Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample | Na | Mg | Al | Si | P  (wt%) | V | Mn | Fe | Ni | Cu | Zn | As | Rb | Sr | Zr |
| P14 High Mn - 1 | 22.4 | 186 | 234 | 445 | 16.6 | 0.26 | 3600 | 1590 | 0.18 | 6.86 | 0.90 | 49.4 | 0.03 | 1110 | 0.19 |
| P14 High Mn - 2 | 18.9 | 123 | 22.4 | 34.0 | 16.7 | 0.03 | 4480 | 1500 | 0.09 | 4.41 | 0.79 | 50.2 | 0.02 | 1220 | 0.57 |
| P14 High Mn - 3 | 63.2 | 84.0 | 56.9 | 93.0 | 16.6 | 0.07 | 3740 | 1210 | 0.20 | 7.31 | 1.01 | 48.8 | 0.04 | 1000 | 0.10 |
| P14 High Mn - 4 | 68.7 | 181 | 11.0 | 45.0 | 17.0 | 0.02 | 6250 | 1650 | 0.10 | 1.97 | 0.92 | 25.2 | 0.02 | 1400 | 0.08 |
| P14 High Mn - 5 | 18.6 | 136 | 2.16 | 48.0 | 17.1 | 0.01 | 3700 | 1090 | 0.06 | 0.62 | 0.72 | 5.50 | 0.02 | 857 | 0.06 |
| P14 High Mn - 6 | 100 | 115 | 17.7 | 290 | 17.3 | 0.04 | 3950 | 855 | 0.10 | 3.63 | 1.39 | 3.97 | 0.03 | 839 | 0.08 |
| P14 High Mn - 7 | 34.0 | 103 | 22.5 | 76.0 | 17.6 | 0.05 | 4130 | 1200 | 0.13 | 5.00 | 1.13 | 26.4 | 0.02 | 996 | 0.09 |
| P14 High Mn - 8 | 41.8 | 86.4 | 7.45 | 15.0 | 17.5 | 0.02 | 4320 | 796 | 0.06 | 2.01 | 0.65 | 1.86 | 0.03 | 920 | 0.03 |
| P14 High Mn - 9 | 25.6 | 88.0 | 13.2 | 44.0 | 17.7 | 0.02 | 3440 | 930 | 0.09 | 2.26 | 0.86 | 43.9 | 0.02 | 824 | 0.03 |
| P14 High Mn - 10 | 26.8 | 80.5 | 59.0 | 42.0 | 17.8 | 0.09 | 3570 | 1830 | 0.15 | 5.23 | 0.77 | 166 | 0.03 | 860 | 0.10 |
| P14 High Mn - 11 | 32.0 | 106 | 1.82 | 16.0 | 17.7 | 0.01 | 4270 | 859 | 0.09 | 0.27 | 0.63 | 4.22 | 0.01 | 993 | 0.03 |
| P14 High Mn - 12 | 24.7 | 118 | 46.2 | 41.0 | 18.3 | 0.06 | 4210 | 1540 | 0.08 | 7.19 | 1.26 | 16.9 | 0.02 | 966 | 0.05 |
| P14 High Mn - 13 | 18.7 | 84.3 | 24.2 | 48.0 | 18.2 | 0.03 | 3150 | 1360 | 0.09 | 3.00 | 0.56 | 138 | 0.02 | 914 | 0.10 |
| P14 High Mn - 14 | 12.4 | 89.9 | 19.2 | 38.0 | 18.3 | 0.03 | 3210 | 1110 | 0.08 | 3.89 | 0.82 | 25.8 | 0.01 | 948 | 0.09 |
| P14 High Mn - 15 | 15.7 | 115 | 6.21 | 0.00 | 18.5 | 0.03 | 3860 | 1100 | 0.08 | 1.38 | 0.74 | 15.3 | 0.02 | 854 | 0.06 |
| P14 High Mn - 16 | 15.3 | 146 | 4.40 | 20.0 | 18.2 | 0.03 | 4500 | 1360 | 0.13 | 0.85 | 1.17 | 5.00 | 0.01 | 1050 | 0.06 |
| P14 High Mn - 17 | 63.1 | 122 | 4.32 | 30.0 | 18.3 | 0.01 | 4240 | 1107 | 0.05 | 0.32 | 0.65 | 10.7 | 0.03 | 1050 | 0.02 |
| P14 High Mn - 18 | 16.3 | 74.9 | 21.8 | 19.0 | 18.3 | 0.03 | 3430 | 1063 | 0.10 | 1.38 | 0.45 | 55.0 | 0.01 | 981 | 0.06 |
| P14 High Mn - 19 | 67.3 | 149 | 17.7 | 11.0 | 18.6 | 0.03 | 5550 | 1370 | 0.11 | 1.40 | 0.83 | 21.5 | 0.04 | 1600 | 0.13 |
| P14 High Mn - 20 | 76.3 | 125 | 52.4 | 62.0 | 18.4 | 0.04 | 6010 | 1290 | 0.16 | 10.6 | 0.72 | 10.8 | 0.04 | 1350 | 0.05 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| P14 High Mn - 1 | 18.2 | 4.56 | 9.82 | 1.28 | 5.70 | 1.66 | 6.82 | 1.92 | 0.36 | 2.51 | 0.60 | 1.82 | 0.28 | 2.15 | 0.28 |
| P14 High Mn - 2 | 0.90 | 2.78 | 6.46 | 0.85 | 3.75 | 0.86 | 4.73 | 0.46 | 0.05 | 0.19 | 0.03 | 0.08 | 0.01 | 0.09 | 0.02 |
| P14 High Mn - 3 | 27.0 | 10.8 | 25.5 | 3.58 | 18.3 | 5.47 | 5.43 | 5.58 | 0.85 | 5.02 | 1.01 | 2.56 | 0.35 | 2.25 | 0.27 |
| P14 High Mn - 4 | 73.9 | 56.5 | 113 | 12.1 | 43.7 | 7.66 | 13.5 | 6.42 | 1.23 | 9.15 | 2.14 | 7.00 | 1.28 | 9.96 | 1.43 |
| P14 High Mn - 5 | 2.14 | 1.32 | 3.07 | 0.42 | 1.99 | 0.59 | 8.09 | 0.57 | 0.10 | 0.52 | 0.09 | 0.19 | 0.03 | 0.16 | 0.02 |
| P14 High Mn - 6 | 16.9 | 3.51 | 9.02 | 1.43 | 7.87 | 2.40 | 3.04 | 3.02 | 0.47 | 3.00 | 0.65 | 1.60 | 0.20 | 1.19 | 0.14 |
| P14 High Mn - 7 | 7.43 | 2.99 | 8.39 | 1.22 | 6.33 | 1.62 | 2.90 | 1.59 | 0.22 | 1.35 | 0.27 | 0.68 | 0.09 | 0.50 | 0.05 |
| P14 High Mn - 8 | 10.5 | 10.6 | 19.5 | 2.15 | 8.01 | 1.62 | 5.99 | 1.44 | 0.24 | 1.58 | 0.32 | 0.97 | 0.17 | 1.30 | 0.19 |
| P14 High Mn - 9 | 1.41 | 3.72 | 7.90 | 0.99 | 4.30 | 0.90 | 3.13 | 0.57 | 0.06 | 0.31 | 0.05 | 0.12 | 0.02 | 0.12 | 0.02 |
| P14 High Mn - 10 | 16.6 | 41.0 | 80.6 | 10.0 | 45.7 | 8.27 | 5.16 | 5.74 | 0.69 | 3.51 | 0.64 | 1.51 | 0.19 | 1.08 | 0.13 |
| P14 High Mn - 11 | 9.82 | 0.53 | 1.61 | 0.27 | 1.82 | 0.82 | 3.22 | 1.42 | 0.25 | 1.77 | 0.39 | 1.01 | 0.13 | 0.74 | 0.10 |
| P14 High Mn - 12 | 1.14 | 6.23 | 12.9 | 1.66 | 7.46 | 1.55 | 3.85 | 0.90 | 0.08 | 0.26 | 0.04 | 0.08 | 0.01 | 0.07 | 0.01 |
| P14 High Mn - 13 | 3.52 | 5.65 | 13.9 | 1.97 | 9.72 | 2.31 | 22.2 | 1.81 | 0.20 | 0.79 | 0.12 | 0.24 | 0.03 | 0.18 | 0.02 |
| P14 High Mn - 14 | 4.91 | 3.72 | 8.81 | 1.23 | 6.35 | 2.06 | 5.32 | 2.22 | 0.28 | 1.29 | 0.19 | 0.38 | 0.04 | 0.25 | 0.03 |
| P14 High Mn - 15 | 7.52 | 3.25 | 6.11 | 0.69 | 2.78 | 0.67 | 4.60 | 0.77 | 0.15 | 1.07 | 0.25 | 0.74 | 0.12 | 0.90 | 0.12 |
| P14 High Mn - 16 | 0.73 | 0.58 | 1.36 | 0.20 | 0.94 | 0.29 | 3.19 | 0.23 | 0.03 | 0.15 | 0.02 | 0.05 | 0.00 | 0.04 | 0.01 |
| P14 High Mn - 17 | 70.3 | 52.7 | 107 | 11.9 | 47.4 | 8.97 | 9.70 | 8.21 | 1.46 | 10.1 | 2.34 | 7.00 | 1.14 | 8.67 | 1.23 |
| P14 High Mn - 18 | 14.9 | 3.45 | 7.94 | 1.11 | 6.02 | 1.88 | 4.48 | 2.36 | 0.38 | 2.44 | 0.53 | 1.41 | 0.20 | 1.40 | 0.19 |
| P14 High Mn - 19 | 88.2 | 55.1 | 116 | 13.5 | 56.7 | 12.3 | 12.0 | 12.3 | 2.09 | 13.9 | 3.03 | 8.65 | 1.41 | 10.15 | 1.41 |
| P14 High Mn - 20 | 80.9 | 66.6 | 131 | 13.8 | 50.2 | 9.39 | 14.2 | 8.28 | 1.47 | 10.6 | 2.41 | 7.76 | 1.38 | 10.66 | 1.56 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| P14 Low Mn - 1 | 66.7 | 33.0 | 43.4 | 78.0 | 17.8 | 0.06 | 1100 | 498 | 0.12 | 8.49 | 0.40 | 16.8 | 0.05 | 490 | 0.10 |
| P14 Low Mn - 2 | 46.6 | 27.0 | 19.8 | 57.0 | 17.7 | 0.01 | 1130 | 363 | 0.07 | 4.79 | 0.30 | 15.1 | 0.04 | 734 | 0.05 |
| P14 Low Mn - 3 | 101 | 19.2 | 42.8 | 32.0 | 17.5 | 0.02 | 988 | 350 | 0.08 | 4.88 | 0.45 | 8.2 | 0.05 | 585 | 0.03 |
| P14 Low Mn - 4 | 33.0 | 17.5 | 39.0 | 16.0 | 17.7 | 0.05 | 880 | 451 | 0.07 | 5.19 | 0.47 | 18.4 | 0.02 | 806 | 0.06 |
| P14 Low Mn - 5 | 93.4 | 36.9 | 9.00 | 36.0 | 17.6 | 0.01 | 1680 | 358 | 0.05 | 1.01 | 0.38 | 7.4 | 0.05 | 651 | 0.02 |
| P14 Low Mn - 6 | 44.7 | 23.1 | 12.2 | 0.00 | 17.9 | 0.01 | 1340 | 302 | 0.06 | 3.45 | 0.33 | 9.9 | 0.02 | 889 | 0.10 |
| P14 Low Mn - 7 | 47.3 | 17.3 | 14.9 | 21.0 | 17.5 | 0.04 | 1170 | 264 | 0.07 | 3.66 | 0.45 | 14.4 | 0.02 | 710 | 0.04 |
| P14 Low Mn - 8 | 24.3 | 43.7 | 65.3 | 101 | 17.7 | 0.12 | 1960 | 1100 | 0.13 | 4.90 | 0.50 | 106 | 0.13 | 824 | 0.18 |
| P14 Low Mn - 9 | 24.1 | 38.0 | 27.3 | 28.0 | 17.5 | 0.06 | 1770 | 639 | 0.05 | 3.82 | 0.41 | 99.6 | 0.02 | 810 | 0.09 |
| P14 Low Mn - 10 | 39.1 | 52.6 | 63.6 | 104 | 17.4 | 0.10 | 1330 | 551 | 0.08 | 4.42 | 0.73 | 51.6 | 0.02 | 710 | 0.08 |
| P14 Low Mn - 11 | 78.2 | 28.0 | 52.4 | 148 | 17.4 | 0.07 | 872 | 471 | 0.18 | 2.46 | 0.25 | 30.5 | 0.06 | 534 | 0.05 |
| P14 Low Mn - 12 | 55.8 | 19.3 | 63.5 | 110 | 17.4 | 0.07 | 713 | 800 | 0.20 | 3.82 | 0.50 | 95.9 | 0.05 | 630 | 0.08 |
| P14 Low Mn - 13 | 40.2 | 19.2 | 32.2 | 50.0 | 17.2 | 0.05 | 925 | 360 | 0.11 | 2.45 | 0.25 | 25.2 | 0.02 | 693 | 0.05 |
| P14 Low Mn - 14 | 100 | 22.7 | 4.55 | 47.0 | 17.4 | 0.02 | 1010 | 313 | 0.03 | 0.47 | 0.23 | 18.2 | 0.07 | 226 | 0.01 |
| P14 Low Mn - 15 | 32.2 | 36.5 | 76.0 | 96.0 | 17.2 | 0.07 | 1090 | 744 | 0.14 | 2.27 | 0.27 | 85.0 | 0.04 | 888 | 0.31 |
| P14 Low Mn - 16 | 0.00 | 1675 | 8250 | 8320 | 17.1 | 10.3 | 999 | 3180 | 0.60 | 3.26 | 21.7 | 75.9 | 0.04 | 738 | 0.08 |
| P14 Low Mn - 17 | 45.6 | 29.6 | 8.82 | 26.0 | 17.1 | 0.01 | 1280 | 322 | 0.07 | 0.85 | 0.18 | 17.1 | 0.03 | 813 | 0.04 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| P14 Low Mn - 1 | 169 | 37.0 | 63.1 | 7.35 | 34.8 | 12.5 | 34.8 | 20.4 | 3.72 | 26.2 | 6.04 | 16.7 | 2.39 | 15.8 | 2.19 |
| P14 LowMn - 2 | 114 | 20.8 | 46.8 | 5.87 | 26.5 | 8.01 | 41.5 | 11.8 | 2.24 | 16.3 | 3.87 | 11.3 | 1.73 | 11.8 | 1.63 |
| P14 LowMn - 3 | 229 | 69.3 | 185 | 23.7 | 103 | 23.9 | 32.4 | 23.5 | 4.31 | 30.8 | 7.17 | 22.0 | 3.64 | 26.1 | 3.61 |
| P14 LowMn - 4 | 100 | 10.4 | 29.5 | 4.72 | 26.9 | 10.0 | 5.46 | 14.0 | 2.41 | 16.2 | 3.59 | 9.96 | 1.46 | 9.40 | 1.22 |
| P14 LowMn - 5 | 221 | 51.7 | 130 | 16.5 | 71.8 | 17.6 | 18.3 | 19.9 | 3.84 | 29.3 | 6.98 | 21.1 | 3.33 | 22.7 | 3.11 |
| P14 LowMn - 6 | 72.9 | 12.2 | 28.6 | 4.01 | 20.7 | 6.25 | 59.9 | 7.45 | 1.46 | 10.4 | 2.52 | 7.26 | 1.15 | 7.71 | 1.10 |
| P14 LowMn - 7 | 125 | 13.1 | 40.2 | 6.72 | 39.4 | 13.6 | 6.78 | 18.5 | 3.24 | 21.3 | 4.64 | 12.5 | 1.74 | 10.9 | 1.40 |
| P14 LowMn - 8 | 44.1 | 8.50 | 22.9 | 3.44 | 18.6 | 5.77 | 5.28 | 6.57 | 1.12 | 7.09 | 1.52 | 4.22 | 0.64 | 4.29 | 0.58 |
| P14 LowMn - 9 | 50.0 | 9.95 | 25.4 | 3.73 | 19.9 | 6.45 | 6.26 | 8.51 | 1.37 | 8.68 | 1.77 | 4.89 | 0.70 | 4.74 | 0.63 |
| P14 LowMn - 10 | 115 | 14.6 | 40.7 | 6.84 | 40.5 | 13.9 | 6.52 | 18.9 | 3.07 | 19.4 | 4.11 | 11.1 | 1.52 | 9.77 | 1.26 |
| P14 LowMn - 11 | 218 | 28.1 | 76.9 | 11.2 | 57.9 | 17.5 | 13.0 | 23.6 | 4.41 | 32.2 | 7.64 | 21.6 | 3.21 | 20.8 | 2.75 |
| P14 LowMn - 12 | 166 | 10.7 | 31.9 | 5.32 | 32.9 | 12.6 | 7.02 | 20.0 | 3.55 | 25.0 | 5.83 | 16.3 | 2.38 | 15.2 | 2.00 |
| P14 LowMn - 13 | 110 | 10.3 | 31.9 | 5.48 | 34.3 | 13.0 | 6.95 | 19.2 | 3.16 | 19.8 | 4.08 | 10.7 | 1.51 | 9.42 | 1.21 |
| P14 LowMn - 14 | 336 | 14.7 | 51.4 | 9.46 | 64.8 | 27.3 | 7.14 | 45.2 | 7.84 | 53.6 | 12.1 | 32.5 | 4.46 | 27.2 | 3.50 |
| P14 LowMn - 15 | 83.9 | 28.9 | 59.0 | 7.57 | 36.2 | 8.65 | 17.3 | 9.66 | 1.69 | 11.8 | 2.86 | 8.4 | 1.30 | 8.79 | 1.19 |
| P14 LowMn - 16 | 119 | 29.8 | 65.1 | 8.43 | 41.2 | 12.3 | 21.4 | 15.8 | 2.66 | 18.0 | 4.01 | 11.2 | 1.76 | 11.9 | 1.66 |
| P14 LowMn - 17 | 108 | 22.6 | 42.8 | 5.12 | 24.2 | 7.67 | 40.5 | 11.6 | 2.18 | 15.7 | 3.68 | 10.9 | 1.70 | 11.5 | 1.57 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P**  **(wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S30331 - 2 | 89.5 | 526 | 786 | 3840 | 19.9 | 3.58 | 437 | 2280 | 6.95 | 3.00 | 1.70 | 232 | 0.11 | 238 | 23.2 |
| S30331 - 4 | 307 | 1210 | 2360 | 3250 | 19.5 | 15.6 | 1170 | 29400 | 84.1 | 55.5 | 3.34 | 11400 | 4.68 | 357 | 25.8 |
| S30334a - 2 | 77.1 | 4950 | 4780 | 9320 | 19.7 | 10.9 | 696 | 3030 | 1.71 | 39.6 | 139 | 1.72 | 2.70 | 196 | 2.85 |
| S30334a - 3 | 11.9 | 1910 | 1930 | 2980 | 20.1 | 6.42 | 689 | 1410 | 0.55 | 10.0 | 15.7 | 2.08 | 0.07 | 609 | 4.24 |
| S30334a - 5 | 1270 | 83.0 | 2960 | 6230 | 20.1 | 0.05 | 926 | 290 | 0.17 | 0.50 | 0.87 | 1.74 | 0.79 | 223 | 0.07 |
| S30334a - 6 | 21.3 | 145 | 127 | 272 | 20.3 | 1.05 | 591 | 308 | 0.21 | 1.80 | 1.42 | 1.67 | 0.03 | 443 | 0.61 |
| S30334a - 7 | 462 | 1560 | 6600 | 8220 | 20.1 | 50.4 | 603 | 7790 | 0.47 | 34.1 | 11.0 | 1.13 | 5.97 | 607 | 2.71 |
| S30334a - 8 | 187 | 266 | 2450 | 3140 | 20.0 | 10.9 | 349 | 744 | 0.19 | 4.75 | 2.20 | 1.12 | 5.32 | 333 | 0.60 |
| S30334a - 9 | 423 | 246 | 6070 | 13200 | 19.9 | 1.38 | 703 | 620 | 0.16 | 1.05 | 3.19 | 6.27 | 23 | 203 | 1.65 |
| S3035 - 1 | 300 | 730 | 900 | 1930 | 20.1 | 4.00 | 247 | 2660 | 1.87 | 3.62 | 2.28 | 3.50 | 0.21 | 176 | 1.27 |
| S3035 - 6 | 137 | 6830 | 9510 | 13700 | 20.2 | 107 | 596 | 15800 | 7.34 | 2.17 | 28.8 | 1.05 | 4.71 | 201 | 0.63 |
| S3052 - 4 | 101 | 163 | 64.7 | 457 | 20.5 | 0.04 | 3180 | 515 | 0.69 | 0.54 | 1.69 | 1.33 | 0.05 | 189 | 0.99 |
| S3052 - 12 | 298 | 61.6 | 1.3 | 56.0 | 20.2 | 0.01 | 1240 | 358 | 0.15 | 0.19 | 0.14 | 2.23 | 0.11 | 228 | 0.02 |
| S3052 - 5 | 21.9 | 63.0 | 33.8 | 145 | 20.2 | 0.12 | 3050 | 415 | 0.17 | 0.38 | 0.27 | 1.02 | 0.04 | 233 | 0.75 |
| S3052 - 19 | 255 | 42.0 | 1.77 | 91.0 | 20.0 | 0.02 | 1610 | 225 | 0.11 | 0.07 | 0.10 | 1.89 | 0.12 | 223 | 0.03 |
| S3052 - 16 | 246 | 152 | 101 | 215 | 19.6 | 0.17 | 1090 | 446 | 0.21 | 0.49 | 0.51 | 1.48 | 0.11 | 215 | 0.20 |
| S3052 - 17 | 44.4 | 102 | 75.7 | 373 | 19.5 | 0.28 | 1060 | 309 | 0.14 | 0.64 | 0.94 | 1.56 | 0.10 | 141 | 4.19 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S30331 - 2 | 302 | 22.4 | 60.3 | 8.64 | 47.2 | 17.3 | 4.53 | 30.7 | 5.33 | 41.0 | 9.80 | 30.2 | 3.97 | 23.9 | 3.02 |
| S30331 - 4 | 516 | 84.0 | 209 | 30.0 | 152 | 50.3 | 9.29 | 76.6 | 12.6 | 88.8 | 18.8 | 53.0 | 6.66 | 37.6 | 4.48 |
| S30334a - 2 | 250 | 165 | 167 | 43.8 | 161 | 30.3 | 9.07 | 28.9 | 5.0 | 36.6 | 8.03 | 25.9 | 3.92 | 27.0 | 3.50 |
| S30334a - 3 | 109 | 23.7 | 40.1 | 6.44 | 24.7 | 6.49 | 13.6 | 7.71 | 1.60 | 12.7 | 2.98 | 11.0 | 2.07 | 18.1 | 2.73 |
| S30334a - 5 | 514 | 22.5 | 76.0 | 14.9 | 98.2 | 50.7 | 4.42 | 93.6 | 15.9 | 104 | 19.4 | 51.3 | 6.63 | 40.5 | 5.04 |
| S30334a - 6 | 115 | 19.6 | 32.7 | 5.23 | 20.5 | 5.88 | 14.4 | 7.38 | 1.60 | 13.0 | 3.04 | 11.1 | 2.02 | 16.9 | 2.48 |
| S30334a - 7 | 342 | 7.57 | 13.1 | 2.52 | 12.6 | 5.83 | 9.26 | 12.8 | 3.16 | 29.6 | 8.03 | 33.2 | 6.00 | 44.5 | 6.23 |
| S30334a - 8 | 411 | 19.4 | 19.5 | 6.39 | 29.7 | 11.0 | 4.70 | 21.5 | 4.62 | 40.1 | 10.1 | 39.0 | 6.63 | 47.6 | 6.59 |
| S30334a - 9 | 150 | 20.2 | 32.3 | 5.20 | 21.2 | 6.66 | 3.57 | 8.96 | 2.02 | 16.7 | 3.98 | 15.1 | 2.92 | 24.9 | 3.53 |
| S3035 - 1 | 557 | 9.72 | 18.0 | 4.27 | 26.2 | 12.7 | 2.48 | 26.8 | 6.27 | 59.4 | 16.8 | 62.0 | 9.22 | 59.1 | 8.22 |
| S3035 - 6 | 654 | 24.7 | 52.7 | 12.5 | 74.8 | 31.8 | 2.59 | 58.2 | 11.4 | 91.6 | 22.1 | 71.6 | 9.89 | 61.5 | 8.15 |
| S3052 - 4 | 72.5 | 5.17 | 18.7 | 3.38 | 19.7 | 9.6 | 1.61 | 15.2 | 2.64 | 16.7 | 2.89 | 7.11 | 0.93 | 5.94 | 0.76 |
| S3052 - 12 | 613 | 52.6 | 201 | 37.9 | 234 | 116 | 13.6 | 185 | 30.3 | 173 | 27.71 | 60.5 | 6.18 | 30.5 | 3.34 |
| S3052 - 5 | 94.5 | 4.61 | 14.3 | 2.36 | 12.7 | 6.21 | 2.33 | 9.30 | 1.90 | 13.2 | 2.80 | 10.8 | 2.24 | 20.9 | 3.48 |
| S3052 - 19 | 564 | 39.9 | 157 | 29.9 | 183 | 93.5 | 10.3 | 152 | 25.7 | 151 | 24.9 | 56.7 | 6.12 | 31.8 | 3.61 |
| S3052 - 16 | 520 | 41.2 | 159 | 30.0 | 188 | 94.2 | 10.2 | 153 | 24.6 | 142 | 23.1 | 52.1 | 5.70 | 30.4 | 3.45 |
| S3052 - 17 | 401 | 26.3 | 85.5 | 13.8 | 69.4 | 31.3 | 4.50 | 43.3 | 8.78 | 61.8 | 12.9 | 46.4 | 8.37 | 68.1 | 10.7 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P**  **(wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S3052 - 18 | 46.3 | 372 | 399 | 700 | 19.8 | 0.21 | 1480 | 575 | 0.39 | 0.40 | 2.36 | 0.66 | 0.08 | 287 | 2.74 |
| S3052 - 19 | 16.7 | 1330 | 1342 | 1820 | 19.8 | 0.22 | 1160 | 1220 | 2.28 | 2.25 | 14.4 | 1.94 | 0.05 | 237 | 6.46 |
| S3052 - 20 | 980 | 306 | 123 | 5080 | 19.2 | 0.03 | 1040 | 353 | 0.30 | 0.55 | 1.20 | 8.10 | 0.30 | 201 | 0.95 |
| S3052 - 21 | 208 | 55.5 | 0.8 | 38.0 | 19.8 | 0.01 | 1140 | 337 | 0.11 | 0.20 | 0.10 | 1.34 | 0.09 | 210 | 0.01 |
| S3052 - 22 | 175 | 666 | 655 | 885 | 20.0 | 0.10 | 1490 | 724 | 0.97 | 1.52 | 5.09 | 1.65 | 0.10 | 221 | 1.09 |
| S3052 - 23 | 209 | 66.5 | 29.0 | 105 | 19.9 | 0.02 | 1240 | 290 | 0.17 | 0.15 | 0.21 | 1.50 | 0.12 | 208 | 0.15 |
| S3052 - 24 | 146 | 809 | 808 | 1130 | 20.1 | 0.04 | 990 | 756 | 1.57 | 1.67 | 6.72 | 1.89 | 0.09 | 216 | 0.54 |
| S3052 - 25 | 90.8 | 54.8 | 4.92 | 188 | 20.1 | 0.46 | 1220 | 316 | 0.11 | 0.07 | 0.28 | 1.32 | 0.05 | 112 | 8.94 |
| S3052 - 26 | 51.4 | 426 | 1100 | 1020 | 20.3 | 0.55 | 2120 | 2260 | 1.39 | 1.04 | 5.26 | 1.56 | 0.04 | 193 | 0.72 |
| S3052 - 27 | 37.0 | 777 | 723 | 1130 | 20.0 | 0.13 | 2670 | 933 | 1.94 | 3.35 | 7.79 | 1.54 | 0.04 | 244 | 3.32 |
| S3052 - 28 | 136 | 1480 | 1730 | 2250 | 20.0 | 0.26 | 446 | 1180 | 2.18 | 2.65 | 12.0 | 3.13 | 0.21 | 202 | 7.07 |
| S3052 - 29 | 34.4 | 190 | 161 | 309 | 19.9 | 0.10 | 1360 | 370 | 0.28 | 0.42 | 1.48 | 0.32 | 0.04 | 255 | 2.01 |
| S3052 - 30 | 92.0 | 86.3 | 11.9 | 380 | 20.0 | 0.14 | 2600 | 412 | 0.16 | 0.07 | 0.27 | 1.52 | 0.04 | 123 | 0.85 |
| S3052 - 31 | 67.5 | 304 | 284 | 707 | 16.4 | 0.46 | 809 | 405 | 0.47 | 1.74 | 5.19 | 1.26 | 0.13 | 223 | 17.7 |
| S3052 - 32 | 91.3 | 1580 | 2330 | 2860 | 20.0 | 1.70 | 517 | 3280 | 5.16 | 9.20 | 21.2 | 37.9 | 0.21 | 177 | 3.02 |
| S3052 - 33 | 200 | 1520 | 1100 | 3350 | 19.2 | 0.10 | 768 | 1170 | 2.50 | 4.78 | 11.7 | 3.80 | 0.18 | 183 | 1.21 |
| S3052 - 34 | 49.0 | 503 | 506 | 767 | 20.2 | 0.12 | 608 | 482 | 0.92 | 1.79 | 3.42 | 2.21 | 0.07 | 198 | 2.56 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S3052 - 18 | 323 | 12.8 | 33.4 | 4.78 | 22.4 | 9.01 | 2.14 | 12.8 | 3.03 | 26.4 | 7.48 | 36.2 | 8.69 | 84.7 | 13.4 |
| S3052 - 19 | 89.9 | 13.6 | 35.1 | 5.01 | 23.0 | 9.79 | 2.09 | 13.3 | 2.65 | 17.7 | 3.11 | 8.81 | 1.38 | 10.0 | 1.32 |
| S3052 - 20 | 434 | 32.2 | 122 | 22.1 | 133 | 63.9 | 7.34 | 99.1 | 17.1 | 104 | 18.0 | 43.7 | 5.22 | 30.2 | 3.63 |
| S3052 - 21 | 507 | 36.1 | 140 | 26.2 | 162 | 81.3 | 8.54 | 130 | 21.5 | 128 | 21.3 | 50.5 | 5.91 | 32.6 | 3.79 |
| S3052 - 22 | 420 | 30.9 | 119 | 22.6 | 140 | 70.7 | 7.91 | 114 | 18.9 | 112 | 18.3 | 42.0 | 4.67 | 25.3 | 2.97 |
| S3052 - 23 | 591 | 37.5 | 146 | 26.8 | 157 | 78.0 | 8.78 | 122 | 22.5 | 141 | 24.3 | 60.7 | 7.33 | 42.2 | 5.01 |
| S3052 - 24 | 362 | 26.4 | 101 | 18.8 | 114 | 58.2 | 7.29 | 93.9 | 15.8 | 93.3 | 15.4 | 35.8 | 4.02 | 22.1 | 2.61 |
| S3052 - 25 | 274 | 20.5 | 76.3 | 13.9 | 83.7 | 41.3 | 7.11 | 65.2 | 11.2 | 66.6 | 11.3 | 27.3 | 3.46 | 22.9 | 3.56 |
| S3052 - 26 | 139 | 13.6 | 43.2 | 7.44 | 40.1 | 18.4 | 3.48 | 27.0 | 5.05 | 31.7 | 5.43 | 13.8 | 1.82 | 11.4 | 1.45 |
| S3052 - 27 | 57.4 | 5.29 | 13.9 | 2.20 | 10.8 | 4.62 | 2.15 | 6.40 | 1.19 | 8.26 | 1.68 | 5.60 | 0.99 | 8.51 | 1.32 |
| S3052 - 28 | 540 | 31.1 | 113 | 21.6 | 127 | 66.8 | 11.9 | 105 | 19.8 | 124 | 21.3 | 54.3 | 7.24 | 46.1 | 5.77 |
| S3052 - 29 | 179 | 21.6 | 57.8 | 8.26 | 36.4 | 14.8 | 7.30 | 19.3 | 4.03 | 28.5 | 5.55 | 18.45 | 3.41 | 29.6 | 4.43 |
| S3052 - 30 | 29.6 | 2.30 | 7.90 | 1.40 | 7.56 | 3.53 | 0.67 | 5.12 | 0.96 | 6.00 | 1.07 | 2.96 | 0.44 | 3.67 | 0.62 |
| S3052 - 31 | 549 | 36.5 | 86.7 | 11.0 | 49.8 | 0.44 | 19.8 | 64.3 | 29.8 | 7.42 | 61.0 | 15.4 | 60.1 | 13.1 | 132 |
| S3052 - 32 | 491 | 41.8 | 127 | 22.5 | 124 | 60.3 | 8.48 | 91.2 | 17.6 | 111 | 19.4 | 50.4 | 6.86 | 44.0 | 5.52 |
| S3052 - 33 | 234 | 17.5 | 55.4 | 9.93 | 57.9 | 29.1 | 4.92 | 46.0 | 8.50 | 53.4 | 9.18 | 23.4 | 3.02 | 19.0 | 2.42 |
| S3052 - 34 | 236 | 20.8 | 68.9 | 11.3 | 58.8 | 27.3 | 4.44 | 39.9 | 7.76 | 50.3 | 8.77 | 23.6 | 3.34 | 22.6 | 2.86 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P**  **(wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S3052 - 35 | 90.0 | 1140 | 1130 | 1680 | 19.8 | 0.11 | 642 | 768 | 2.02 | 2.57 | 10.2 | 2.19 | 0.09 | 202 | 2.18 |
| S3052 - 36 | 112 | 60.2 | 28.8 | 107 | 16.6 | 0.03 | 1250 | 262 | 0.15 | 0.20 | 0.24 | -0.27 | 0.06 | 159 | 0.02 |
| S3052 - 37 | 181 | 38.9 | 6.10 | 65 | 20.3 | 0.01 | 977 | 166 | 0.15 | 0.04 | 0.21 | 1.76 | 0.09 | 201 | 0.01 |
| S3053b - 9 | 7980 | 1580 | 10700 | 38400 | 18.5 | 0.25 | 457 | 428 | 0.64 | 2.04 | 3.95 | 37.00 | 2.58 | 139 | 4.73 |
| S3053b - 10 | 8.50 | 14.4 | 5.90 | 28 | 19.7 | 0.31 | 335 | 45.8 | 0.15 | 0.26 | 0.12 | 7.81 | 0.06 | 101 | 0.03 |
| S3053b - 11 | 52.0 | 31.0 | 8.00 | 0.00 | 19.4 | 0.18 | 426 | 140 | 0.16 | 0.04 | 0.07 | 4.34 | 0.07 | 117 | 0.01 |
| S3053b - 12 | 57.2 | 43.3 | 0.46 | 76 | 19.5 | 0.21 | 717 | 239 | 0.14 | 0.04 | 0.10 | 3.57 | 0.09 | 114 | 0.01 |
| S3053b - 13 | 19.5 | 196 | 147 | 9147 | 19.7 | 0.06 | 967 | 472 | 0.23 | 0.44 | 1.16 | 0.61 | 0.03 | 270 | 0.07 |
| S3056 - 14 | 116 | 4650 | 6010 | 5809 | 19.9 | 17.5 | 564 | 8772 | 1.73 | 0.13 | 17.8 | 0.00 | 0.21 | 158 | 0.04 |
| S3056 - 17 | 566 | 1263 | 16100.0 | 31400 | 19.4 | 3.67 | 738 | 6070 | 0.88 | 3.30 | 6.5 | 1.09 | 48.1 | 304 | 36.0 |
| S3056 - 17 | 810 | 1420 | 1530 | 4530 | 20.0 | 8.50 | 918 | 3790 | 0.56 | 540 | 3.00 | 7.00 | 0.46 | 147 | 1.78 |
| S3056 - 6 | 10100 | 9890 | 12000 | 440000 | 18.3 | 32.9 | 710 | 15530 | 4.08 | 1.29 | 41.0 | 102 | 3.08 | 142 | 12.7 |
| S3056 - 7 | 620 | 571 | 24100 | 75400 | 14.8 | 6.86 | 617 | 1940 | 0.64 | 2.61 | 1.26 | 0.18 | 59.4 | 170 | 0.39 |
| S3056 - 8 | 154 | 107 | 621 | 356 | 15.6 | 5.99 | 866 | 7490 | 1.07 | 11.5 | 0.54 | 1.23 | 0.22 | 241 | 0.09 |
| B8b - 19 | 220 | 1410 | 1710 | 3090 | 15.1 | 4.50 | 614 | 4090 | 6.86 | 2.36 | 17.2 | 4.70 | 0.17 | 907 | 1.22 |
| B8b - 1 | 146 | 49.5 | 2.92 | 162 | 15.6 | 0.04 | 945 | 344 | 0.28 | 0.08 | 0.12 | 1.73 | 0.13 | 150 | 0.03 |
| B8b - 6 | 52.6 | 499 | 831 | 1060 | 15.7 | 3.63 | 638 | 1420 | 2.22 | 3.30 | 5.20 | 2.34 | 0.68 | 1435 | 0.02 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S3052 - 35 | 240 | 21.2 | 73.1 | 12.3 | 64.8 | 30.5 | 4.86 | 43.6 | 8.21 | 52.7 | 9.14 | 24.1 | 3.32 | 22.1 | 2.80 |
| S3052 - 36 | 376 | 28.5 | 98.8 | 16.4 | 94.3 | 1.60 | 45.0 | 7.90 | 66.4 | 13.2 | 83.6 | 15.2 | 37.3 | 5.09 | 32.3 |
| S3052 - 37 | 438 | 28.6 | 112 | 20.8 | 123 | 58.4 | 6.70 | 90.2 | 16 | 102 | 17.7 | 44.6 | 5.42 | 31.2 | 3.75 |
| S3053b - 9 | 280 | 3.75 | 7.79 | 1.26 | 6.10 | 2.46 | 3.56 | 4.67 | 1.34 | 15.9 | 6.34 | 34.1 | 7.11 | 61 | 11.0 |
| S3053b - 10 | 222 | 1.23 | 4.21 | 0.78 | 4.99 | 2.64 | 4.97 | 5.52 | 1.36 | 14.3 | 4.90 | 23.8 | 5.16 | 50.7 | 9.7 |
| S3053b - 11 | 253 | 0.32 | 0.47 | 0.07 | 0.36 | 0.26 | 3.07 | 1.44 | 0.64 | 10.6 | 5.10 | 31.4 | 7.08 | 65.3 | 12.6 |
| S3053b - 12 | 321 | 5.96 | 19.4 | 3.54 | 22.8 | 11.4 | 3.70 | 23.1 | 4.46 | 35.4 | 9.22 | 37.9 | 6.89 | 56.0 | 9.7 |
| S3053b - 13 | 88.7 | 12.4 | 23.1 | 2.86 | 10.3 | 2.77 | 15.9 | 3.14 | 0.78 | 7.47 | 1.98 | 9.21 | 2.25 | 22.4 | 3.63 |
| S3056 - 14 | 702 | 3.75 | 7.79 | 1.26 | 6.10 | 2.46 | 3.56 | 4.67 | 1.34 | 15.9 | 6.34 | 34.1 | 7.11 | 60.8 | 11.0 |
| S3056 - 17 | 1230 | 1.23 | 4.21 | 0.78 | 4.99 | 2.64 | 4.97 | 5.52 | 1.36 | 14.3 | 4.90 | 23.8 | 5.16 | 50.7 | 9.7 |
| S3056 - 17 | 1110 | 0.32 | 0.47 | 0.07 | 0.36 | 0.26 | 3.07 | 1.44 | 0.64 | 10.6 | 5.10 | 31.4 | 7.08 | 65.3 | 12.6 |
| S3056 - 6 | 800 | 5.96 | 19.4 | 3.54 | 22.8 | 11.4 | 3.70 | 23.1 | 4.46 | 35.4 | 9.22 | 37.9 | 6.89 | 56.0 | 9.68 |
| S3056 - 7 | 541 | 12.4 | 23.1 | 2.86 | 10.3 | 2.77 | 15.9 | 3.14 | 0.78 | 7.47 | 1.98 | 9.21 | 2.25 | 22.4 | 3.63 |
| S3056 - 8 | 852 | 16.0 | 58.6 | 10.7 | 61.1 | 24.6 | 6.41 | 40.7 | 9.16 | 81.5 | 21.7 | 81.1 | 13.6 | 95.0 | 12.6 |
| B8b - 19 | 113 | 42.3 | 132 | 20.4 | 112 | 47.2 | 7.28 | 92.0 | 19.1 | 167 | 43.2 | 149 | 22.1 | 143 | 18.3 |
| B8b - 1 | 693 | 32.1 | 108 | 18.9 | 116 | 49.5 | 6.33 | 89.6 | 17.9 | 151 | 38.8 | 135 | 20.3 | 131 | 17.2 |
| B8b - 6 | 167 | 15.7 | 59.4 | 11.3 | 72.3 | 32.9 | 4.93 | 59.6 | 12.4 | 104 | 26.8 | 93.4 | 14.5 | 96.2 | 12.3 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| B8b - 2 | 389 | 3100 | 10000 | 16200 | 18.7 | 27.2 | 555 | 8600 | 37.4 | 1.96 | 64.3 | 2.02 | 14.3 | 910 | 4.37 |
| B8b - 4 | 87.8 | 6690 | 13900 | 16700 | 18.7 | 59.8 | 677 | 19200 | 68.5 | 1.03 | 95.2 | 2.15 | 14.5 | 572 | 1.98 |
| B8b - 3 | 249 | 1340 | 8480 | 20500 | 19.0 | 11 | 478 | 3573 | 11.9 | 6.20 | 31.3 | 1.35 | 25.0 | 906 | 2.45 |
| B8b - 10 | 96.0 | 319 | 480 | 990 | 19.1 | 0.14 | 303 | 661 | 3.38 | 0.38 | 2.55 | 4.51 | 0.41 | 119 | 3.11 |
| B8b - 8 | 98.0 | 580 | 1140 | 1430 | 19.1 | 4.90 | 142 | 1750 | 5.40 | 0.08 | 2.98 | 1.68 | 1 | 1070 | 1.27 |
| B8b - 17 | 97.8 | 2350 | 7600 | 15500 | 19.5 | 13.4 | 486 | 7140 | 34.2 | 5.40 | 66.5 | 4.25 | 14.6 | 117 | 1.64 |
| B8b - 27 | 94.9 | 1020 | 1600 | 1870 | 20.6 | 6.58 | 382 | 3020 | 6.66 | 220 | 9.00 | 1.89 | 0.68 | 480 | 0.92 |
| S3026 - 2 | 1370 | 310 | 135 | 4030 | 19.7 | 0.25 | 1060 | 348 | 0.36 | 2.54 | 0.45 | 14.4 | 0.42 | 1540 | 2.85 |
| S3026 - 3 | 222 | 40.6 | 30.9 | 0.10 | 19.9 | 0.21 | 1180 | 380 | 0.21 | 0.90 | 0.22 | 3.25 | 0.13 | 2440 | 95.0 |
| S3036 - 1 | 25.1 | 302 | 235 | 375 | 20.3 | 0.03 | 805 | 611 | 0.24 | 0.87 | 0.50 | 0.10 | 0.03 | 836 | 0.41 |
| S3036 - 2 | 37.7 | 294 | 239 | 413 | 20.4 | 0.03 | 883 | 595 | 0.19 | 0.98 | 0.61 | 1.40 | 0.04 | 765 | 0.71 |
| S3062 - 3 | 115 | 259 | 317 | 2760 | 20.3 | 0.43 | 729 | 630 | 0.27 | 0.37 | 0.44 | 1.48 | 0.11 | 825 | 0.10 |
| S3062 - 4 | 136 | 283 | 436 | 1080 | 20.1 | 0.60 | 759 | 1260 | 0.70 | 0.17 | 1.05 | 1.62 | 0.18 | 1440 | 0.11 |
| S3062 - 5 | 98.1 | 98.0 | 125 | 329 | 20.5 | 0.20 | 849 | 361 | 0.34 | 0.31 | 0.50 | 1.52 | 0.12 | 1380 | 0.22 |
| S3062 - 6 | 148 | 1500 | 2550 | 4700 | 20.3 | 4.65 | 816 | 4290 | 0.92 | 0.14 | 2.38 | 2.89 | 2.65 | 787 | 0.17 |
| S3063 - 6 | 64.4 | 1170 | 1063 | 5900 | 197000 | 0.22 | 679 | 1562 | 4.65 | 25.4 | 3.71 | 3.72 | 0.15 | 131 | 0.80 |
| S3063 - 7 | 630 | 145 | 59.0 | 1890 | 195000 | 0.11 | 364 | 354 | 0.45 | 0.89 | 0.21 | 7.80 | 0.27 | 125 | 0.66 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| B8b - 2 | 110 | 25.8 | 74.4 | 11.3 | 62.0 | 21.9 | 6.72 | 35.2 | 7.57 | 63.7 | 17.1 | 59.5 | 9.86 | 72.5 | 9.70 |
| B8b - 4 | 293 | 135 | 226 | 25.1 | 124 | 44.2 | 6.66 | 73.6 | 14.8 | 118 | 30.3 | 97.9 | 14.9 | 102 | 13.3 |
| B8b - 3 | 109 | 6.77 | 18.5 | 2.83 | 14.7 | 5.38 | 2.27 | 8.63 | 1.67 | 13.5 | 3.37 | 11.8 | 1.92 | 14.1 | 2.21 |
| B8b - 10 | 510 | 1.13 | 3.63 | 0.59 | 3.38 | 1.93 | 1.16 | 6.95 | 2.16 | 30.8 | 14.9 | 83.6 | 15.8 | 123 | 19.1 |
| B8b - 8 | 107 | 2.12 | 6.76 | 1.25 | 8.25 | 3.93 | 1.47 | 8.68 | 1.66 | 13.2 | 3.27 | 10.2 | 1.21 | 6.74 | 0.84 |
| B8b - 17 | 487 | 3.17 | 10.7 | 1.99 | 12.1 | 6.03 | 2.18 | 14.1 | 3.61 | 39.0 | 14.8 | 71.3 | 12.7 | 97.5 | 16.3 |
| B8b - 27 | 321 | 8.82 | 30.9 | 5.92 | 39.3 | 20.3 | 3.82 | 40.2 | 7.61 | 54.6 | 11.3 | 32.9 | 4.58 | 30.0 | 4.09 |
| S3026 - 2 | 524 | 318 | 38.9 | 144 | 28.6 | 193 | 93.8 | 24.4 | 150 | 22.1 | 127 | 20.9 | 50.2 | 5.73 | 31.3 |
| S3026 - 3 | 541 | 340 | 58.2 | 217 | 42.5 | 279 | 124 | 40.3 | 180 | 25.6 | 140 | 22.1 | 49.9 | 5.44 | 29.3 |
| S3036 - 1 | 84.0 | 330 | 9.56 | 23.4 | 3.52 | 15.5 | 4.29 | 0.76 | 5.30 | 1.11 | 9.36 | 2.41 | 9.8 | 1.78 | 14.0 |
| S3036 - 2 | 114 | 418 | 11.8 | 33.9 | 5.71 | 27.3 | 8.49 | 1.41 | 10.3 | 1.96 | 14.8 | 3.45 | 12.5 | 2.07 | 15.1 |
| S3062 - 3 | 292 | 8.94 | 33.0 | 6.52 | 42.4 | 17.8 | 7.99 | 28.9 | 5.05 | 39.6 | 9.29 | 31.3 | 4.82 | 33.4 | 4.45 |
| S3062 - 4 | 194 | 19.4 | 79.7 | 15.8 | 98.8 | 34.0 | 24.6 | 43.4 | 5.70 | 34.1 | 6.51 | 18.6 | 2.61 | 17.8 | 2.33 |
| S3062 - 5 | 181 | 18.7 | 72.6 | 14.0 | 85.7 | 28.6 | 21.1 | 37.4 | 5.02 | 30.7 | 6.05 | 17.9 | 2.57 | 17.4 | 2.30 |
| S3062 - 6 | 324 | 31.5 | 104 | 16.1 | 84.8 | 26.3 | 10.9 | 36.2 | 6.13 | 47.0 | 10.5 | 34.4 | 5.18 | 35.7 | 4.71 |
| S3063 - 6 | 318 | 8.85 | 20.6 | 3.72 | 20.1 | 8.99 | 2.70 | 17.8 | 4.03 | 36.6 | 10.4 | 41.0 | 6.47 | 44.0 | 5.78 |
| S3063 - 7 | 340 | 1.08 | 2.90 | 0.58 | 3.54 | 2.40 | 2.40 | 9.86 | 2.78 | 31.2 | 10.5 | 45.6 | 7.68 | 54.9 | 7.61 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt %)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S3063 - 8 | 95.2 | 59.8 | 22.2 | 77.0 | 199580 | 0.22 | 878 | 3110 | 0.58 | 2.16 | 0.62 | 3.18 | 0.10 | 148 | 0.02 |
| S3063 - 9 | 54.7 | 37.0 | 1.49 | 100 | 196490 | 0.12 | 370 | 228 | 0.20 | 0.65 | 0.22 | 3.66 | 0.16 | 115 | 0.01 |
| S3063 - 10 | 93.7 | 55.3 | 1.80 | 668 | 200000 | 0.07 | 994 | 508 | 0.18 | 0.15 | 0.31 | 1.72 | 0.11 | 180 | 0.14 |
| X-16 - 10 | 184 | 132 | 1040 | 1020 | 20.1 | 1.36 | 3380 | 2370 | 0.27 | 0.45 | 3.01 | 86.6 | 9.9 | 2080 | 69.0 |
| X-16 - 11 | 123 | 158 | 31.8 | 136 | 20.3 | 0.11 | 4190 | 2510 | 0.34 | 0.38 | 1.98 | 35.5 | 0.04 | 2330 | 96.1 |
| X-16 - 12 | 342 | 472 | 2376 | 2496 | 20.3 | 1.88 | 5740 | 3700 | 0.56 | 0.26 | 8.32 | 6.31 | 0.17 | 1980 | 8.22 |
| X-16 - 13 | 420 | 570 | 3440 | 3350 | 20.3 | 3.95 | 3270 | 3820 | 0.49 | 0.55 | 10.4 | 35.1 | 2.30 | 1940 | 64.5 |
| X-16 - 14 | 171 | 109 | 960 | 1080 | 20.1 | 1.22 | 3640 | 2080 | 0.25 | 0.41 | 1.51 | 32.4 | 11.2 | 1748 | 42.6 |
| X-16 - 16 | 141 | 200 | 3.92 | 24.0 | 20.1 | Below LOD | 3820 | 2900 | 0.16 | 0.16 | 1.94 | 2.44 | 0.03 | 1900 | 0.05 |
| X-16 - 17 | 227 | 133 | 2.37 | 28.0 | 20.5 | Below LOD | 6600 | 2290 | 0.14 | 0.23 | 0.95 | 5.13 | 0.05 | 2090 | 0.29 |
| X-16 - 18 | 176 | 401 | 716 | 783 | 20.3 | 0.47 | 5640 | 3760 | 1.10 | 0.94 | 2.54 | 19.2 | 2.82 | 1770 | 35.9 |
| X-16 - 20 | 913 | 950 | 7660 | 8000 | 19.7 | 6.28 | 2620 | 6990 | 0.78 | 0.61 | 25.6 | 71.0 | 2.51 | 1630 | 67.8 |
| X-16 - 21 | 192 | 130 | 104 | 72.0 | 20.5 | 0.12 | 8250 | 2400 | 0.22 | 0.21 | 0.77 | 5.84 | 1.01 | 1710 | 79.0 |
| X-16 - 24 | 297 | 396 | 1840 | 1800 | 20.2 | 2.13 | 5890 | 4150 | 0.87 | 1.14 | 7.39 | 74.7 | 0.18 | 1580 | 31.8 |
| X-16 - 25 | 52.0 | 236 | 1.79 | 64.0 | 20.5 | Below LOD | 4980 | 3900 | 0.13 | 4.60 | 2.52 | 1.10 | 0.03 | 2930 | 0.23 |
| X-16 - 26 | 460 | 275 | 40.0 | 350 | 20.2 | 0.04 | 3840 | 3130 | 0.15 | 0.73 | 2.21 | 11.7 | 0.19 | 1593 | 1.55 |
| X-16 - 27 | 231 | 207 | 196 | 4600 | 20.3 | 0.47 | 3760 | 3130 | 0.15 | 0.62 | 2.32 | 5.57 | 3.08 | 1995 | 7.23 |

\*

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S3063 - 8 | 330 | 14.7 | 41.5 | 6.95 | 37.4 | 15.3 | 3.53 | 26.2 | 5.24 | 42.4 | 10.4 | 38.4 | 6.19 | 43.4 | 5.79 |
| S3063 - 9 | 418 | 0.34 | 0.94 | 0.18 | 1.42 | 1.36 | 2.49 | 7.59 | 2.51 | 32.9 | 12.8 | 63.1 | 11.4 | 85.4 | 12.8 |
| S3063 - 10 | 442 | 34.7 | 94.0 | 13.6 | 66.7 | 22.5 | 6.82 | 32.0 | 6.50 | 53.0 | 12.6 | 46.1 | 8.07 | 61.5 | 8.10 |
| X-16 - 10 | 149 | 110 | 270 | 35.9 | 158 | 34.2 | 11.4 | 29.8 | 4.07 | 25.0 | 4.94 | 15.0 | 2.20 | 15.1 | 2.13 |
| X-16 - 11 | 118 | 98.1 | 208 | 26.0 | 115 | 26.2 | 13.8 | 22.1 | 3.00 | 18.6 | 3.71 | 11.7 | 1.80 | 13.2 | 1.88 |
| X-16 - 12 | 128 | 169 | 351 | 40.3 | 157 | 29.1 | 10.3 | 23.2 | 3.19 | 19.8 | 3.92 | 12.4 | 1.95 | 14.3 | 2.08 |
| X-16 - 13 | 150 | 213 | 467 | 58.6 | 246 | 45.3 | 14.2 | 36.8 | 4.43 | 26.0 | 5.02 | 15.1 | 2.18 | 15.4 | 2.14 |
| X-16 - 14 | 152 | 131 | 317 | 41.2 | 178 | 36.4 | 11.3 | 31.0 | 4.26 | 26.0 | 5.12 | 15.4 | 2.23 | 15.5 | 2.12 |
| X-16 - 16 | 128 | 143 | 315 | 38.7 | 160 | 31.3 | 10.4 | 25.7 | 3.52 | 21.3 | 4.22 | 12.9 | 1.92 | 13.5 | 1.90 |
| X-16 - 17 | 223 | 226 | 483 | 57.5 | 227 | 43.3 | 13.8 | 37.2 | 5.45 | 36.2 | 7.51 | 23.4 | 3.28 | 21.4 | 2.90 |
| X-16 - 18 | 163 | 148 | 353 | 45.2 | 191 | 38.5 | 12.4 | 32.5 | 4.49 | 27.6 | 5.39 | 16.3 | 2.36 | 16.2 | 2.26 |
| X-16 - 20 | 505 | 165 | 426 | 58.2 | 269 | 62.4 | 12.3 | 65.0 | 9.9 | 72.9 | 18.7 | 70.5 | 11.1 | 74.6 | 9.12 |
| X-16 - 21 | 176 | 173 | 411 | 52.6 | 223 | 43.8 | 12.8 | 37.9 | 5.02 | 30.8 | 6.00 | 18.1 | 2.58 | 17.7 | 2.45 |
| X-16 - 24 | 173 | 137 | 338 | 44.6 | 196 | 41.0 | 11.1 | 35.7 | 4.88 | 30.0 | 5.84 | 17.6 | 2.49 | 17.2 | 2.33 |
| X-16 - 25 | 46.4 | 53.1 | 88.6 | 8.46 | 27.0 | 4.68 | 15.8 | 3.72 | 0.60 | 4.40 | 1.03 | 4.24 | 0.91 | 8.71 | 1.33 |
| X-16 - 26 | 142 | 149 | 330 | 40.3 | 165 | 32.8 | 13.7 | 27.8 | 3.82 | 23.5 | 4.72 | 14.4 | 2.07 | 14.4 | 1.97 |
| X-16 - 27 | 254 | 243 | 503 | 57.7 | 222 | 44.3 | 20.4 | 37.9 | 5.55 | 35.3 | 7.19 | 24.2 | 4.07 | 31.4 | 4.52 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| X-16 - 28 | 218 | 174 | 500 | 439 | 20.1 | 0.24 | 3450 | 2670 | 0.22 | 0.12 | 1.37 | 3.43 | 5.90 | 1349 | 0.13 |
| X-16 - 30 | 121 | 235 | 623 | 990 | 20.4 | 0.96 | 4870 | 3210 | 0.19 | 0.13 | 2.69 | 1.08 | 7.30 | 2315 | 0.04 |
| X-16 - 31 | 117 | 167 | 18.4 | 67 | 20.5 | 0.02 | 4080 | 2750 | 0.19 | 0.16 | 1.91 | 5.70 | 0.22 | 1983 | 2.10 |
| X-16 - 33 | 292 | 1400 | 2770 | 3370 | 20.7 | 1.83 | 3570 | 8480 | 0.56 | 2.40 | 5.47 | 28.5 | 0.14 | 3942 | 2.77 |
| X-16 - 34 | 225 | 269 | 2870 | 3530 | 20.6 | 3.85 | 5600 | 2960 | 0.35 | 0.45 | 1.63 | 13.1 | 17.2 | 2409 | 13.7 |
| X-16 - 36 | 490 | 195 | 57.0 | 2080 | 20.1 | 0.22 | 3550 | 2450 | 0.25 | 5.20 | 2.60 | 34.0 | 0.12 | 1990 | 0.63 |
| X-16 - 37 | 195 | 190 | 87.2 | 466 | 20.2 | 0.27 | 4850 | 2950 | 0.38 | 0.59 | 2.17 | 39.1 | 0.06 | 1461 | 990 |
| S3057 | 114 | 1386 | 2660 | 4020 | 19.6 | 4.01 | 831 | 2470 | 1.12 | 0.73 | 4.33 | 3.13 | 4.07 | 144 | 66 |
| S3057 | 247 | 1840 | 1740 | 9920 | 19.2 | 3.24 | 656 | 1500 | 0.79 | 3.00 | 2.77 | 3.49 | 3.54 | 145 | 43.0 |
| S3057 | 1070 | 703 | 2270 | 7730 | 19.2 | 0.61 | 353 | 313 | 0.25 | 1.11 | 1.21 | 2.00 | 3.90 | 158 | 0.89 |
| S3057 | 66.2 | 75.0 | 43.2 | 310 | 19.4 | 0.10 | 405 | 77.2 | 0.06 | 0.33 | 0.22 | 1.25 | 0.05 | 200 | 0.01 |
| S3057 | 666 | 565 | 3320 | 8090 | 19.4 | 3.75 | 651 | 685 | 0.12 | 0.24 | 0.80 | 1.92 | 10.2 | 608 | 0.49 |
| S3057 | 536 | 356 | 1820 | 3630 | 20.2 | 4.30 | 943 | 722 | 0.14 | 0.45 | 0.77 | 2.33 | 0.51 | 676 | 0.11 |
| S3057 | 3110 | 1050 | 7290 | 22100 | 20.1 | 1.90 | 545 | 880 | 0.84 | 2.83 | 2.88 | 1.47 | 8.60 | 145 | 8.99 |
| S3037 - 2 | 537 | 1530 | 4680 | 6940 | 20.4 | 57.7 | 3740 | 19000 | 1.73 | 1.09 | 7.92 | 1.73 | 0.52 | 186 | 1.01 |
| S3037 - 3 | 2350 | 521 | 11900 | 18800 | 20.1 | 3.10 | 475 | 931 | 0.78 | 1.03 | 1.55 | 2.79 | 0.67 | 220 | 1.06 |
| S3037 - 10 | 820 | 2140 | 6700 | 9600 | 20.4 | 33.7 | 716 | 4190 | 1.68 | 0.46 | 12.3 | 1.16 | 0.61 | 193 | 0.30 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| X-16 - 28 | 162 | 196 | 435 | 52.8 | 216 | 42.2 | 12.4 | 34.7 | 4.66 | 28.3 | 5.55 | 16.5 | 2.34 | 16.1 | 2.19 |
| X-16 - 30 | 70.7 | 151 | 288 | 31.0 | 111 | 19.2 | 18.8 | 13.9 | 1.87 | 11.0 | 2.11 | 7 | 1.23 | 10.2 | 1.62 |
| X-16 - 31 | 104 | 109 | 243 | 30.4 | 129 | 26.2 | 10.3 | 22.6 | 2.99 | 18.0 | 3.44 | 10.5 | 1.57 | 11.3 | 1.59 |
| X-16 - 33 | 83.3 | 112 | 373 | 57.0 | 265 | 49.1 | 8.90 | 30.4 | 3.01 | 15.5 | 3.09 | 10.4 | 1.56 | 10.4 | 1.12 |
| X-16 - 34 | 133 | 150 | 318 | 37.4 | 145 | 28.6 | 17.6 | 23.3 | 3.21 | 19.9 | 3.99 | 13.0 | 2.20 | 17.0 | 2.51 |
| X-16 - 36 | 92.5 | 113 | 248 | 30.3 | 123 | 23.8 | 11.4 | 19.1 | 2.56 | 15.7 | 3.10 | 9.6 | 1.42 | 10.0 | 1.40 |
| X-16 - 37 | 278 | 181 | 429 | 55.8 | 251 | 58.3 | 15.4 | 57.9 | 7.59 | 46.5 | 8.96 | 25.3 | 3.59 | 25.7 | 3.54 |
| S3057 | 520 | 18.2 | 47.6 | 7.24 | 35.3 | 14.0 | 4.19 | 27.5 | 6.38 | 59.8 | 17.8 | 70.6 | 11.1 | 75.4 | 10.6 |
| S3057 | 655 | 8.94 | 23.7 | 3.73 | 19.4 | 9 | 3.44 | 23.0 | 5.97 | 63.7 | 21.5 | 93.3 | 15.9 | 111 | 16.1 |
| S3057 | 281 | 7.94 | 28.0 | 5.50 | 33.4 | 14.7 | 3.48 | 26.6 | 5.31 | 40.8 | 9.51 | 32.5 | 4.89 | 32.8 | 4.55 |
| S3057 | 245 | 10.6 | 33.5 | 5.55 | 31.0 | 12.7 | 3.38 | 23.5 | 4.55 | 35.3 | 8.43 | 28.9 | 4.29 | 28.0 | 3.86 |
| S3057 | 209 | 10.2 | 27.1 | 4.58 | 25.0 | 10.6 | 2.25 | 19.6 | 4.05 | 31.4 | 7.29 | 23.3 | 3.39 | 21.5 | 2.88 |
| S3057 | 285 | 30.3 | 79.0 | 11.3 | 53.9 | 20.2 | 4.58 | 33.3 | 6.60 | 47.8 | 10.0 | 29.3 | 3.88 | 24.1 | 3.06 |
| S3057 | 322 | 12.6 | 42.8 | 9.09 | 58.0 | 23.1 | 4.51 | 36.0 | 6.79 | 50.2 | 10.9 | 32.6 | 4.43 | 26.7 | 3.38 |
| S3037 - 2 | 271 | 19.0 | 55.3 | 8.52 | 41.0 | 10.9 | 2.89 | 14.4 | 2.90 | 25.6 | 7.02 | 28.4 | 5.17 | 39.4 | 5.39 |
| S3037 - 3 | 392 | 15.6 | 52.0 | 8.66 | 44.3 | 13.3 | 6.72 | 18.4 | 3.96 | 36.4 | 10.2 | 42.6 | 7.76 | 60.0 | 8.18 |
| S3037 - 10 | 233 | 14.1 | 42.4 | 6.53 | 32.2 | 8.81 | 2.45 | 12.0 | 2.44 | 21.5 | 5.97 | 24.3 | 4.40 | 34.1 | 4.63 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S3029 - 1 | 16.5 | 249 | 82.2 | 334 | 20.8 | 0.18 | 726 | 237 | 0.44 | 0.60 | 0.35 | 4.31 | 0.02 | 193 | 0.44 |
| S3029 - 2 | 12.5 | 70.7 | 0.13 | 48.0 | 21.1 | 0.07 | 1230 | 397 | 0.08 | 0.15 | 0.10 | 0.52 | 0.02 | 207 | 0.04 |
| S3029 - 4 | 230 | 514 | 681 | 1640 | 20.9 | 0.09 | 958 | 346 | 0.21 | 0.55 | 0.30 | 0.99 | 0.12 | 193 | 0.16 |
| S3029 - 5 | 41.6 | 1270 | 1260 | 3520 | 20.6 | 9.6 | 672 | 1930 | 0.42 | 0.97 | 1.37 | 3.59 | 0.13 | 174 | 0.29 |
| S3029 - 8 | 18.2 | 559 | 370 | 757 | 20.6 | 0.27 | 1055 | 644 | 0.41 | 0.69 | 0.71 | 0.87 | 0.04 | 212 | 0.23 |
| S3029 - 10 | 178 | 422 | 540 | 1440 | 20.6 | 0.13 | 1279 | 585 | 6.79 | 7.90 | 1.25 | 4.17 | 0.75 | 169 | 0.11 |
| S3029 - 12 | 30.2 | 1010 | 1050 | 1620 | 20.9 | 3.70 | 742 | 1571 | 0.64 | 0.73 | 1.54 | 3.94 | 0.07 | 189 | 1.72 |
| S3029 - 16 | 31.9 | 625 | 430 | 820 | 20.3 | 2.10 | 880 | 750 | 0.30 | 0.33 | 1.39 | 0.25 | 0.06 | 162 | 0.87 |
| S3029 - 18 | 26.6 | 1240 | 348 | 1570 | 20.1 | 0.14 | 1450 | 572 | 0.79 | 2.64 | 0.96 | 0.73 | 0.07 | 195 | 0.46 |
| S3029 - 20 | 20.5 | 291 | 61.6 | 256 | 20.7 | 0.08 | 1800 | 368 | 1.24 | 0.77 | 1.75 | 0.41 | 0.01 | 227 | 1.63 |
| S3029 - 21 | 17.1 | 3780 | 5220 | 5730 | 20.4 | 26.5 | 1130 | 7390 | 1.27 | 0.20 | 21.9 | 0.60 | 0.02 | 205 | 0.18 |
| S3029 - 22 | 22.9 | 1040 | 933 | 1750 | 21.0 | 4.97 | 1340 | 1460 | 1.83 | 1.42 | 2.50 | 4.65 | 0.05 | 191 | 0.96 |
| S3029 - 23 | 99.0 | 258 | 353 | 770 | 21.0 | 0.07 | 606 | 124 | 0.25 | 0.44 | 0.25 | 0.99 | 0.02 | 201 | 0.40 |
| S3029 - 24 | 25.2 | 421 | 222 | 1290 | 21.1 | 2.41 | 834 | 596 | 0.25 | 0.11 | 0.92 | 4.11 | 0.05 | 188 | 0.32 |
| S3029 - 25 | 720 | 2860 | 3530 | 7460 | 20.1 | 14.7 | 728 | 4710 | 1.16 | 2.21 | 12.2 | 9.40 | 0.29 | 180 | 1.73 |
| S3029 - 26 | 98.0 | 910 | 1400 | 2170 | 20.9 | 2.17 | 676 | 1390 | 0.54 | 0.93 | 2.18 | 1.11 | 0.72 | 176 | 0.81 |
| S3029 - 27 | 24.6 | 704 | 744 | 2560 | 21.2 | 4.95 | 749 | 1380 | 0.30 | 0.08 | 3.21 | 4.67 | 0.06 | 175 | 0.07 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S3029 - 1 | 56.9 | 3.23 | 6.70 | 0.94 | 4.21 | 1.37 | 1.06 | 1.46 | 0.30 | 2.98 | 1.11 | 7.09 | 2.11 | 24.7 | 4.68 |
| S3029 - 2 | 57.2 | 4.54 | 9.36 | 1.13 | 4.56 | 1.60 | 7.56 | 2.25 | 0.50 | 4.67 | 1.26 | 5.84 | 1.37 | 14.3 | 2.33 |
| S3029 - 4 | 111 | 7.22 | 16.0 | 2.25 | 10.1 | 3.81 | 4.80 | 5.46 | 1.12 | 9.9 | 2.70 | 11.9 | 2.63 | 25.2 | 4.07 |
| S3029 - 5 | 231 | 6.22 | 13.6 | 1.88 | 9.00 | 3.32 | 4.06 | 5.69 | 1.37 | 14.5 | 4.95 | 26.1 | 6.15 | 62.1 | 10.3 |
| S3029 - 8 | 62.9 | 6.53 | 13.2 | 1.73 | 7.32 | 2.38 | 9.36 | 3.05 | 0.61 | 5.29 | 1.40 | 6.43 | 1.53 | 16.0 | 2.69 |
| S3029 - 10 | 242 | 12.6 | 36.4 | 5.73 | 28.3 | 10.3 | 1.94 | 14.3 | 2.99 | 26 | 7.56 | 29.5 | 4.51 | 29.0 | 3.92 |
| S3029 - 12 | 58.4 | 3.98 | 8.13 | 1.31 | 6.33 | 1.95 | 0.70 | 2.04 | 0.33 | 3.01 | 1.15 | 7.37 | 2.15 | 25.0 | 4.72 |
| S3029 - 16 | 188 | 3.38 | 8.06 | 1.15 | 5.54 | 2.21 | 2.14 | 4.31 | 1.10 | 13 | 4.41 | 23.1 | 5.32 | 50.5 | 8.47 |
| S3029 - 18 | 77.5 | 6.31 | 14.1 | 1.80 | 8.33 | 2.81 | 5.19 | 3.52 | 0.71 | 6.23 | 1.75 | 8.27 | 2.08 | 22.2 | 3.78 |
| S3029 - 20 | 62.7 | 6.97 | 13.4 | 1.78 | 7.71 | 2.37 | 6.44 | 3.21 | 0.62 | 5.41 | 1.44 | 6.26 | 1.36 | 13.0 | 2.11 |
| S3029 - 21 | 80.2 | 5.91 | 13.2 | 1.74 | 7.65 | 2.65 | 7.50 | 3.69 | 0.82 | 6.99 | 1.85 | 8.30 | 1.93 | 19.3 | 3.21 |
| S3029 - 22 | 102 | 3.28 | 7.99 | 0.96 | 4.60 | 1.57 | 1.09 | 1.91 | 0.42 | 4.88 | 1.92 | 12.2 | 3.36 | 36.4 | 6.63 |
| S3029 - 23 | 97.2 | 6.58 | 15.1 | 2.11 | 9.35 | 3.09 | 6.68 | 4.19 | 0.90 | 7.97 | 2.18 | 10.1 | 2.41 | 24.6 | 4.13 |
| S3029 - 24 | 141 | 2.87 | 6.25 | 0.82 | 3.48 | 1.28 | 1.89 | 2.19 | 0.63 | 7.62 | 2.78 | 15.8 | 4.21 | 45.6 | 8.12 |
| S3029 - 25 | 126 | 3.03 | 7.09 | 0.97 | 4.23 | 1.59 | 1.86 | 2.80 | 0.71 | 7.65 | 2.63 | 13.7 | 3.43 | 35.4 | 6.02 |
| S3029 - 26 | 104 | 3.96 | 9.01 | 1.32 | 6.25 | 2.26 | 2.06 | 3.34 | 0.74 | 7.29 | 2.27 | 11.5 | 2.73 | 27.2 | 4.57 |
| S3029 - 27 | 174 | 2.43 | 5.06 | 0.64 | 2.94 | 1.23 | 2.23 | 2.53 | 0.74 | 9.04 | 3.46 | 20.0 | 5.31 | 57.5 | 10.0 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| S3029 - 28 | 17.1 | 3780 | 5220 | 5730 | 20.4 | 26.5 | 1130 | 7390 | 1.27 | 0.20 | 21.9 | 0.60 | 0.02 | 205 | 0.18 |
| P-9 - 2 | 622 | 1140 | 6860 | 6960 | 18.7 | 10.2 | 1040 | 2970 | 1.33 | 2.47 | 17.6 | 171 | 0.26 | 447 | 0.39 |
| P-9 - 3 | 224 | 247 | 1300 | 2780 | 18.3 | 2.31 | 509 | 7430 | 1.47 | 8.41 | 1.02 | 2790 | 0.74 | 384 | 0.94 |
| P-9 - 16 | 550 | 69.0 | 67.0 | 690 | 19.3 | 0.07 | 3460 | 498 | 0.43 | 6.80 | 0.69 | 19.0 | 0.14 | 1710 | 0.67 |
| P-9 - 22 | 245 | 129 | 106 | 158 | 19.0 | 0.06 | 7580 | 1542 | 0.34 | 4.85 | 0.48 | 41.6 | 0.12 | 1950 | 0.09 |
| P-9 - 23 | 301 | 124 | 59.0 | 280 | 17.7 | 0.11 | 3820 | 1800 | 0.33 | 5.70 | 0.91 | 80.0 | 0.12 | 772 | 0.13 |
| P-9 - 25 | 670 | 146 | 30.0 | 1230 | 17.5 | 0.06 | 2159 | 1265 | 0.27 | 2.78 | 0.59 | 13.8 | 0.30 | 256 | 0.39 |
| P-9 - 26 | 292 | 124 | 51.0 | 162 | 18.9 | 0.02 | 3050 | 1420 | 0.15 | 0.97 | 0.64 | 3.17 | 0.18 | 568 | 0.07 |
| A\_P20 - 4 | 51.0 | 133 | 6.60 | 148 | 16.2 | 0.01 | 4260 | 1180 | 0.09 | 0.78 | 1.08 | 2.15 | 0.03 | 1130 | 0.08 |
| A\_P20 - 11 | 102 | 167 | 8.00 | 220 | 16.9 | 0.02 | 4700 | 1350 | 0.07 | 0.17 | 0.81 | 1.05 | 0.03 | 1030 | 0.02 |
| A\_P20 - 3 | 56.4 | 233 | 217 | 339 | 16.3 | 0.43 | 4230 | 1430 | 0.14 | 8.10 | 0.71 | 8.56 | 0.02 | 1130 | 0.04 |
| A\_P20 - 16 | 39.8 | 51.9 | 47.6 | 125 | 16.7 | 0.05 | 1360 | 840 | 0.06 | 15.2 | 0.37 | 6.23 | 0.01 | 713 | 0.04 |
| A\_P20 - 9 | 48.7 | 100 | 3.70 | 61.0 | 16.6 | 0.01 | 2940 | 740 | 0.07 | 0.96 | 0.36 | 2.90 | 0.01 | 983 | 1.07 |
| A\_P20 - 7 | 106 | 162 | 14.6 | 665 | 16.5 | 0.01 | 6270 | 1310 | 0.09 | 6.50 | 0.76 | 5.07 | 0.03 | 1450 | 0.03 |
| A\_P20 - 13 | 40.9 | 80.2 | 64.0 | 91.0 | 16.7 | 0.05 | 2050 | 545 | 0.05 | 6.29 | 0.36 | 11.5 | 0.02 | 1170 | 0.04 |
| A\_P20 - 15 | 24.3 | 68.1 | 24.2 | 48.0 | 16.7 | 0.03 | 2270 | 562 | 0.09 | 11.0 | 0.37 | 34.9 | 0.02 | 1240 | 0.05 |
| A\_P20 - 14 | 33.5 | 68.1 | 110 | 180 | 16.7 | 0.07 | 1420 | 598 | 0.20 | 11.5 | 0.64 | 43.7 | 0.01 | 892 | 0.04 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| S3029 - 28 | 80.2 | 5.91 | 13.2 | 1.74 | 7.65 | 2.65 | 7.50 | 3.69 | 0.82 | 6.99 | 1.85 | 8.30 | 1.93 | 19.3 | 3.21 |
| P-9 - 2 | 624 | 59.8 | 212 | 37.8 | 228 | 91.8 | 14.9 | 135 | 22.0 | 140 | 25.9 | 66.0 | 7.85 | 44.3 | 5.39 |
| P-9 - 3 | 466 | 23.9 | 92.8 | 17.6 | 110 | 43.5 | 10.1 | 67.9 | 11.5 | 81.1 | 17.1 | 49.3 | 6.38 | 38.1 | 4.92 |
| P-9 - 16 | 226 | 63.7 | 156 | 21.0 | 93 | 26.2 | 13.9 | 31.0 | 5.20 | 36.0 | 7.55 | 22.3 | 3.20 | 20.2 | 2.65 |
| P-9 - 22 | 565 | 43.8 | 158 | 28.4 | 166 | 72.2 | 12.8 | 109 | 19.5 | 126 | 23.0 | 58.8 | 7.33 | 43.5 | 5.44 |
| P-9 - 23 | 583 | 40.5 | 156 | 28.5 | 167 | 74.7 | 11.5 | 111 | 19.8 | 129 | 23.4 | 58.1 | 7.20 | 42.2 | 5.20 |
| P-9 - 25 | 640 | 44.1 | 168 | 30.6 | 174 | 74.1 | 12.1 | 109 | 20.4 | 136 | 25.5 | 65.7 | 8.29 | 49.0 | 6.05 |
| P-9 - 26 | 618 | 43.2 | 164 | 30.1 | 176 | 77.5 | 11.8 | 117 | 21.4 | 139 | 25.3 | 64.4 | 7.88 | 46.7 | 5.78 |
| A\_P20 - 4 | 20.6 | 44.6 | 68.5 | 6.28 | 18.2 | 2.65 | 11.2 | 1.78 | 0.36 | 2.54 | 0.57 | 1.98 | 0.42 | 3.70 | 0.58 |
| A\_P20 - 11 | 133 | 78.2 | 172 | 20.9 | 86.9 | 18.1 | 13.3 | 16.7 | 2.94 | 19.9 | 4.54 | 13.3 | 2.16 | 15.3 | 2.14 |
| A\_P20 - 3 | 63.4 | 46.8 | 87.4 | 10.0 | 38.8 | 8.40 | 24.9 | 8.7 | 1.53 | 10.1 | 2.23 | 6.27 | 1.03 | 7.47 | 1.05 |
| A\_P20 - 16 | 65.0 | 54.9 | 63.1 | 5.56 | 21.8 | 7.47 | 83.0 | 11.0 | 1.77 | 10.7 | 2.15 | 5.81 | 1.03 | 9.37 | 1.48 |
| A\_P20 - 9 | 75.0 | 79.1 | 135 | 14.7 | 57.4 | 11.3 | 68.8 | 10.7 | 1.77 | 11.6 | 2.54 | 7.41 | 1.22 | 9.24 | 1.34 |
| A\_P20 - 7 | 148 | 83.1 | 172 | 20.9 | 87.8 | 19.0 | 13.9 | 19.0 | 3.42 | 23.3 | 5.29 | 15.2 | 2.36 | 16.2 | 2.26 |
| A\_P20 - 13 | 60.0 | 58.4 | 79.0 | 7.23 | 25.4 | 6.72 | 48.9 | 8.31 | 1.45 | 9.36 | 2.02 | 5.76 | 0.95 | 7.55 | 1.09 |
| A\_P20 - 15 | 30.4 | 12.8 | 18.0 | 1.86 | 8.48 | 2.76 | 36.3 | 3.73 | 0.71 | 4.71 | 1.09 | 3.04 | 0.49 | 3.48 | 0.50 |
| A\_P20 - 14 | 95.4 | 22.3 | 41.4 | 5.15 | 26 | 9.17 | 18.1 | 13.9 | 2.42 | 15.7 | 3.45 | 9.29 | 1.37 | 9.36 | 1.26 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| A\_P20 - 6 | 112 | 34.0 | 61.0 | 930 | 16.4 | 0.04 | 2370 | 407 | 0.28 | 21.2 | 0.50 | 22.5 | 0.05 | 1180 | 0.04 |
| A\_P20 - 24 | 83.5 | 81.9 | 267 | 299 | 16.3 | 0.33 | 1690 | 400 | 0.07 | 3.14 | 0.72 | 11.2 | 0.03 | 876 | 0.04 |
| A\_P20 - 20 | 114 | 225 | 284 | 324 | 16.6 | 0.19 | 5900 | 2100 | 0.17 | 33.5 | 1.36 | 22.2 | 0.51 | 2430 | 0.26 |
| A\_P20 - 17 | 76.7 | 46.5 | 11.8 | 24.0 | 16.6 | 0.02 | 4360 | 335 | 0.06 | 5.90 | 0.17 | 8.47 | 0.03 | 1790 | 0.04 |
| A\_P20 - 8 | 74.5 | 84.9 | 45.4 | 89.0 | 16.4 | 0.07 | 3060 | 854 | 0.11 | 5.18 | 0.69 | 32.8 | 0.05 | 1120 | 0.06 |
| A\_P20 - 25 | 66.0 | 99.3 | 64.0 | 79.0 | 16.2 | 0.05 | 2580 | 778 | 0.10 | 75.0 | 0.59 | 25.6 | 0.03 | 679 | 0.19 |
| MR 002 - 1 | 120 | 30.8 | 1.60 | 0.00 | 19.2 | 0.00 | 22200 | 1600 | 0.23 | 5.47 | 1.21 | 2.16 | 0.20 | 1095 | 10.5 |
| MR 002 - 2 | 276 | 20.2 | 12.7 | 209 | 18.6 | 0.05 | 8730 | 873 | 0.85 | 96.0 | 3.90 | 11.4 | 0.22 | 1390 | 46.9 |
| MR 002 - 3 | 2160 | 29.0 | 2960 | 8658 | 19.0 | 0.00 | 20100 | 1420 | 0.26 | 20.7 | 0.66 | 0.69 | 0.00 | 414 | 15.0 |
| MR 002 - 4 | 1650 | 22.8 | 2140 | 6882 | 18.5 | 0.00 | 4140 | 188 | 0.19 | 4.61 | 0.31 | 0.75 | 0.24 | 194 | 27.4 |
| MR 002 – 5 | 106 | 40.5 | 17.8 | 188 | 19.6 | 0.00 | 27200 | 2750 | 0.33 | 12.3 | 0.92 | 1.29 | 0.06 | 602 | 0.63 |
| MR 002 - 6 | 4150 | 19.3 | 5400 | 16800 | 19.5 | 0.00 | 31900 | 2250 | 0.15 | 2.63 | 1.00 | 0.78 | 0.07 | 227 | 95.0 |
| MR 002 - 7 | 9610 | 20.6 | 11900 | 37500 | 19.3 | 0.00 | 29000 | 1870 | 0.17 | 1.16 | 0.86 | 0.00 | 0.00 | 435 | 22.5 |
| MR 002 - 8 | 25.4 | 37.3 | 10.2 | 103 | 20.6 | 0.00 | 46900 | 4156 | 0.13 | 0.00 | 2.28 | 0.00 | 0.00 | 200 | 0.89 |
| MR 002 - 9 | 311 | 21.6 | 195 | 620 | 18.6 | 0.00 | 1520 | 170 | 0.23 | 2.81 | 0.18 | 0.86 | 0.44 | 2199 | 5.07 |
| MR 003 - 1 | 22.8 | 16.1 | 1.17 | 0.00 | 19.4 | 0.00 | 13500 | 3080 | 0.13 | 0.00 | 5.24 | 0.00 | 0.00 | 19.9 | 0.04 |
| MR 003 - 2 | 35.3 | 8.77 | 3.50 | 80.0 | 19.0 | 0.00 | 8690 | 982 | 0.13 | 0.00 | 1.53 | 0.00 | 0.00 | 16.6 | 0.04 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| A\_P20 - 6 | 216 | 58.3 | 143 | 19.9 | 96.0 | 25.7 | 14.9 | 29.7 | 5.42 | 36.0 | 7.99 | 21.6 | 3.16 | 20.6 | 2.77 |
| A\_P20 - 24 | 134 | 35.2 | 82.7 | 10.9 | 50.3 | 13.3 | 11.6 | 15.8 | 2.93 | 20.6 | 4.62 | 13.6 | 2.10 | 14.3 | 1.92 |
| A\_P20 - 20 | 192 | 85.1 | 174 | 20.7 | 87.5 | 20.0 | 16.5 | 21.7 | 3.77 | 25.7 | 6.06 | 18.1 | 2.93 | 20.3 | 2.81 |
| A\_P20 - 17 | 110 | 71.8 | 145 | 16.8 | 70.1 | 14.8 | 12.3 | 13.4 | 2.40 | 16.2 | 3.64 | 11.1 | 1.84 | 13.7 | 1.92 |
| A\_P20 - 8 | 143 | 48.3 | 111 | 14.8 | 70.2 | 20.5 | 15.3 | 24.2 | 4.25 | 26.8 | 5.40 | 13.9 | 2.05 | 13.2 | 1.76 |
| A\_P20 - 25 | 95.8 | 95.0 | 187 | 21.1 | 84.3 | 16.2 | 21.6 | 14.3 | 2.34 | 15.4 | 3.43 | 9.47 | 1.46 | 9.88 | 1.32 |
| MR 002 - 1 | 65.4 | 88.4 | 243 | 35.6 | 169 | 83.9 | 14.4 | 76.4 | 8.35 | 16.9 | 1.22 | 2.06 | 0.14 | 0.63 | 0.06 |
| MR 002 - 2 | 95.9 | 91.6 | 284 | 44.6 | 226 | 111 | 19.2 | 103 | 10.8 | 23.1 | 1.74 | 3.04 | 0.23 | 1.13 | 0.13 |
| MR 002 - 3 | 19.2 | 11.8 | 38.2 | 6.61 | 34.9 | 17.1 | 4.01 | 18.9 | 2.20 | 5.23 | 0.48 | 0.87 | 0.08 | 0.48 | 0.04 |
| MR 002 - 4 | 50.5 | 14.2 | 49.5 | 9.35 | 58.5 | 23.9 | 4.79 | 29.3 | 3.16 | 9.82 | 1.16 | 2.27 | 0.22 | 1.16 | 0.11 |
| MR 002 – 5 | 9.24 | 4.70 | 15.4 | 2.63 | 15.3 | 5.65 | 3.08 | 6.25 | 0.77 | 2.05 | 0.20 | 0.45 | 0.04 | 0.22 | 0.01 |
| MR 002 - 6 | 25.3 | 3.83 | 12.2 | 2.28 | 12.9 | 6.04 | 2.59 | 8.83 | 1.96 | 6.54 | 0.70 | 1.63 | 0.19 | 1.01 | 0.10 |
| MR 002 - 7 | 14.7 | 2.74 | 9.14 | 1.60 | 8.73 | 8.91 | 4.06 | 12.5 | 2.47 | 5.34 | 0.26 | 0.43 | 0.05 | 0.23 | 0.03 |
| MR 002 - 8 | 9.92 | 0.72 | 1.36 | 0.15 | 0.39 | 1.51 | 2.54 | 3.30 | 1.14 | 3.14 | 0.10 | 0.08 | 0.01 | 0.03 | 0.00 |
| MR 002 - 9 | 39.3 | 62.2 | 181 | 28.5 | 143 | 44.1 | 24.7 | 40.2 | 4.18 | 9.04 | 0.65 | 1.02 | 0.08 | 0.35 | 0.03 |
| MR 003 - 1 | 27.6 | 18.0 | 31.5 | 3.34 | 10.9 | 7.60 | 0.81 | 9.12 | 1.70 | 5.72 | 0.39 | 0.82 | 0.14 | 1.47 | 0.18 |
| MR 003 - 2 | 31.7 | 24.0 | 38.9 | 3.71 | 10.7 | 7.28 | 0.73 | 9.11 | 1.86 | 6.48 | 0.45 | 0.94 | 0.18 | 1.79 | 0.21 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Na** | **Mg** | **Al** | **Si** | **P (wt%)** | **V** | **Mn** | **Fe** | **Ni** | **Cu** | **Zn** | **As** | **Rb** | **Sr** | **Zr** |
| MR 003 - 3 | 47.2 | 9.80 | 1.34 | 125 | 19.0 | 0.00 | 8450 | 964 | 0.13 | 0.00 | 1.37 | 0.00 | 0.00 | 15.0 | 0.05 |
| MR 003 - 4 | 38.9 | 7.20 | 0.90 | 113 | 19.0 | 0.00 | 7030 | 807 | 0.17 | 0.00 | 1.17 | 0.00 | 0.06 | 17.6 | 0.02 |
| MR 003 - 5 | 73.0 | 11.8 | 5.80 | 145 | 18.9 | 0.00 | 6215 | 747 | 0.00 | 0.00 | 1.09 | 0.96 | 0.00 | 17.3 | 0.06 |
| MR 003 - 6 | 33.0 | 6.86 | 0.93 | 0.00 | 19.1 | 0.00 | 6760 | 820 | 0.13 | 0.00 | 1.23 | 0.00 | 0.00 | 16.9 | 0.02 |
| MR 003 - 7 | 730 | 41.0 | 5120 | 15600 | 18.9 | 0.20 | 9250 | 1880 | 0.21 | 0.75 | 2.25 | 12.7 | 2.76 | 29.8 | 0.29 |
| MR 003 - 8 | 66.0 | 8.47 | 7.80 | 134 | 19.1 | 0.00 | 8320 | 1760 | 0.11 | 0.15 | 1.37 | 1.01 | 0.00 | 19.5 | 0.05 |
| MR 003 - 9 | 55.5 | 7.84 | 9.00 | 135 | 19.0 | 0.00 | 5450 | 926 | 0.13 | 0.30 | 0.90 | 0.95 | 0.05 | 17.5 | 0.25 |
| MR 003 - 10 | 3070 | 236 | 6240 | 18700 | 18.5 | 0.82 | 5660 | 1080 | 0.65 | 1.80 | 1.00 | 72.0 | 1.94 | 26.5 | 0.85 |
| MR 003 - 11 | 281 | 28.5 | 142 | 1020 | 18.9 | 0.05 | 5490 | 1170 | 0.14 | 0.22 | 0.93 | 2.06 | 0.06 | 18.1 | 0.24 |
| MR 003 - 12 | 161 | 37.0 | 99.0 | 620 | 19.0 | 0.00 | 5500 | 664 | 0.14 | 0.16 | 0.91 | 2.38 | 0.09 | 25.5 | 0.11 |
| MR 003 - 13 | 196 | 24.3 | 34.8 | 377 | 19.1 | 0.00 | 6160 | 2180 | 0.12 | 0.47 | 0.93 | 3.37 | 0.00 | 25.7 | 0.08 |
| MR 003 - 14 | 113 | 18.7 | 52.0 | 374 | 19.1 | 0.14 | 5530 | 601 | 0.08 | 0.00 | 0.88 | 1.77 | 0.30 | 16.8 | 0.06 |
| MR 003 - 15 | 171 | 20.7 | 221.0 | 1010 | 18.9 | 0.08 | 5760 | 1310 | 0.00 | 0.29 | 1.04 | 4.23 | 0.26 | 28.0 | 0.22 |
| MR 003 - 16 | 212 | 36.0 | 27.6 | 382 | 19.1 | 0.00 | 5670 | 1730 | 0.11 | 0.31 | 0.92 | 3.33 | 0.00 | 22.6 | 0.14 |
| MR 003 - 17 | 307 | 53.0 | 98.0 | 1000 | 19.1 | 0.03 | 5450 | 1830 | 0.00 | 0.43 | 0.83 | 6.60 | 0.10 | 22.8 | 0.22 |
| MR 003 - 18 | 144 | 23.4 | 11.2 | 215 | 19.2 | 0.00 | 8220 | 2380 | 0.05 | 0.27 | 1.54 | 1.64 | 0.06 | 17.7 | 0.12 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| MR 003 - 3 | 41.5 | 28.0 | 46.2 | 4.66 | 13.2 | 9.6 | 0.79 | 14.0 | 2.69 | 8.95 | 0.64 | 1.29 | 0.23 | 2.01 | 0.26 |
| MR 003 - 4 | 40.7 | 28.6 | 48.8 | 4.82 | 13.9 | 9.33 | 0.70 | 12.5 | 2.52 | 8.75 | 0.62 | 1.30 | 0.23 | 2.13 | 0.26 |
| MR 003 - 5 | 42.7 | 31.4 | 54.6 | 5.60 | 16.2 | 11.1 | 0.78 | 14.3 | 2.72 | 9.27 | 0.65 | 1.37 | 0.24 | 2.03 | 0.27 |
| MR 003 - 6 | 37.8 | 31.5 | 53.1 | 5.20 | 15.2 | 9.44 | 0.73 | 11.1 | 2.27 | 7.59 | 0.54 | 1.18 | 0.21 | 2.00 | 0.24 |
| MR 003 - 7 | 53.2 | 37.2 | 63.3 | 10.6 | 45.5 | 22.0 | 2.98 | 23.0 | 3.60 | 11.7 | 0.89 | 1.61 | 0.25 | 2.19 | 0.27 |
| MR 003 - 8 | 51.9 | 34.2 | 59.4 | 6.13 | 19.1 | 13.3 | 0.99 | 18.8 | 3.54 | 11.9 | 0.81 | 1.68 | 0.29 | 2.46 | 0.31 |
| MR 003 - 9 | 50.1 | 34.4 | 63.2 | 6.96 | 22.4 | 14.1 | 0.98 | 18.0 | 3.42 | 11.5 | 0.84 | 1.57 | 0.27 | 2.27 | 0.29 |
| MR 003 - 10 | 65.6 | 63.1 | 70.5 | 21.3 | 89.0 | 29.4 | 4.90 | 30.4 | 4.38 | 14.0 | 1.17 | 2.18 | 0.31 | 2.40 | 0.27 |
| MR 003 - 11 | 49.7 | 33.4 | 59.7 | 6.45 | 20.4 | 13.5 | 0.91 | 18.3 | 3.33 | 11.2 | 0.78 | 1.61 | 0.28 | 2.20 | 0.26 |
| MR 003 - 12 | 39.9 | 30.9 | 53.8 | 5.49 | 16.1 | 10.7 | 0.81 | 12.6 | 2.43 | 8.36 | 0.60 | 1.26 | 0.21 | 1.98 | 0.25 |
| MR 003 - 13 | 119 | 54.2 | 120 | 14.3 | 48.0 | 31.7 | 1.08 | 35.0 | 6.65 | 23.8 | 1.80 | 3.67 | 0.55 | 4.32 | 0.47 |
| MR 003 - 14 | 105 | 49.9 | 109 | 12.5 | 42.9 | 28.6 | 0.85 | 32.5 | 6.12 | 22.4 | 1.66 | 3.28 | 0.50 | 3.91 | 0.42 |
| MR 003 - 15 | 98 | 49.4 | 107 | 13.6 | 49.1 | 30.8 | 1.69 | 33.3 | 5.83 | 20.4 | 1.52 | 2.94 | 0.48 | 3.62 | 0.40 |
| MR 003 - 16 | 102 | 47.9 | 106 | 12.6 | 43.3 | 29.3 | 0.86 | 33.6 | 6.30 | 22.0 | 1.66 | 3.26 | 0.47 | 3.49 | 0.41 |
| MR 003 - 17 | 76.2 | 42.6 | 89.6 | 10.7 | 37.8 | 24.6 | 1.08 | 26.8 | 4.82 | 16.7 | 1.23 | 2.44 | 0.38 | 2.97 | 0.33 |
| MR 003 - 18 | 80.1 | 58.3 | 116 | 12.7 | 40.7 | 25.7 | 0.98 | 26.2 | 4.90 | 17.1 | 1.25 | 2.62 | 0.40 | 3.35 | 0.38 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample | Na | Mg | Al | Si | P(wt%) | V | Mn (Wt%) | Fe | Ni | Cu | Zn | As | Rb | Sr | Zr |
| MR 003 - 19 | 115 | 11.2 | 4.20 | 181 | 19.4 | 0.00 | 1.06 | 1100 | 0.07 | 0.00 | 1.49 | 1.16 | 0.00 | 14.2 | 0.12 |
| MR 003 - 20 | 160 | 6.05 | 44.0 | 202 | 19.0 | 0.00 | 0.41 | 572 | 0.11 | 0.00 | 0.43 | 1.73 | 0.00 | 18.0 | 0.01 |
| MR 003 - 21 | 3260 | 23.4 | 4900 | 15600 | 18.7 | 0.21 | 0.24 | 302 | 0.17 | 0.75 | 0.32 | 21.7 | 0.86 | 25.2 | 1.01 |
| MR 003 - 22 | 64.6 | 13.6 | 28.0 | 204 | 19.5 | 0.00 | 1.05 | 2380 | 0.11 | 0.24 | 2.18 | 0.74 | 0.00 | 23.0 | 0.07 |
| MR 003 - 23 | 1650 | 7.27 | 1710 | 56000 | 18.1 | 0.04 | 0.37 | 659 | 0.00 | 0.81 | 0.59 | 2.07 | 7.64 | 26.6 | 0.26 |
| MR 003 - 24 | 2190 | 11.4 | 10700 | 33500 | 18.7 | 0.03 | 0.52 | 950 | 0.16 | 0.32 | 1.10 | 6.23 | 3.99 | 17.0 | 0.91 |
| MR 005 - 1 | 127 | 30.3 | 12.5 | 0.00 | 19.4 | 0.00 | 1.03 | 1280 | 0.00 | 4.07 | 0.90 | 1.80 | 0.28 | 180 | 30.0 |
| MR 005 - 2 | 2240 | 520 | 190 | 7320 | 19.8 | 0.07 | 1.89 | 1690 | 0.12 | 13.1 | 1.09 | 18.0 | 0.57 | 78.9 | 10.0 |
| MR 005 - 3 | 86.0 | 25.6 | 15.6 | 145 | 19.9 | 0.02 | 1.63 | 1220 | 0.00 | 4.88 | 0.56 | 1.41 | 0.00 | 72.0 | 2.14 |
| MR 005 - 4 | 460 | 24.5 | 550 | 1670 | 19.5 | 0.00 | 1.34 | 1830 | 0.00 | 1.17 | 2.65 | 3.36 | 0.22 | 89.0 | 0.27 |
| MR 005 - 5 | 125 | 22.6 | 107 | 380 | 18.4 | 0.00 | 0.72 | 314 | 0.11 | 1.77 | 2.83 | 2.41 | 0.09 | 86.0 | 8.10 |
| MR 005 - 6 | 107 | 16.2 | 22.7 | 182 | 18.5 | 0.04 | 0.74 | 229 | 0.10 | 2.23 | 3.00 | 2.23 | 0.09 | 93.8 | 9.9 |
| MR 005 - 7 | 67.8 | 9.80 | 1.90 | 108 | 19.3 | 0.00 | 0.90 | 589 | 0.07 | 0.00 | 0.48 | 0.57 | 0.00 | 68.5 | 0.03 |
| MR 005 - 8 | 100 | 17.1 | 6.60 | 590 | 19.1 | 0.00 | 0.64 | 312 | 0.00 | 1.63 | 0.93 | 1.31 | 0.06 | 88.4 | 4.10 |
| MR 005 - 9 | 213 | 54.7 | 806 | 27300 | 18.2 | 0.00 | 0.17 | 744 | 0.17 | 6.01 | 15.8 | 9.36 | 0.28 | 113 | 61.7 |
| MR 005 - 10 | 2570 | 350 | 7890 | 27200 | 19.0 | 0.05 | 0.75 | 773 | 0.19 | 2.23 | 5.62 | 13.7 | 44.6 | 95.1 | 3.50 |
| MR 005 - 11 | 4740 | 50.5 | 17700 | 50900 | 19.2 | 0.00 | 1.43 | 2090 | 0.09 | 2.63 | 3.91 | 2.59 | 176 | 69.6 | 41.0 |
| MR 005 - 12 | 860 | 190 | 92.0 | 2450 | 20.1 | 0.04 | 1.80 | 3320 | 0.12 | 1.12 | 3.36 | 7.20 | 0.39 | 54.8 | 5.10 |
| MR 005 - 13 | 23000 | 25.5 | 27000 | 86900 | 18.7 | 0.00 | 1.52 | 2650 | 0.00 | 0.59 | 2.38 | 1.38 | 0.32 | 53.6 | 1.94 |

Supplemental Table 2. Trace element composition of apatite determined by LA-ICP-MS in (ppm) unless specified

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Y** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| MR 003 - 19 | 84.0 | 65.2 | 124 | 13.1 | 40.2 | 25.7 | 0.91 | 26.2 | 4.95 | 17.3 | 1.25 | 2.57 | 0.43 | 3.59 | 0.41 |
| MR 003 - 20 | 51.2 | 160 | 438 | 57.9 | 228 | 144 | 0.73 | 90.6 | 8.58 | 17.4 | 0.84 | 1.17 | 0.14 | 0.76 | 0.08 |
| MR 003 - 21 | 64.5 | 100 | 297 | 50.7 | 231 | 156 | 2.38 | 103 | 9.6 | 21.1 | 1.08 | 1.46 | 0.15 | 0.85 | 0.08 |
| MR 003 - 22 | 17.8 | 29.9 | 53.1 | 6.22 | 23.5 | 11.4 | 1.39 | 7.73 | 0.94 | 3.18 | 0.27 | 0.63 | 0.12 | 1.05 | 0.13 |
| MR 003 - 23 | 44.6 | 53.0 | 110 | 13.4 | 45.7 | 26.5 | 1.21 | 22.0 | 3.35 | 10.2 | 0.79 | 1.35 | 0.19 | 1.34 | 0.15 |
| MR 003 - 24 | 40.1 | 53.5 | 108 | 14.3 | 50.1 | 29.7 | 1.16 | 24.0 | 3.46 | 10.4 | 0.68 | 1.31 | 0.19 | 1.42 | 0.17 |
| MR 005 - 1 | 112 | 80.4 | 170 | 19.8 | 69.6 | 23.2 | 6.45 | 19.2 | 3.07 | 15.3 | 2.04 | 5.33 | 0.81 | 5.36 | 0.54 |
| MR 005 - 2 | 12.7 | 56.7 | 60.3 | 4.15 | 9.8 | 2.65 | 6.79 | 2.02 | 0.33 | 1.72 | 0.22 | 0.67 | 0.13 | 1.21 | 0.15 |
| MR 005 - 3 | 29.0 | 69.4 | 84.5 | 6.45 | 15.7 | 4.21 | 6.50 | 3.35 | 0.60 | 3.46 | 0.47 | 1.46 | 0.28 | 2.40 | 0.31 |
| MR 005 - 4 | 40.4 | 74.0 | 91.5 | 6.91 | 16.5 | 4.33 | 7.02 | 3.39 | 0.76 | 4.56 | 0.67 | 2.18 | 0.43 | 3.91 | 0.49 |
| MR 005 - 5 | 95.1 | 95.1 | 150 | 13.3 | 36.2 | 11.6 | 4.86 | 11.3 | 2.32 | 13.8 | 2.00 | 6.20 | 1.04 | 8.26 | 0.95 |
| MR 005 - 6 | 95.8 | 101 | 157 | 13.9 | 38.1 | 11.9 | 4.91 | 11.5 | 2.40 | 14.2 | 2.02 | 6.03 | 1.00 | 8.00 | 0.98 |
| MR 005 - 7 | 71.5 | 83.3 | 126 | 10.8 | 27.6 | 8.14 | 5.23 | 7.51 | 1.67 | 10.2 | 1.53 | 4.81 | 0.87 | 7.04 | 0.86 |
| MR 005 - 8 | 79.9 | 84.7 | 134 | 12.1 | 34.7 | 10.5 | 5.47 | 9.76 | 2.03 | 11.7 | 1.73 | 5.33 | 0.91 | 7.45 | 0.93 |
| MR 005 - 9 | 312 | 63.1 | 176 | 24.4 | 95.4 | 38.4 | 2.14 | 40.3 | 7.97 | 46.8 | 7.13 | 21.3 | 3.23 | 22.2 | 2.39 |
| MR 005 - 10 | 53.1 | 79.9 | 118 | 10.1 | 29.0 | 8.50 | 7.41 | 6.76 | 1.27 | 7.58 | 1.11 | 3.75 | 0.69 | 6.25 | 0.78 |
| MR 005 - 11 | 128 | 196 | 346 | 31.6 | 87.6 | 25.5 | 6.10 | 20.2 | 4.06 | 21.2 | 2.60 | 6.52 | 0.91 | 6.51 | 0.66 |
| MR 005 - 12 | 127 | 215 | 380 | 33.1 | 88.9 | 24.5 | 6.09 | 19.4 | 3.89 | 20.6 | 2.44 | 6.07 | 0.89 | 6.33 | 0.62 |
| MR 005 - 13 | 7.40 | 59.3 | 60.9 | 4.28 | 11.2 | 3.29 | 6.87 | 2.68 | 0.34 | 1.51 | 0.18 | 0.47 | 0.05 | 0.32 | 0.03 |