | 1390 | 1448 | | |

SULFUR IN COAL

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

| # | Number | S | Units | # | Number | S | Units | # | Number | S | Units |
|---|---------------|------|------------|---|-----------|-------|-----------|---|---------------|-------|-----------|
| 1 | IARM HC20800A | 8.6 | 50 g | 1 | BCR 336 | 3.290 | 20 g | 2 | VSI-0.96 | 0.96 | 50g, last |
| 1 | ASCRM 012 D | 5.21 | 125g, last | 2 | VSI-1.91 | 1.91 | 50g, last | 1 | IARM HC20075C | 0.76 | 50g, last |
| 2 | COCO 037 | 4.74 | 50 g | 2 | ACIRS S1C | 1.46 | 250 g | 1 | BCR 331 | 0.499 | 20 g |
| 2 | VSI-4.18 | 4.18 | 50g, last | 1 | BCR 333 | 1.344 | 20 g | 2 | ACIRS S1A | 0.42 | 250 g |
| | | | | 1 | BCR 332 | 0.961 | 20 g | | | | |

RM COAL

typical analysis listed in mass % 50 g units, last of stock

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

CRM COAL

analysis listed in mass % (T) = Total SARM 20 also contains Ta: 0.00012, Y: 0.0029

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

analysis listed in mg/kg US CLB-1 also contains informational Ash, Li, Mo, Nb, Nd and Sb

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

CRM COAL

analysis in mass % 50g units analysis in mg/kg

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

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

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

CRM COAL

analysis listed in mass % except * which is mg/kg powder 50 g

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

CRM COAL

analysis listed in mass %

| Number | Al ₂ O ₃ | C | Fe ₂ O ₃ | H | N | P ₂ O ₅ | S | SO ₃ | SiO ₂ | TiO ₂ | Units |
|--------|--------------------------------|-------|--------------------------------|------|------|-------------------------------|------|-----------------|------------------|------------------|-------|
| NM 151 | 26.09 | 52.71 | 6.86 | 3.30 | 1.13 | 0.91 | 0.64 | 0.32 | 59.45 | 1.70 | 50 g |

CRM COAL

BCR: 40 g units GBW: 50 g units

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

CRM COAL AIR DRIED vs. HEATED DRIED ANALYSIS

20 g powder

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

CRM FUSIBILITY OF COAL ASH

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

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

COAL ASH

= class, where 1 = CRM and 2 = RM

analysis listed in mass %

| # | Number | SiO ₂ | Al ₂ O ₃ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | Mn | Na ₂ O | P ₂ O ₅ | SO ₃ | TiO ₂ | V ₂ O ₅ | Units | Other |
|---|---------------|------------------|--------------------------------|-------|--------------------------------|------------------|------|-------------|-------------------|-------------------------------|-----------------|------------------|-------------------------------|-------|--------------------------|
| 2 | COCO ASH 015 | 55.67 | 31.44 | 2.42 | 3.99 | 0.65 | 0.74 | MnO2: 0.036 | 0.13 | 0.37 | 1.89 | 1.78 | . | 20 g | |
| 2 | COCO ASH 013 | 54.89 | 32.44 | 2.16 | 4.43 | 0.84 | 0.54 | MnO2: 0.041 | 0.06 | 0.33 | 2.05 | 1.82 | . | 20 g | |
| 1 | NCS FC28154 | 53.17 | 32.02 | 2.28 | 6.47 | 1.37 | 0.90 | MnO: 0.035 | 0.41 | 0.19 | 0.78 | 1.34 | 0.027 | 5 g | |
| 2 | COCO ASH 014 | 52.29 | 31.67 | 2.53 | 6.46 | 0.85 | 0.51 | MnO2: 0.050 | 0.07 | 0.44 | 2.73 | 1.86 | . | 20 g | |
| 2 | ASRM 010-2 | 52.2 | 27.1 | 3.47 | 10.8 | 0.92 | 1.40 | Mn3O4: 0.16 | 0.47 | 1.13 | 0.21 | 1.34 | . | 100 g | BaO: 0.14 SrO: 0.11 last |
| 2 | COCOASHSRM017 | 51.24 | 33.96 | 2.90 | 4.34 | 0.55 | 0.41 | MnO2: 0.044 | 0.11 | 2.31 | 0.99 | 1.70 | . | 20 g | |
| 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 | |
| 2 | COCO ASH 016 | 50.18 | 29.05 | 6.35 | 5.82 | 0.93 | 1.39 | MnO2: 0.061 | 0.21 | 0.57 | 3.23 | 1.56 | . | 20 g | |
| 1 | NCS FC28148 | 48.03 | 35.80 | 3.27 | 2.81 | 0.90 | 0.69 | MnO: 0.0073 | 0.54 | 0.25 | . | 1.25 | 0.049 | 5 g | |
| 1 | NCS FC28150 | 47.64 | 26.03 | 10.44 | 5.79 | 1.41 | 1.87 | MnO: 0.097 | 0.28 | 0.091 | . | 1.21 | 0.042 | 5 g | |
| 1 | NCS FC28151 | 43.42 | 28.53 | 3.33 | 15.18 | 0.64 | 1.21 | MnO: 0.042 | 0.43 | 0.12 | . | 1.22 | 0.062 | 5 g | |
| 1 | NCS FC28146 | 37.86 | 33.71 | 9.90 | 4.74 | 0.30 | 1.27 | MnO: 0.037 | 1.45 | 1.44 | . | 1.52 | 0.020 | 5 g | |
| 1 | NCS FC28147 | 37.52 | 32.78 | 10.97 | 4.81 | 0.24 | 1.17 | MnO: 0.020 | 1.75 | 1.00 | . | 1.31 | 0.019 | 5 g | |
| 1 | NCS FC28149 | 35.54 | 25.92 | 14.92 | 7.56 | 0.20 | 1.63 | MnO: 0.17 | 0.75 | 0.72 | . | 1.26 | 0.032 | 5 g | |
| 1 | NCS FC28145 | 15.66 | 7.34 | 18.37 | 39.61 | 0.30 | 6.05 | MnO: 0.44 | 1.69 | 0.10 | . | 0.26 | 0.0042 | 5 g | |

* JCFA-1 also contains (in mg/kg) Be: 4.06, Co: 37.4, Cr: 75, Cs: 8.6, Cu: 122, Li: 91, Ni: 32.2, Pb: 47.2, Rb: 54.1, S: 1960, Sb: 2.1, V: 243, and Zn: 63.
 * JCFA-1 also contains (in mass %): FeO: 0.88, TFe2O3: 5.2, C: 1.35, H₂O: 0.18, H₂O+: 0.37, Sr: 0.110

CRM COAL ASH

analysis listed in mass %

100 g units

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

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

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

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

CRM COAL ASH

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

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

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

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

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

CRM COAL FLY ASH analysis listed in mass %

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

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

| Number | Ag | Au | B | Be | Br | Cd | Ce | Co | Cr | Cs | Cu | Eu | F | Hf | Hg | La |
|--------------|--------|---------|------|----|-------|-------|--------|-------|--------|--------|--------|---------|----------|----------|--------|--------|
| SRM 2689 | . | . | (21) | . | (3) | . | (48) | (170) | (11) | . | (3) | (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) | . | . |

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

COAL FLY ASH analysis listed in mass %

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

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

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

INDUSTRIAL FLY ASH

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

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

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

RM**COAL-TAR PITCH**

analysis listed in mg/kg except as noted

60 g units

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

continued informational values listed in mg/kg except as noted

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

CRM COATING THICKNESSNumber nominal μm coating thickness

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

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

CONTINUOUS CASTING POWDER

analysis listed in mass %

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

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

RM**CONTINUOUS CASTING POWDER**

typical analysis listed in mass %

100 g units

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

RM**COVER POWDER**

analysis listed in mass %

100 g units

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

CRM COKE

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

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

COKE ASH

analysis listed in mass %

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

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

BaO: 0.170 PbO: 0.209

CRM DUST

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

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

RM DUST

typical analysis listed in mass %

* samples list Cu as CuO and Ni as NiO

DH 6203-6205: 20 g

all others: 100 g

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

continued

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

analysis for DH 6204 continues in mg/kg

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

CRM FLUE DUST

informational analysis listed in mass %

30 g units

| Number | Type | Al ₂ O ₃ | CO ₂ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Na ₂ O | SO ₃ | SiO ₂ | TiO ₂ |
|------------|--------------|--------------------------------|-----------------|-------|--------------------------------|------------------|------|------|-------------------|-----------------|------------------|------------------|
| 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 ₂ O | Hg |
|------------|--------|-------|--------|--------|--------|------|--------|-------|--------|-------|--------|-------|-------|------------------|----------|
| ECRM 876-1 | . | 0.034 | 0.023 | . | . | 3.43 | . | . | . | 0.17 | 0.42 | . | 24.85 | . | . |
| ECRM 880-1 | . | 1.28 | . | . | . | 3.15 | . | 0.085 | . | 0.027 | 0.005 | 0.034 | 31.0 | . | . |
| ECRM 884-1 | 0.0028 | 0.379 | 0.0054 | 0.0280 | (0.82) | 5.22 | 0.0045 | 0.991 | 0.0046 | 1.86 | 0.1569 | 0.411 | 31.67 | (0.30) | (0.0002) |

continued

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

CRM INDOOR DUST

analysis listed in mg/kg

8 g units

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

CRM ROAD DUST

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

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

continued analysis listed in mass %

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

CRM USED AUTOMOBILE EXHAUST CATALYST

mg/kg

| Number | Pb | +/- | Pd | +/- | Pt | +/- | Rh | +/- | Units |
|------------|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| SRM 2557 | 13931 | 97 | 233.2 | 1.9 | 1131 | 11 | 135.1 | 1.9 | 70 g |
| SRM 2556 | 6228 | 49 | 326.0 | 1.6 | 697.4 | 2.3 | 512 | 0.5 | 70 g |
| FLX CRM132 | . | . | 1673 | 43 | 1770 | 18 | 295 | 6 | 30 g |
| ERM-EB504a | . | . | 1596 | 11 | 1414 | 9 | 210.0 | 2.2 | 200 g |
| FLX CRM133 | . | . | 1075 | 33 | 465 | 32 | 242 | 4 | 30 g |

RM ELECTRODE CARBON

| Number | Size Analysis | Ash | Bulk Density | Relative Density | Moisture | Volatile Matter | Units |
|----------|---------------|------|--------------|------------------|----------|-----------------|-------|
| ACIRS EC | <1% @ +212 µm | 2.8% | 1028 g/L | 2.08 | 0.2% | 0.8% | 1 kg |

ELECTRONIC SCRAP POWDER

analysis listed in mass %

200 g units

| Number | Ag | As | Au | Be | Cd | Cr | Cu | Hg | In | Ni | Pb | Pd | Pt | Sn |
|-----------|--------|--------|---------|---------|---------|-------|-------|-----------|----------|-------|------|---------|---------|-------|
| BAM M505a | 0.0633 | 0.0372 | 0.00524 | 0.00068 | 0.00164 | 0.980 | 16.76 | (<0.0005) | (0.0043) | 0.694 | 1.13 | 0.00480 | 0.00057 | 0.468 |

FERROBORON

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

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

FERROCHROMIUM

= class, where 1 = CRM and 2 = RM

chips as noted

all others: powder

| # | Number | Cr | Al | C | Co | Cu | Fe | Mn | N | Ni | P | S | Si | Ti | V | Units |
|---|-----------------|-------|-------|---------|-----------|------------|-------|----------|-----------|------------|---------|----------|--------|----------|--------|--------------------|
| 1 | IRSID 509-1 | 72.85 | . | 0.012 | . | . | . | . | 0.029 | . | (0.019) | . | 0.230 | . | . | 100 g |
| 1 | ECRM 580-1 | 72.18 | . | 0.019 | 0.047 | . | . | . | 0.035 | . | 0.011 | . | 0.306 | . | 0.083 | 100 g |
| 1 | VS F11/4 | 71.41 | . | 0.119 | . | . | 27.20 | 0.161 | 0.035 | 0.362 | 0.023 | 0.0021 | 0.68 | . | 0.084 | 100 g |
| 2 | DH 1602 | 71.20 | 0.017 | 8.12 | Nb:0.006 | . | 19.38 | 0.103 | W:0.038 | 0.304 | 0.014 | Mg:0.049 | 0.153 | 0.009 | 0.102 | 50 g |
| 1 | IPT 65 | 71.2 | 9.2 | 0.051 | 0.016 | . | 17.9 | 0.128 | . | 0.077 | 0.006 | 0.016 | 0.71 | . | . | 100 g |
| 1 | BCS 203/6 | 71.01 | . | 0.0270 | 0.0442 | . | . | 0.153 | . | 0.218 | 0.0195 | 0.004 | 0.381 | . | 0.0729 | 100 g |
| 1 | SRM 196 | 70.83 | . | 0.035 | . | . | . | . | . | 0.020 | 0.003 | 0.003 | 0.373 | . | . | 100 g |
| 1 | IRSID 507-1 | 70.30 | . | 5.40 | . | . | 0.270 | 0.049 | . | 0.017 | . | 0.017 | 1.20 | . | . | 100 g |
| 1 | VS F47 | 69.8 | . | 8.80 | . | . | . | 0.020 | . | 0.025 | 0.036 | 0.103 | . | . | . | 100 g |
| 2 | DFS 1 | 69.8 | . | 0.0549 | . | H:(0.0024) | . | O:(0.56) | 0.0973 | . | (0.027) | (0.0017) | (0.87) | . | . | 50 g |
| 2 | DFS 2 | 69.6 | . | 9.03 | . | . | . | O:(0.2) | (0.0178) | . | (0.021) | (0.0174) | (0.2) | . | . | 50 g |
| 1 | JSS 733-1 | 69.24 | . | 8.35 | . | . | . | . | . | 0.0219 | 0.0248 | (0.262) | . | . | . | 150 g |
| 1 | NCS HC37618 | 69.12 | . | 8.44 | . | . | . | . | . | 0.026 | 0.026 | 0.30 | . | . | . | 50 g |
| 1 | VS F45 | 69.0 | 0.041 | 0.071 | . | . | . | 0.082 | . | 0.027 | 0.0024 | 1.10 | . | . | . | 100 g |
| 1 | VS F35/2 | 68.9 | . | 0.79 | . | . | 28.16 | . | 0.185 | . | 0.027 | 0.0022 | 0.181 | . | . | 100 g chips |
| 1 | BCS 204/6 | 68.77 | . | 8.57 | 0.0359 | . | . | 0.225 | . | 0.289 | 0.0164 | 0.0190 | 0.715 | 0.0565 | 0.094 | 100 g |
| 1 | NCS HC93604 | 68.13 | . | 0.038 | . | . | . | 0.103 | . | 0.260 | 0.022 | 0.015 | 0.466 | 0.016 | . | 50 g |
| 1 | VS F15/2 | 68.1 | 0.30 | 0.080 | . | . | . | 1.79 | . | 0.036 | 0.0019 | 2.08 | . | . | . | 100 g chips |
| 1 | SRM 64c | 68.00 | . | 4.68 | 0.051 | 0.005 | 24.98 | 0.16 | 0.045 | 0.43 | 0.020 | 0.067 | 1.22 | 0.002 | 0.15 | 100 g |
| 1 | NCS HC26607b | 65.86 | . | 7.23 | . | . | . | 0.38 | . | 0.29 | 0.017 | 0.020 | 2.18 | 0.15 | . | 50 g |
| 1 | NCS HC25603b | 65.27 | . | 7.37 | 0.044 | . | 24.90 | 0.31 | . | 0.39 | 0.020 | 0.015 | 1.27 | 0.104 | 0.138 | 50 g |
| 1 | NCS HC37607 | 64.32 | . | 0.086 | . | . | . | 0.35 | . | . | 0.034 | 0.005 | 1.39 | . | . | 40 g chips |
| 1 | VS F50 | 64.3 | 0.168 | 0.079 | . | . | . | . | 11.2 | . | 0.0048 | 0.0058 | 1.29 | . | . | 100 g |
| 2 | DFS 3 | 64.2 | . | (0.068) | . | . | . | O:(3) | 9.71 | . | (0.023) | (0.016) | (0.54) | . | . | 50 or 100 g |
| 1 | NCS HC11606 | 64.17 | . | 6.37 | . | . | . | 0.32 | . | . | 0.023 | 0.013 | 4.29 | . | . | 100 g |
| 1 | NCS HC37608 | 64.06 | . | 0.243 | . | . | . | 0.34 | . | . | 0.039 | 0.019 | 0.99 | . | . | 40 g chips |
| 1 | NCS HC37615 | 63.50 | . | 8.78 | . | . | . | . | . | 0.023 | 0.025 | 0.78 | 0.097 | . | . | 50 g |
| 1 | NCS HC25635a | 63.44 | . | 0.218 | . | . | . | 0.44 | . | 0.035 | 0.0033 | 1.07 | . | 0.093 | . | 50 g chips |
| 1 | NCS HC25651 | 63.31 | . | 2.55 | . | . | . | 0.47 | . | 0.023 | 0.047 | 2.04 | . | . | . | 50 g |
| 1 | NM 230 | 62.89 | . | 7.86 | . | . | . | 0.31 | . | 0.035 | 0.037 | 3.46 | . | . | . | 100 g |
| 1 | NCS HC25636a | 62.81 | . | 0.078 | 0.16 | 0.032 | 35.56 | 0.39 | . | 0.34 | 0.028 | 0.0052 | 0.32 | . | 0.098 | 50 g chips |
| 1 | NCS HC25644 | 62.57 | . | 0.0064 | . | . | . | 0.207 | 8.69 | . | 0.024 | 0.029 | 0.75 | . | . | 50 g |
| 1 | NCS HC28621 | 62.54 | . | 7.78 | . | . | 27.09 | 0.307 | . | . | 0.026 | 0.033 | 1.45 | 0.166 | 0.138 | 50 g |
| 1 | NCS HC25653 | 62.49 | . | 8.70 | . | . | . | 0.11 | . | 0.025 | 0.024 | 0.15 | 0.016 | . | . | 50 g |
| 1 | NCS HC37609 | 61.54 | . | 8.49 | . | . | . | 0.20 | . | . | 0.024 | 0.015 | 2.15 | 0.24 | . | 40 g |
| 1 | NCS HC93611 | 60.42 | . | 8.13 | . | . | . | 0.21 | . | . | 0.022 | 0.059 | 0.92 | . | . | 50 g |
| 1 | NCS HC28622 | 60.00 | . | 7.72 | . | . | 28.65 | 0.340 | . | 0.025 | 0.033 | 2.43 | 0.261 | 0.153 | . | 50 g |
| 1 | NCS HC93605 | 59.71 | . | 8.00 | . | . | . | 0.308 | . | 0.312 | 0.037 | 0.037 | 2.94 | 0.410 | . | 50 g |
| 1 | NCS HC37617 | 59.35 | . | 8.32 | . | . | . | . | . | 0.021 | 0.040 | 1.91 | . | . | . | 50 g |
| 1 | NCS HC11610 | 58.83 | . | 0.040 | . | . | . | 0.313 | 4.76 | . | 0.020 | 0.042 | 0.525 | . | . | 70 g |
| 1 | NCS HC28630 | 58.65 | . | 0.45 | Ca:0.0012 | 0.020 | . | 0.35 | As:0.0027 | 0.242 | 0.030 | 0.0015 | 1.43 | Zn:0.010 | 0.154 | 50 g |
| 1 | NCS HC93609 | 58.28 | . | 8.36 | . | . | . | 0.207 | . | 0.023 | 0.068 | 1.15 | . | . | . | 50 g |
| 1 | NCS HC14615a | 57.44 | . | 8.00 | . | . | 31.46 | 0.24 | . | 0.23 | 0.017 | 0.015 | 1.96 | . | 0.28 | 50 g |
| 1 | NCS HC28619 | 56.76 | . | 7.28 | . | . | 30.22 | 0.300 | . | 0.023 | 0.024 | 4.25 | 0.412 | 0.203 | . | 50 g |
| 1 | NCS HC14615 | 56.16 | . | 8.07 | . | . | . | 0.23 | . | 0.017 | 0.045 | 2.30 | . | . | . | 50 g |
| 1 | NCS HC14614 | 55.81 | . | 7.67 | . | . | . | 0.28 | . | 0.018 | 0.032 | 2.57 | . | . | . | 50 g |
| 1 | NCS HC28620 | 55.77 | . | 7.60 | . | . | 31.41 | 0.382 | . | 0.022 | 0.031 | 3.95 | 0.423 | 0.175 | . | 50 g |
| 1 | NCS HC14613 | 54.04 | . | 7.56 | . | . | . | 0.18 | . | 0.020 | 0.032 | 2.58 | . | . | . | 50 g |
| 1 | BS 130/2 | 52.6 | . | 7.70 | . | (0.012) | . | 0.44 | . | 0.015 | 0.045 | 2.12 | (0.18) | (0.36) | . | 100 g |
| 1 | <u>BS 130/1</u> | 51.6 | . | 7.12 | . | (0.015) | . | 1.25 | . | Mo:(0.005) | 0.014 | 0.034 | 4.41 | (0.38) | (0.32) | 100 g <u>17025</u> |
| 1 | <u>BS 130/3</u> | 49.01 | . | 6.47 | . | (0.01) | . | 0.76 | . | Mo:(0.003) | 0.015 | 0.028 | 6.20 | (0.41) | (0.38) | 100 g <u>17025</u> |
| 1 | SARM 144 | 49 | . | . | . | . | 36.9 | 0.33 | . | 0.21 | . | . | 5.31 | 0.67 | 0.37 | 100 g |
| 1 | VS F38 | . | . | 4.62 | . | . | . | . | . | . | . | . | . | . | . | 100 g last |
| 1 | VS F12/3 | . | . | 0.289 | . | . | . | . | . | . | . | . | . | . | . | 100 g chips |
| 1 | VS F10/2 | . | . | 0.018 | . | . | . | . | . | . | . | . | . | . | . | 100 g chips |
| 1 | VS F9/2 | . | . | 0.012 | 0.042 | . | . | . | . | . | . | . | . | . | . | 100 g chips |
| # | Number | Cr | Al | C | Co | Cu | Fe | Mn | N | Ni | P | S | Si | Ti | V | Units |

CRM FERRONICKEL

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

FERRONIUBIUM

= class, where 1 = CRM and 2 = RM

* notes the total of Nb+Ta

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

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

FERROPHOSPHORUS

= class, where 1 = CRM and 2 = RM

analysis listed in mass %

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

FERROTITANIUM

= Class, where 1 = CRM and 2 = RM

| # | Number | Ti | Al | Sol.Al | C | Co | Cr | Cu | Fe | Mn | P | S | Si | V | Zr |
|---|------------------|-------|-------|--------|-------|--------|-------|---------|-------|-------|---------|---------|-------|-------|-------|
| 2 | DH 2409 | 72.74 | 2.93 | . | . | . | 0.384 | 0.074 | 19.27 | 0.192 | 0.004 | . | 0.180 | 1.167 | 0.383 |
| 1 | VS F30/4 | 70.3 | 3.83 | . | 0.154 | . | 0.154 | 0.065 | 21.51 | 0.189 | 0.0030 | 0.0054 | 0.163 | 2.29 | 0.231 |
| 1 | NCS HC15601 | 70.02 | 0.3 | . | 0.057 | . | 0.039 | 0.037 | 26.57 | 0.106 | 0.0071 | 0.0047 | 1.47 | 0.011 | . |
| 1 | NCS HC19604 | 43.81 | 10.64 | . | 0.041 | . | . | . | . | 1.59 | 0.051 | 0.011 | 3.46 | 0.158 | . |
| 1 | NCS HC19605 | 38.81 | 8.61 | . | 0.032 | . | . | 0.025 | . | 0.81 | 0.032 | 0.009 | 4.20 | 0.303 | . |
| 1 | ECRM 584-1 | 37.17 | 7.19 | (6.0) | 0.044 | . | . | . | . | 1.13 | 0.032 | 0.030 | 1.80 | . | . |
| 1 | NCS HC93608 | 32.22 | 3.00 | . | 0.095 | . | . | 0.281 | . | 0.255 | 0.014 | 0.015 | 0.30 | . | . |
| 1 | VS F43 | 31.9 | 11.11 | . | 0.098 | . | 0.354 | 0.336 | . | 1.22 | 0.038 | 0.0058 | 2.50 | 0.152 | 0.059 |
| 1 | NCS HC26613 | 30.24 | 8.13 | . | 0.019 | . | . | (0.005) | . | 1.11 | 0.020 | 0.012 | 1.84 | 0.19 | . |
| 1 | NCS HC18604 | 27.93 | 5.38 | . | 0.065 | . | . | 0.117 | . | 2.67 | 0.043 | 0.013 | 4.68 | . | . |
| 1 | NCS HC28638 | 27.34 | 7.82 | . | 0.033 | . | 0.055 | . | . | 0.362 | 0.015 | 0.0048 | 4.51 | 0.15 | . |
| 1 | VS F42 | 27.13 | 11.41 | . | 0.55 | . | 2.22 | 1.32 | . | 1.1 | 0.05 | 0.023 | 6.74 | . | . |
| 1 | IRSID 510-1 | 26.95 | (4.9) | . | 0.058 | . | . | . | . | . | (0.035) | . | 4.65 | . | . |
| 1 | NM 341 | 24.91 | 5.54 | . | . | . | . | . | . | . | . | . | 2.55 | . | . |
| 1 | BS FeTi-1 | 20.0 | 12.5 | . | 0.57 | (0.03) | 0.33 | 0.60 | . | 7.7 | (0.05) | (0.009) | 2.8 | 0.69 | 3.7 |
| 1 | BS FeTi-2 | 19.6 | 12.6 | . | 0.455 | 0.037 | 0.30 | 0.43 | . | 7.9 | (0.05) | (0.01) | 3.2 | 0.76 | 3.8 |

| Number | B | Ca | Mg | Mo | N | Nb | Ni | Pb | Sn | W | Zn | Units |
|------------------|------|------|-------|--------|--------|--------|-------|----|-------|-------|--------|-------|
| DH 2409 | . | . | 0.070 | 0.814 | . | 0.072 | 0.047 | . | 0.246 | . | . | 50 g |
| VS F30/4 | . | . | . | 0.60 | 0.38 | . | 0.053 | . | 0.077 | . | . | 100 g |
| NCS HC15601 | . | . | . | 0.028 | . | . | 0.29 | . | . | . | . | 50 g |
| NCS HC19604 | . | . | . | . | . | . | . | . | 0.056 | . | . | 100 g |
| NCS HC19605 | . | . | . | . | . | . | . | . | 0.061 | . | . | 100 g |
| ECRM 584-1 | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NCS HC93608 | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| VS F43 | . | . | . | 0.0036 | 0.085 | . | . | . | 0.013 | 0.032 | . | 100 g |
| NCS HC26613 | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC18604 | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC28638 | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| VS F42 | . | . | . | 0.106 | . | . | . | . | 0.33 | 0.129 | . | 100 g |
| IRSID 510-1 | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NM 341 | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| BS FeTi-1 | 0.60 | 1.14 | (0.4) | 0.058 | 0.144 | (0.05) | 0.17 | . | 0.11 | . | (0.03) | 100g |
| BS FeTi-2 | 1.10 | 0.98 | (0.4) | 0.15 | (0.15) | 0.036 | 0.156 | . | 0.160 | . | (0.03) | 100g |

17025

17025

CRM FERROTUNGSTEN

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

FERROVANADIUM

= Class, where 1 = CRM and 2 = RM

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

| Number | As | Ca | O | Pb | Ti | Units |
|------------------|----------|---------|---|--------|-------------|-------|
| NCS HC93629 | . | . | . | . | . | 25 g |
| DH 2510 | . | . | . | . | 0.071 | 50 g |
| VS F40 | . | . | . | . | . | 100 g |
| NCS HC11608 | 0.0024 | . | . | . | . | 70 g |
| NCS HC28633 | 0.0017 | 0.022 | . | 0.0006 | . | 50 g |
| NCS HC26608c | . | . | . | . | Zn:(0.004) | 50 g |
| NM 351 | . | . | . | . | . | 100 g |
| NCS HC19606 | . | . | . | . | . | 50 g |
| NCS HC26608b | . | . | . | . | Zn:(0.0024) | 50 g |
| NCS HC93628 | . | . | . | . | . | 30 g |
| ECRM 577-1 | . | . | . | . | . | 100 g |
| NCS HC93628a | . | . | . | . | . | 30 g |
| NCS HC37616 | . | . | . | . | . | 50 g |
| NCS HC11607 | 0.021 | . | . | . | . | 70 g |
| NCS HC18608 | . | . | . | . | . | 50 g |
| NCS HC28634 | 0.024 | 0.115 | . | 0.0004 | . | 50 g |
| BS FeV 45 | (0.013) | 0.010 | . | . | 0.021 | 100 g |
| VS F19/3 | 0.0009 | . | . | . | . | 100 g |
| BS FeV 42 | (0.01) | (0.052) | . | . | 0.033 | 100 g |
| VS F32/3 | (<0.001) | . | . | . | . | 100 g |

Co: 0.008 Nb: 0.013 W: 0.025

17025, 34

17025, 34

CRM RARE EARTH FERROSILICON

* VS F31/2 lists Rare Earth Oxides

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

FERROSILICOALUMINUM, FERROSILICOCALCIUM, FERROSILICOCHROMIUM, and FERROSILICOTITANIUM

= class, where 1 = CRM and 2 = RM

DH, NCS: 50 g units

VS: 100 g units

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

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 | 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 | NCS HC14612 | 77.49 | 22.12 | 0.0074 | 0.016 | 0.0067 | 0.0044 | 0.011 | 0.020 | 0.016 | 0.0074 | 0.0030 | 0.011 |
| 1 | NCS HC25647 | 77.42 | . | 0.011 | 0.0068 | 0.0030 | 0.010 | . | 0.074 | . | 0.012 | 0.003 | 0.043 |
| 2 | DH 2315 | 77.17 | 19.88 | 1.316 | 0.042 | 0.357 | 0.143 | 0.042 | 0.159 | 0.049 | 0.023 | . | 0.086 |
| 1 | CMSI 1655 | 76.74 | . | 1.80 | 0.081 | 0.30 | 0.14 | . | 0.17 | . | 0.023 | 0.004 | . |
| 1 | NCS HC25627 | 76.74 | . | 1.80 | 0.081 | 0.30 | 0.140 | . | 0.172 | . | 0.023 | 0.004 | . |
| 1 | NCS HC93603 | 76.53 | 19.07 | 1.52 | 0.095 | 1.373 | 0.043 | 0.025 | 0.281 | 0.012 | 0.019 | 0.0023 | 0.085 |
| 1 | NCS HC25618 | 76.42 | . | 0.78 | 0.066 | 0.179 | 0.097 | . | 0.14 | . | 0.025 | 0.003 | . |
| 1 | NCS HC93617 | 76.34 | 19.43 | 1.75 | 0.220 | 1.31 | 0.027 | 0.015 | 0.237 | 0.0056 | 0.025 | 0.0039 | 0.119 |
| 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 | NCS HC93601 | 75.46 | 20.23 | 1.40 | 0.148 | 1.15 | 0.044 | 0.019 | 0.588 | 0.0093 | 0.021 | 0.0026 | 0.097 |
| 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 | NCS HC93602 | 74.81 | 20.96 | 1.28 | 0.196 | 0.986 | 0.052 | 0.013 | 1.09 | 0.0071 | 0.024 | 0.0052 | 0.106 |
| 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 HC11611 | 74.03 | 1.41 | 0.035 | . | 0.208 | 0.063 | . | 0.25 | . | 0.020 | 0.0023 | . |
| 1 | NCS HC11601a | 73.75 | . | 1.14 | 0.073 | 0.34 | 0.085 | 0.031 | 0.26 | . | 0.023 | 0.003 | . |
| 1 | NCS HC93616 | 73.61 | 21.06 | 2.14 | 0.208 | 2.05 | 0.022 | 0.019 | 0.237 | 0.0069 | 0.023 | 0.0033 | 0.121 |
| 1 | NCS HC37602 | 73.29 | 21.37 | 2.74 | . | 0.616 | . | . | 0.14 | . | 0.022 | . | . |
| 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 | NM 31.3 | 72.8 | . | 1.48 | . | 0.62 | . | . | 0.16 | . | 0.03 | . | . |
| 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 | . | . |
| 1 | NCS HC37601 | 68.91 | 26.88 | 2.18 | . | . | 0.142 | . | 0.177 | . | 0.024 | . | . |
| 1 | YSBC25614-97 | 67.18 | . | 1.28 | 0.071 | 0.440 | 0.285 | . | 0.301 | . | 0.025 | 0.0029 | . |
| 1 | BS 140/2 | 51.9 | 46.1 | (0.63) | 0.027 | (0.033) | (0.25) | (0.141) | 0.53 | (0.153) | (0.022) | (0.006) | (0.095) |
| 1 | NCS HC25652 | 51.85 | . | . | 0.35 | . | . | . | . | . | 0.014 | 0.003 | 0.052 |
| 2 | DH 2311 | 50.00 | 9.06 | 4.36 | 8.31 | 7.84 | 0.024 | 0.016 | 0.080 | 0.007 | 0.012 | 0.048 | 0.070 |
| 1 | BS 140/4 | 49.7 | 47.6 | (0.90) | (0.040) | (0.078) | (0.19) | (0.089) | 1.01 | (0.113) | (0.016) | (0.003) | (0.079) |
| 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 | . |
| 1 | BS 140/3 | 46.9 | 51.0 | (0.59) | (0.044) | (0.095) | (0.18) | (0.091) | 0.60 | (0.090) | (0.018) | (0.004) | (0.073) |
| 1 | BS 140/1 | 45.0 | 52.9 | (0.68) | 0.031 | (0.040) | (0.25) | (0.134) | 0.46 | (0.153) | (0.022) | (0.004) | (0.086) |
| 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 F2/4 | 44.3 | . | 0.83 | 0.045 | 0.032 | 0.242 | . | 0.302 | . | 0.031 | 0.0024 | . |
| 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 | |
|-----------------|--------|--------|-------|--------|-------|----|--------|----|----|----|--------|--------|-------|-------|
| | | | | | | | | | | | | | | |
| Number | As | B | Ba | Co | Mg | Mo | N | O | Sn | Sr | V | Zn | Zr | Units |
| BAM 529-1 | . | . | . | . | 0.04 | . | . | . | . | . | . | . | . | 100 g |
| DH 2314 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| VS F3/3 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NCS HC14612 | . | 0.0022 | . | 0.0012 | . | . | . | . | . | . | . | . | . | 60 g |
| NCS HC25647 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| DH 2315 | . | . | . | . | 0.025 | . | . | . | . | . | . | . | 0.008 | 50 g |
| CMSI 1655 | . | . | . | . | . | . | . | . | . | . | . | . | . | 70 g |
| NCS HC25627 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC93603 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC25618 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC93617 | . | . | . | . | . | . | . | . | . | . | . | . | . | 80 g |
| DH 2310 | . | . | 0.042 | . | 0.029 | . | . | . | . | . | . | . | . | 50 g |
| NCS HC15602 | . | . | . | . | . | . | . | . | . | . | 0.0036 | . | . | 50 g |
| JK 39 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC93601 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| SRM 195 | . | 0.0010 | . | <0.01 | . | . | . | . | . | . | . | . | 0.011 | 75 g |
| NCS HC93602 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| VS F4/2 | . | . | . | . | . | . | (0.02) | . | . | . | . | 0.0013 | . | 100 g |
| NCS HC11611 | . | . | . | . | . | . | . | . | . | . | . | . | . | 60 g |
| NCS HC11601a | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NCS HC93616 | . | . | . | . | . | . | . | . | . | . | . | . | . | 80 g |
| NCS HC37602 | . | . | . | . | . | . | . | . | . | . | . | . | . | 80 g |
| SRM 58a | . | 0.0010 | . | <0.01 | . | . | . | . | . | . | . | . | 0.002 | 75 g |
| NM 31.3 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NCS HC18601 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC19602 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| NCS HC37601 | . | . | . | . | . | . | . | . | . | . | . | . | . | 80 g |
| YSBC25614-97 | . | . | . | . | . | . | . | . | . | . | . | . | . | 50 g |
| BS 140/2 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| NCS HC25652 | . | . | . | . | . | . | 28.15 | . | . | . | . | . | chips | 50 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 F2/4 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| VS F1/3 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |
| SARM 33 | . | . | . | . | . | . | . | . | . | . | . | . | . | 100 g |

17025

17025

17025

17025

| Number | As | B | Ba | Co | Mg | Mo | N | O | Sn | Sr | V | Zn | Zr | Units |
|--------|----|---|----|----|----|----|---|---|----|----|---|----|----|-------|
|--------|----|---|----|----|----|----|---|---|----|----|---|----|----|-------|

CRM IRON IN FLAT SODA LIME GLASS

| Number | Fe | FeII | FeII as Fe2O3 | FeIII | Units |
|----------|--------|--------|---------------|----------|-------------------------|
| BAM S052 | 0.597 | 0.164 | (0.234) | (0.433) | 100 mm x 50 mm x 3.2 mm |
| BAM S051 | 0.0481 | 0.0158 | (0.0226) | (0.0323) | 100 mm x 50 mm x 5.9 mm |
| BAM S050 | 0.0084 | 0.0027 | (0.0038) | (0.0057) | 100 mm x 50 mm x 3.2 mm |

CRM MULTI-ELEMENT GLASS DISCS

listed in mg/kg each unit contains uncertified 72% SiO₂, 12% CaO, 14% Na₂O, and 2% Al₂O₃ each sample is 4 wafers ~13 mm Ø

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

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

CRM URANIUM IN GLASS

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

| Number | U |
|-----------|-----------|
| IRMM 540R | 15.0 last |

CRM GLASS SAND

T = Total

SRM 89: 45 g

other SRM: 75 g

all others: 100 g units

| Number | SiO ₂ | Al ₂ O ₃ | BaO | CaO | Cr ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Mn ₃ O ₄ | Na ₂ O | P ₂ O ₅ | PbO | SO ₃ | TiO ₂ | ZrO ₂ | LOI |
|----------|------------------|--------------------------------|---------|--------|--------------------------------|--------------------------------|------------------|---------|---------|--------------------------------|-------------------|-------------------------------|-------------|-----------------|------------------|------------------|-------|
| BCS 531 | 99.74 | 0.0327 | 0.00112 | 0.0040 | . | 0.00636 | 0.0039 | 0.00132 | 0.00014 | . | . | 0.00082 | SrO:0.00017 | 0.0160 | . | . | . |
| UNS SPS | 99.32 | 0.248 | . | 0.029 | . | 0.037 | 0.058 | 0.0071 | . | . | 0.045 | . | . | 0.035 | . | . | 0.167 |
| BCS 516 | 98.73 | 0.513 | 0.0040 | 0.0243 | 0.0081 | 0.0596 | 0.127 | 0.0387 | . | 0.0012 | 0.0195 | (0.013) | 0.0127 | . | 0.175 | (0.075) | 0.24 |
| 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 As₂O₃: 0.03, As₂O₅: 0.36, Cl: 0.05

RM GRAVEL

typical analysis listed in mass %

100 g units

| Number | SiO ₂ | Al ₂ O ₃ | CO ₂ | CaO | Co ₃ O ₄ | Cr ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | MgO | Mn ₃ O ₄ | Na ₂ O | P ₂ O ₅ | S | TiO ₂ | -H ₂ O 900°C |
|---------|------------------|--------------------------------|-----------------|-------|--------------------------------|--------------------------------|--------------------------------|------------------|-------|--------------------------------|-------------------|-------------------------------|-------|------------------|-------------------------|
| DH 3610 | 98.80 | 0.234 | . | 0.008 | . | 0.030 | 0.419 | 0.014 | . | 0.009 | <0.003 | . | 0.009 | . | 0.153 |
| DH 3609 | 96.44 | 1.46 | 0.010 | 0.047 | 0.005 | 0.029 | 0.703 | 0.334 | 0.104 | 0.020 | 0.045 | 0.019 | . | 0.086 | 0.48 |

HARDGROVE GRINDABILITY INDEX

| Class | Set Number | HGI | HGI | HGI | HGI | Units |
|-------|-----------------|---------------|---------------|---------------|----------------|-------------------------------------|
| CRM | NCS AG82001d-4d | sample 1d: 35 | sample 2d: 56 | sample 3d: 74 | sample 4d: 107 | 250 g of each 1d - 4d last of stock |
| CRM | NCS AG82001g-4g | sample 1g: 35 | sample 2g: 54 | sample 3g: 72 | sample 4g: 119 | 250 g of each 1d - 4d |
| RM | ACIRS H6 | sample A : 32 | sample B : 44 | sample C : 61 | sample D : 87 | 1 kg of each A - D |
| RM | ACIRS H7 | sample A : 30 | sample B : 46 | sample C : 66 | sample D : 86 | 1 kg of each A - D |
| RM | ACIRS H5 | sample A : 28 | sample B : 46 | sample C : 63 | sample D : 85 | 1 kg of each A - D last |

RM HARDGROVE GRINDABILITY INDEX

individually available in 1 kg units

| Number | HGI | Number | HGI | Number | HGI | Number | HGI | Number | HGI |
|--------------|-----|--------------|-----|--------------|-----|--------------|-----|--------------|-----|
| COCO HGI 007 | 66 | COCO HGI 021 | 57 | COCO HGI 006 | 54 | COCO HGI 018 | 51 | COCO HGI 022 | 47 |
| COCO HGI 005 | 64 | COCO HGI 019 | 57 | COCO HGI 026 | 54 | COCO HGI 020 | 51 | COCO HGI 023 | 46 |
| COCO HGI 013 | 64 | COCO HGI 004 | 56 | COCO HGI 014 | 53 | COCO HGI 016 | 50 | COCO HGI 010 | 31 |
| COCO HGI 008 | 60 | COCO HGI 003 | 55 | COCO HGI 024 | 52 | COCO HGI 015 | 48 | | |
| COCO HGI 009 | 59 | COCO HGI 011 | 55 | COCO HGI 012 | 51 | COCO HGI 027 | 48 | | |

CRM HARDNESS TEST BLOCKS

for NCS items, please indicate desired hardness when ordering

| Number | Scale | Available Range | Units (mm) |
|-----------------|--|-----------------|-----------------------------|
| NCS HBS | Brinell Hardness S | (8-650) | 100 x 80 x 16 |
| NCS HBW | Brinell Hardness W | (8-650) | 100 x 80 x 16 |
| NCS HL | Leeb Hardness | (200-900) | 90 Ø x 55 |
| NCS HLG | Leeb Type G Hardness | (300-750) | 120 Ø x 70 |
| NCS HRA | Rockwell Hardness A | (20-88) | 60 x 40 x 10 |
| NCS HRB | Rockwell Hardness B | (20-100) | 60 x 40 x 10 |
| BS TRM-3 | Rockwell Hardness B | 86.3 | 300 x 300 x -2 17025 |
| 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 |
| BS TRM-4 | Rockwell Superficial Hardness 15T | 71.9 | 300 x 300 x -2 17025 |
| 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 ₂ O ₃ | CO ₂ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Na ₂ O | P ₂ O ₅ | SO ₃ | SiO ₂ | TiO ₂ |
|------------|--------------------------------|-----------------|---------|--------------------------------|------------------|--------|--------|-------------------|-------------------------------|-----------------|------------------|------------------|
| 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-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 last of stock |

CRM LAYER THICKNESS

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

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

CRM NANOSCALE LAYER THICKNESS

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

CRM LEAD PAINT FILMS

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

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

RM ELECTROLYTIC MANGANESE

typical analysis

50 g units

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

CRM MANGANESE METAL POWDER

analysis listed in mass %

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

last

MELTING POINT

| Class | Number | Form | Melting point °C |
|-------|---------|--------------------|------------------|
| CRM | 501-951 | 6 inch nickel wire | 1455 |
| RM | 502-496 | 6 inch gold wire | 1063 |

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 ₂ > 99.99% | . | 8.7 | <0.1 | . | . | . | . | 0.42 | <0.05 | . | . | . | 0.062 |
| BAM RS 2 | Al ₂ O ₃ = 99.76% | . | . | (<0.5) | (<5) | . | (<0.2) | . | 3.1 | (<0.5) | (<0.1) | (<10) | <1 | <1.5 |
| BAM RS 5 | NiO | <1 | (<15) | <0.2 | . | <1 | . | 14 | 2.2 | <0.2 | . | . | <2 | 16.1 |
| BAM RS 6A | MgO 100 - 350 μm | . | 46 | . | . | (<10) | . | (<50) | 994 | . | . | . | (<5) | 9.2 |
| BAM RS 6B | MgO 50 - 100 μm | . | 49 | . | . | (<20) | . | (<210) | 956 | . | . | . | (<5) | 8.1 |

continued

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

continued

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

CRM IRON OXIDE

analysis listed in mass %

75 g units

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

CRM IRON OXIDE

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 NICKEL OXIDE

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

25 g units

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

continued informational analysis in mg/kg

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

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

CRM SILICON OXIDE

analysis listed in mass % except

| Number | SiO ₂ | Al ₂ O ₃ | CaO | Fe | MgO | MnO | TiO ₂ | Units |
|-------------|------------------|--------------------------------|------|------|------|-------|------------------|-------|
| IRSID 608-1 | 60.39 | 9.94 | 8.70 | 4.00 | 1.34 | 0.057 | 0.714 | 100 g |

CRM TITANIUM DIBORIDE

analysis listed in mass %

powder 50 g

| Number | Ti | B | B ₂ O ₃ | Al | C | Ca | Cr | Fe | Mg | Mn | Mo | Ni | O | V | Zr | InsRes |
|----------|------|------|-------------------------------|--------|---------|--------|--------|-------|---------|---------|---------|--------|--------|---------|--------|--------|
| BAM S012 | 68.3 | 30.7 | 0.35 | 0.0012 | (0.169) | 0.0044 | 0.0097 | 0.064 | 0.00016 | 0.00038 | 0.00117 | 0.0023 | (0.48) | 0.00102 | 0.0121 | (0.22) |

CRM TITANIUM DIOXIDE SET

analysis listed in mass %

ONLY available in SET/8 x 20 g units

| Number | Cr | Cu | Fe | Mn | Mo | Ni | Si | Sn | V |
|-------------|---------|--------|---------|--------|--------|---------|---------|---------|--------|
| GSO 2158-81 | 0.0010 | . | . | . | . | . | 0.00054 | 0.00020 | . |
| GSO 2159-81 | 0.00035 | . | 0.00055 | . | . | 0.00046 | 0.0010 | . | . |
| GSO 2160-81 | 0.0013 | 0.0110 | 0.0010 | 0.090 | . | 0.0120 | 0.0015 | 0.0018 | 0.0014 |
| GSO 2161-81 | 0.0013 | 0.0024 | 0.0023 | 0.0010 | 0.0130 | 0.0088 | . | 0.0028 | . |
| GSO 2162-81 | 0.0023 | 0.0043 | 0.0180 | 0.0025 | 0.0048 | 0.0029 | 0.0130 | 0.0047 | 0.1800 |
| GSO 2163-81 | 0.038 | 0.032 | . | 0.0180 | . | 0.0280 | 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 ₂ | Uncertainty | Units |
|----------|------------------|-------------|-----------|
| SRM 154c | 99.591 | +/- 0.062 | 90 g last |

CRM VANADIUM PENTOXIDE

analysis listed in mass %

NCS: 25-50 g units

SARM, VS: 100 g units

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

CRM ZINC OXIDE

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

CRM PAPER

AVAILABLE IN SET/20 ONLY

includes software for data processing

5 pages per sample, 8.5 x 11" each

| Number | dry TAPPI analysis listed in mass % | | | | | | | Total | 400°C | 900°C | Base Weight |
|--------|-------------------------------------|--------|------------------|-------|-----------|--------------------------------|-------------------------------|-------|-------|-------|-------------|
| | CaCO ₃ | Kaolin | TiO ₂ | Talc | Muscovite | Al ₂ O ₃ | P ₂ O ₅ | | | | |
| 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 ² /g | 5,000 cm ² /g | 0.57 | 1-64 Ø µm | 12.7 Ø µm |
| TL AB | 10,300 cm ² /g | 31,000 cm ² /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 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 ³ | 3396 cm ³ /g | 11.4% @ 2.0 μm - 99.9% @ 160 μm | 71.4% @ 31.5 μm - 100% @ 160 μm | 20 x 5 g |

CRM pH STANDARDS

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

RM PLASTER analysis listed in mass % 100 g units

| Number | Al ₂ O ₃ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | Na ₂ O | P ₂ O ₅ | SO ₃ | SiO ₂ | SrO | TiO ₂ | LOI |
|----------|--------------------------------|------|--------------------------------|------------------|------|-------------------|-------------------------------|-----------------|------------------|------|------------------|-----|
| BCS 202A | 0.33 | 37.4 | 0.10 | 0.10 | 0.39 | <0.03 | <0.01 | 53 | 1.38 | 0.33 | 0.03 | 7.0 |

RM PLASTIC analysis listed in mass % 50 g pellets

| Number | Al | Ca | Cl | Cr | F | Fe | Mg | Na | P | S | Si | Ti | Zn |
|------------|--------|--------|----------|--------|---------|--------|--------|--------|--------|----------|----------|--------|--------|
| JSM P702-1 | 0.0012 | 0.0013 | (0.0017) | 0.0012 | . | 0.0015 | 0.0015 | 0.0012 | 0.0011 | (0.0014) | (0.0008) | 0.0009 | 0.0010 |
| JSM P703-1 | 0.022 | 0.023 | (0.018) | 0.020 | (0.018) | 0.021 | 0.029 | 0.024 | 0.017 | (0.021) | 0.018 | 0.017 | 0.020 |

CRM POROUS MATERIAL

| Number | Description | Units | Specific Pore Volume | Median Pore Diameter | Density |
|-----------|-----------------|-----------------------|------------------------|----------------------|----------------------------|
| BAM P 128 | Alumina Ceramic | 6 Cylinders 7 g total | 220 mm ³ /g | 27.6 μm | (3.6405) g/cm ³ |

CRM POROUS MATERIALS and SURFACE AREA

| Number | Description | Units | A _{BET} (m ² /g) BET Specific Surface Area | V _p (cm ³ /g) Specific Pore Volume | D ₁ (nm) Hydraulic Pore Diameter | D ₂ (nm) Most Frequent Pore Diameter | D ₃ (nm) Most Frequent Pore Diameter | (nm) Median Pore Width |
|-----------|-------------------|-------|---|---|--|--|--|---------------------------|
| BAM P 109 | Activated Carbon | 10g | 1396 | . | . | . | . | . |
| BAM P 106 | Titanium Dioxide | 15g | 96.6 | 0.2341 | 9.69 | 8.2 | 11.5 | . |
| BAM FD107 | Faujasite Zeolite | 10g | . | 0.217 cm ³ /g ⁻¹ | . | . | . | 0.86 |

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

ROHS/WEEE SAMPLES

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

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

| # | Type | Units | Number | As | Br | Cd | Cr | Hg | Pb | Se | Sold As |
|---|------|-------|--------|----|----|----|----|----|----|----|---------|
|---|------|-------|--------|----|----|----|----|----|----|----|---------|

REFRACTORIES

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

| # | Number | SiO ₂ | Al ₂ O ₃ | C | CO ₂ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Mn ₃ O ₄ | Na ₂ O | P ₂ O ₅ | S | SO ₃ | TiO ₂ | ZrO ₂ | LOI |
|---|------------|------------------|--------------------------------|---------|-----------------|--------|--------------------------------|------------------|-------|-------|--------------------------------|-------------------|-------------------------------|-------|-----------------|------------------|------------------|--------|
| 1 | IPT 63 | 96.28 | 0.48 | . | . | 2.21 | 0.52 | 0.043 | 0.18 | 0.008 | . | 0.013 | 0.013 | . | . | 0.030 | (0.002) | 0.17 |
| 2 | DH 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 2613 | 25.83 | 42.78 | 1.779 | 0.53 | 2.31 | 2.57 | 0.404 | 21.03 | . | 0.122 | 0.118 | 0.122 | 0.066 | . | 1.199 | . | . |
| 2 | DH 2609 | 23.41 | 63.82 | 0.739 T | 0.170 | 2.25 | 1.75 | 0.526 | 4.17 | 0.282 | . | 0.220 | 0.339 | . | 0.121 | 1.27 | 0.097 | . |
| 1 | FLX CRM112 | 12.16 | 79.81 | . | . | 0.147 | 0.326 | 0.090 | 0.755 | . | 0.024 | 0.267 | 0.074 | . | (0.04) | 0.273 | 5.95 | (5.42) |
| 1 | VS K6/4 | 2.12 | 0.54 | . | . | 2.95 | 2.26 | . | 92.4 | . | . | . | . | . | . | . | . | . |
| 1 | VS K10/3 | (0.2) | 97 | (0.05) | . | (0.03) | 1.82 | (0.03) | . | . | . | (0.5) | . | . | . | 0.35 | . | . |

continued

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

CRM ALUMINA-MAGNESIA REFRACTORY SET

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

CRM ALUMINA-ZIRCONIA-SILICA REFRACTORY SET

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

CRM SILICA REFRACTORY SETS

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

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

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

CRM ZIRCON-ZIRCONIA REFRACTORY SET

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

RM RICE STRAW ASH - THERMOSTIL

| Number | typical analysis | | | | | | | | | | | | | | 100 g units | |
|---------|------------------|--------------------------------|------|-----------------|------|--------------------------------|------------------|-------|-------|-------------------|-------------------------------|-----------------|------------------|-------------------------|-------------|--|
| | SiO ₂ | Al ₂ O ₃ | C | CO ₂ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Na ₂ O | P ₂ O ₅ | SO ₃ | TiO ₂ | -H ₂ O 900°C | | |
| DH 5704 | 92.49 | 0.198 | 3.60 | 0.008 | 0.30 | 0.090 | 0.97 | 0.362 | 0.062 | 0.070 | 0.273 | 0.177 | 0.004 | 1.38 | | |
| DH 5708 | 86.67 | 1.15 | 3.83 | 0.094 | 0.97 | 0.931 | 0.872 | 3.10 | 0.117 | 0.085 | 0.226 | 0.255 | 0.126 | 1.70 | | |
| DH 5705 | 76.31 | 0.363 | 4.33 | 0.265 | 2.51 | 2.89 | 0.653 | 9.60 | 0.245 | 0.116 | 0.123 | 0.409 | 0.217 | 2.32 | | |

| RM | | SAND FOR SLIDING GATES | | | | | | | | | | | | | | | | typical analysis listed in mass % | | 100 g units | |
|---------|------------------|--------------------------------|-------|--------|--------------------------------|-------|------------------|------|--------------------------------|-------------------|-------|-------------------------------|-------|------------------|-------------------------------|-----------------|------------------|-----------------------------------|-------|-------------|--|
| Number | SiO ₂ | Al ₂ O ₃ | C | CaO | Cr ₂ O ₃ | Fe | K ₂ O | MgO | Mn ₃ O ₄ | Na ₂ O | NiO | P ₂ O ₅ | S | TiO ₂ | V ₂ O ₅ | WO ₃ | ZrO ₂ | -H ₂ O | 900°C | | |
| DH 4501 | 72.21 | 4.92 | 0.607 | 0.025 | 11.53 | 5.14 | 0.633 | 2.40 | 0.065 | 0.059 | 0.053 | 0.008 | . | 0.195 | 0.102 | . | . | . | 0.204 | | |
| DH 4502 | 65.97 | 5.69 | 0.47 | 0.038 | 14.75 | 6.31 | 0.693 | 3.24 | 0.074 | 0.062 | 0.033 | 0.007 | 0.010 | 0.203 | 0.110 | . | . | . | 0.177 | | |
| DH 4507 | 27.95 | 11.00 | 0.326 | 0.096 | 33.41 | 14.51 | . | 7.29 | 0.179 | . | 0.090 | CO ₂ | 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 ₂ | 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 ₂ | Co ₃ O ₄ | Cr ₂ O ₃ | CuO | La* | Li* | Nd* | NiO | Sr* | TiO ₂ | V ₂ O ₅ | ZnO | ZrO ₂ | | | | |
| 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 ₂ O ₃ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | Mn ₃ O ₄ | Na ₂ O | P ₂ O ₅ | SO ₃ | SiO ₂ |
|---------|--------------------------------|-------|--------------------------------|------------------|-------|--------------------------------|-------------------|-------------------------------|-----------------|------------------|
| 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 ₂ + HfO ₂ | Al ₂ O ₃ | Fe ₂ O ₃ | SiO ₂ | TiO ₂ | 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 ₂ O ₃ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | Na ₂ O | SiO ₂ | TiO ₂ | 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 | | | |

| CRM | | SILICA BRICK | | | | | | | | | | | | | | | | |
|-------------------------------------|------------|---------------------------|--------------------------------|-------|-------|--------------------------------|--------------------------------|------------------|-------------------|-------|-------|-------------------|-------------|-------------------------------|------------------|------|--------------|--|
| # = class, where 1 = CRM and 2 = RM | | analysis listed in mass % | | | | | | | | | | | NH, VS: 75g | | SRM: 45g | | others: 100g | |
| # | Number | SiO ₂ | Al ₂ O ₃ | BaO | CaO | Cr ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | Li ₂ O | MgO | MnO | Na ₂ O | P | P ₂ O ₅ | TiO ₂ | LOI | | |
| 1 | VS K1/3 | 96.1 | 0.55 | . | 1.35 | . | 1.36 | . | . | 0.045 | 0.031 | . | 0.0122 | . | . | . | | |
| 1 | ECRM 777-1 | 95.06 | 0.795 | . | 2.826 | . | 0.330 | 0.154 | . | 0.071 | . | 0.02 | . | . | 0.444 | . | | |
| 1 | ECRM 776-1 | 62.76 | 29.28 | 0.122 | 0.31 | 0.022 | 1.43 | 2.92 | 0.019 | 0.476 | . | 0.488 | . | 0.062 | 1.62 | . | | |
| 1 | VS K2/4 | 58.6 | 35.1 | . | 0.4 | . | 2.94 | 0.69 | . | 0.48 | 0.06 | 0.19 | . | . | 1.91 | . | | |
| 1 | VS K3/2 | 32.3 | 63.6 | . | 0.44 | . | 1.15 | 0.15 | . | 0.27 | . | 0.17 | . | . | 1.34 | . | | |
| 1 | SRM 198 | . | 0.16 | . | 2.71 | . | 0.66 | 0.017 | 0.001 | 0.07 | . | 0.012 | . | 0.022 | 0.02 | 0.21 | | |
| 1 | SRM 199 | . | 0.48 | . | 2.41 | . | 0.74 | 0.094 | 0.002 | 0.13 | . | 0.015 | . | 0.015 | 0.06 | 0.17 | | |

| CRM | | SILICEOUS MATERIAL | | | | | | | | | | | | | |
|----------------------------------|--------------|---------------------------|--------------------------------|--------|--------------------------------|--------------------------------|------------------|--------|----------|-------------------|-------------------------------|------------------|-----------|------------|--------------|
| # = class, where 1 = CRM, 2 = RM | | analysis listed in mass % | | | | | | | | | | | T = Total | | |
| # | Number | SiO ₂ | Al ₂ O ₃ | CaO | Cr ₂ O ₃ | Fe ₂ O ₃ | K ₂ O | MgO | MnO | Na ₂ O | P ₂ O ₅ | TiO ₂ | LOI | Units | Other |
| 1 | BCS 313/2 | 99.73 | 0.068 | 0.0160 | BaO:0.00067 | 0.0229 | 0.0108 | 0.0038 | 0.00032 | 0.0057 | . | 0.0243 | . | 100 g | SrO: 0.00024 |
| 1 | NCS DC60116a | 98.32 | 1.10 | 0.038 | 0.00030 | 0.076 | 0.15 | 0.026 | 0.0013 | 0.076 | (0.0069) | 0.023 | 0.14 | 50 g | . |
| 1 | GBW 03113 | 95.74 | 2.36 | 0.17 | 0.00054 | 0.21 | 0.67 | 0.098 | (0.0033) | 0.25 | (0.0076) | 0.036 | 0.35 | 60 g | . |
| 1 | SRM 2696 | 95.61 | 0.2080 | 0.426 | . | (0.055) | 0.652 | 0.235 | 0.032 | (0.129) | (0.0863) | . | (2.11) | 70 g | ZnO:0.051 |
| 1 | NCS DC60117a | 94.41 | 3.20 | 0.094 | 0.00034 | 0.088 | 1.26 | 0.025 | 0.0011 | 0.47 | (0.0070) | 0.019 | 0.27 | 50 g | . |
| 1 | GBW 03114 | 89.59 | 5.48 | 0.34 | 0.0012 | 0.48 | 2.07 | 0.16 | (0.010) | 1.09 | (0.014) | 0.102 | 0.53 | 60 g | . |
| 2 | CERAM CEB1 | 74.0 | 16.2 | 0.52 | BaO:0.05 | 0.48 | 1.75 | 0.16 | . | 0.71 | 0.14 | 0.34 | 5.60 | 25 or 100g | SrO: 0.02 |
| 1 | GBW 03117 | 71.25 | 2.56 | 6.37 | . | 0.18 | 1.10 | 3.98 | . | 13.77 | . | 0.057 | 0.44 | 50 g | . |

| RM | | CERAMIC POWDER | | | | | | | | | | | | | | |
|---------|------------------|--------------------------------|------|--------------------------------|------------------|------|-------|------------------|--------|--------|--------|--------|--------|--------|--------|-------|
| Number | SiO ₂ | Al ₂ O ₃ | CaO | Fe ₂ O ₃ | K ₂ O | MgO | MnO | TiO ₂ | Ba | Co | Cr | Cu | Ni | Sc | Zn | Units |
| SARM 69 | 66.6 | 14.4 | 2.37 | 7.18 | 1.96 | 1.85 | 0.129 | 0.777 | 0.0518 | 0.0028 | 0.0223 | 0.0046 | 0.0053 | 0.0020 | 0.0068 | 100 g |

CRM SYNTHETIC SILICATE WITH TRACE ELEMENTSMaterial base: SiO₂ 72%, Al₂O₃ 15%, Fe₂O₃ 4%, CaMg(CO₃)₂ pure dolomite 4%, Na₂SO₄ 2.5%, K₂SO₄ 2.5% analysis listed in mg/kg 70 g units

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

continued

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

CRM SILICON METAL POWDER

analysis listed in mass %

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

CRM SILICON CARBIDE

analysis listed in mass %

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

CRM SILICON CARBIDE

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

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

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

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

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

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

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

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

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

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

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

SILICOCALCIUM

= class, where 1 = CRM and 2 = RM

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

CRM

SILICOCHROMIUM

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

SILICOMANGANESE

= class, where 1 = CRM and 2 = RM

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

the below continuation shows only the samples with more data

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

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

SILICOZIRCONIUM

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

CRM BASIC SLAG

analysis listed in mass %

100 g units

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

CRM FERROALLOY SLAG

100 g units

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

IRON MAKING SLAG

= class, where 1 = CRM and 2 = RM

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

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

STEEL MAKING SLAG

= class, where 1 = CRM and 2 = RM

CMSI, GBW, RH: 50 g units

NH: 75 g units

all others: 100 g units

| # | Number | CaO | T.Ca | CaF ₂ | SiO ₂ | Al ₂ O ₃ | Cr ₂ O ₃ | F | Fe | FeO | K ₂ O | MgO | MnO | Na ₂ O | P ₂ O ₅ | s.P ₂ O ₅ | S | TiO ₂ | V ₂ O ₅ |
|---|-------------|--------|-------|------------------|------------------|--------------------------------|--------------------------------|-------|--------|--------|------------------|---------|--------|-------------------|-------------------------------|---------------------------------|-------|------------------|-------------------------------|
| 2 | RH02 | 64.7 | . | . | (12.9) | 11.0 | (0.03) | . | (0.2) | (0.2) | . | 3.5 | 0.024 | . | P:0.003 | . | (0.9) | 0.07 | . |
| 1 | JK S11 * | . | 60.0 | . | 26.8 | 2.85 | 0.17 | (7.9) | . | (0.2)* | . | 4.7 | 0.12 | . | (<0.005) | . | 0.30 | 0.95 | (<0.01) |
| 2 | BS 101/3 | 54.4 | . | . | 18.8 | 1.42 | . | . | 10.9 | . | 0.005 | 3.0 | 5.0 | 0.027 | 0.74 | . | 0.18 | (0.9) | . |
| 1 | CMSI 1745 | . | 37.64 | 1.41 | 14.91 | 1.78 | . | . | 13.38 | 12.33 | . | 9.28 | 1.86 | . | 1.02 | . | 0.097 | 0.42 | . |
| 2 | BS 101/1 | 52.9 | . | . | 23.3 | 0.70 | . | . | 5.8 | . | 0.008 | 8.7 | 3.47 | 0.013 | 0.76 | . | 0.19 | 0.8 | . |
| 1 | BS 101/4 | 52.5 | . | . | 16.7 | 0.86 | . | . | (13.3) | . | 0.007 | 4.8 | 4.79 | 0.018 | 0.81 | . | 0.15 | 1.16 | 17025 |
| 1 | IRSID 804-1 | 51.60 | . | . | 5.54 | (0.79) | . | . | 11.92 | . | . | 1.46 | 1.91 | . | 17.58 | . | 0.127 | 0.25 | 0.82 |
| 1 | BCS 381 | 49.0 | . | . | 8.78 | 0.67 | 0.33 | . | 13.3 | 3.69 | . | 1.03 | 3.16 | . | 15.7 | 15.2 | 0.19 | 0.35 | 0.94 |
| 1 | IRSID 805-1 | 48.92 | . | . | 6.63 | 0.616 | . | . | 14.87 | . | . | 1.86 | 2.05 | . | 16.20 | . | 0.092 | 0.342 | 0.918 |
| 2 | BS 101/2 | 47.6 | . | . | 16.9 | 0.91 | . | . | 15.1 | . | 0.008 | 7.0 | 4.8 | 0.031 | 0.63 | . | 0.20 | (0.8) | . |
| 1 | IRSID 806-1 | 46.13 | . | . | 11.72 | 0.901 | . | . | 17.89 | . | . | 3.02 | 5.94 | . | 2.25 | . | 0.110 | 0.504 | 0.514 |
| 2 | BS 101/5 | 46.1 | . | . | 15.2 | 0.74 | . | . | 19.4 | . | 0.0044 | 5.0 | 5.7 | (0.04) | 0.71 | . | 0.12 | 1.2 | . |
| 1 | ECRM 879-1 | 43.70 | . | . | 8.82 | 0.803 | 0.477 | 0.368 | 18.97 | . | . | 2.19 | 4.45 | . | 8.46 | 7.59 | 0.102 | 0.535 | 0.738 |
| 1 | NH 143 | 42.90 | . | . | 4.88 | (0.50) | 0.97 | . | 14.53 | 8.62 | . | 5.29 | 2.84 | . | 16.71 | . | 0.083 | 0.15 | . |
| 1 | NH 146 | 40.56 | . | . | 11.38 | 4.29 | 0.69 | . | 20.30 | 18.47 | . | 5.47 | 5.52 | . | 2.11 | . | 0.165 | 0.39 | . |
| 1 | NH 151 | 34.83 | . | . | 15.97 | 2.06 | 0.65 | . | 14.94 | 0.14 | . | 5.05 | 8.44 | . | 7.92 | . | 0.079 | 0.53 | . |
| 1 | NH 156 | 34.66 | . | . | 15.20 | 7.80 | 0.75 | . | 16.35 | 0.14 | . | 4.66 | 3.81 | . | 5.98 | . | 0.111 | 0.36 | . |
| 1 | CMSI 1744 | 26.73 | . | . | 8.91 | 3.92 | . | . | 34.33 | 36.55 | . | 12.15 | 2.01 | . | 0.87 | . | 0.107 | 0.32 | . |
| 1 | VS W4/4 | 25.5 | . | . | 16.7 | 3.62 | . | . | 23.2 | 25.5 | . | 18.3 | 4.17 | . | P: 0.259 | . | 0.037 | 1.02 | . |
| 1 | NH 150 | 21.77 | . | . | 15.69 | 3.23 | 1.74 | . | 24.23 | 27.30 | . | (14.46) | 8.16 | . | 0.62 | . | 0.044 | 0.15 | . |
| 1 | NH 152 | 21.95 | . | . | 15.91 | 2.60 | 28.67 | . | 14.40 | 12.79 | . | 6.17 | 4.85 | . | (0.12) | . | 0.028 | 0.37 | . |
| 1 | NH 145 | 20.85 | . | . | 22.43 | 2.39 | 0.99 | . | 27.97 | 30.46 | . | 2.71 | 9.26 | . | 2.05 | . | 0.089 | 0.56 | . |
| 1 | NH 149 | 9.85 | . | . | 8.42 | 3.36 | 53.81 | . | 14.09 | 8.12 | . | 2.89 | 3.74 | . | (0.03) | . | 0.040 | 0.22 | . |
| 1 | SARM 77 | 3.64 | . | . | 26.8 | 27.5 | 12.5 | . | 5.31T | . | . | 22.99 | . | . | . | . | 0.32T | . | . |
| 1 | NH 154 | (1.15) | . | . | 48.67 | 3.68 | 1.54 | . | 10.65 | 13.36 | . | 2.44 | (28.0) | . | (0.03) | . | 0.074 | 0.27 | . |

* JK S11 lists total Fe as FeO

CONVERTER SLAG

= class, where 1 = CRM and 2 = RM

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

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

CRM ELECTRIC FURNACE SLAG

50 g units

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

CRM FLUORINE SLAG

100 g units

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

MANGANESE SLAG

analysis listed in mass %

DH: RM, 100 g units

VS: CRM, 150 g units

| Number | Mn | Mn ₃ O ₄ | Al ₂ O ₃ | C | CaO | CuO | Fe | Fe ₂ O ₃ | K ₂ O | MgO | P | P ₂ O ₅ | S | SiO ₂ | 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 ₂ | Cr ₂ O ₃ | Na ₂ O | SnO ₂ | SrO | TiO ₂ | Y ₂ O ₃ | ZrO ₂ | -H ₂ O@900°C |
|-----------|---------|-----------------|--------------------------------|-------------------|------------------|-------|------------------|-------------------------------|------------------|-------------------------|
| VS SH11/1 | . | . | . | . | . | . | . | . | . | . |
| DH 7403 | (0.475) | 0.032 | 0.007 | 0.433 | . | 0.083 | 0.100 | (0.009) | 0.039 | 0.062 |
| DH 7404 | 0.925 | . | 0.007 | (0.229) | . | 0.109 | 0.164 | 0.014 | 0.035 | . |
| DH 7402 | . | . | 0.086 | 0.133 | 0.386 | . | 0.274 | . | 0.024 | 0.077 |

CRM PHOSPHATE SLAG

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

CRM SLAG

analysis listed in mass %

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

CRM TIN SLAG

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

CRM TITANIUM SLAG

100 g units

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

RM TUNDISH SLAG

typical analysis listed in mass %

100 g units

| Number | CaO | SiO ₂ | MgO | Al ₂ O ₃ | CO ₂ | Fe ₂ O ₃ | K ₂ O | MnO | Mn ₃ O ₄ | Na ₂ O | P ₂ O ₅ | S | SO ₃ | TiO ₂ | -H ₂ O 900°C |
|---------|-------|------------------|-------|--------------------------------|-----------------|--------------------------------|------------------|-------|--------------------------------|-------------------|-------------------------------|-------|-----------------|------------------|-------------------------|
| DH 5903 | 61.81 | 21.33 | 10.07 | 3.70 | 0.016 | 1.36 | 0.599 | . | 0.046 | 0.174 | 0.151 | 0.194 | . | 0.183 | 0.023 |
| DH 5904 | 39.47 | 30.68 | 14.53 | 12.37 | . | 0.591 | 0.622 | . | 0.076 | 0.530 | 0.019 | . | . | 0.038 | . |
| DH 6604 | 1.609 | 24.75 | 64.45 | 1.884 | 0.35 | 4.62 | 0.089 | . | 0.098 | 0.516 | 0.084 | . | 0.026 | 0.141 | 1.02 |
| DH 6606 | 1.37 | 27.46 | 62.63 | 1.30 | 0.16 | 4.93 | 0.070 | 0.093 | . | . | 0.055 | 0.022 | . | 0.103 | 1.15 |
| DH 6605 | . | . | . | . | 0.40179 | . | . | . | . | 0.347 | . | . | . | . | 1.15451 |

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

VACUUM SLAG

NCS: CRM, 80 g units

DH: RM, 100 g units

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

CRM VANADIUM SLAG

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

CRM SLUDGE

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

SRM 2781: 40 g

SRM 2782: 70 g

all others: 40 g units

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

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

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

CRM RED SLURRY SET

analysis listed in mass % 50 g units, SET ONLY

| Number | Al ₂ O ₃ | CaO | Fe ₂ O ₃ | SiO ₂ | TiO ₂ |
|-----------|--------------------------------|------|--------------------------------|------------------|------------------|
| 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 |

RM SODA ASH

analysis listed in mass % 100 g units

| Number | Na ₂ CO ₃ | NaCl | Fe ₂ O ₃ | Na ₂ SO ₄ |
|---------|---------------------------------|-------|--------------------------------|---------------------------------|
| BCS 526 | 99.74 | 0.126 | 0.0005 | 0.008 |

CRM SURFACE AREAdata listed in m²/g

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

CRM TENSILE CREEP

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

CRM TENSILE STRENGTH and HARDNESS

data shows estimates of (material, measurement) uncertainty

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

CRM TENSILE STRENGTH

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

CRM BORON CARBIDE

analysis listed in mass %

analysis listed in mg/kg

100 g

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

CRM CHROMIUM CARBIDE

analysis listed in mass %

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

CRM SILICON CARBIDE

analysis listed in mass %

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

CRM TUNGSTEN CARBIDE

analysis listed in mass %

SRM 276b: 75 g units

all others: 100 g units

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

CRM URBAN AEROSOLS analysis listed in mass %

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

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

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

CRM VANADIUM NITROGEN ALLOY analysis listed in mass %

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

CRM ZIRCON CONCENTRATE * SARM 62 lists Total Fe as Fe₂O₃ and Ti as TiO₂ DSU: 20 or 50 g others: 100 g

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

CRM ZIRCONIA - Yttrium Stabilized Zirconium Oxide

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

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

| Number | Al ₂ O ₃ | CaO | Fe ₂ O ₃ | HfO ₂ | K ₂ O | MgO | Na ₂ O | Nb ₂ O ₅ | SiO ₂ | TiO ₂ | LOI |
|-----------|--------------------------------|--------|--------------------------------|------------------|------------------|--------|-------------------|--------------------------------|------------------|------------------|------|
| JCRM R051 | . | 0.0017 | 0.0017 | 1.96 | . | 0.0004 | 0.015 | . | (0.005) | (0.0005) | 0.71 |
| JCRM R052 | . | 0.019 | (0.0004) | 1.81 | 0.0013 | 0.0042 | 0.0021 | . | 0.019 | 0.0012 | 0.25 |
| JCRM R053 | . | 0.021 | 0.030 | 1.67 | (0.0007) | 0.0020 | 0.028 | 0.054 | 0.036 | 0.127 | 0.65 |
| JCRM R054 | 0.136 | 0.535 | 0.132 | 1.60 | (0.0003) | 0.208 | 0.0027 | 0.427 | 0.300 | 0.138 | 0.15 |