**Table 5**

Trace elements and rare earth elements (REE) concentrations (in ppm) of iron duricrusts of Missole I area. Ferr: ferriband

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Type | | Conglomeratic duricrust | | | | | | | | Nodular duricrust | | | | | | | Massive duricrust | | Fine iron duricrust | | Ferr | |
| Facies | | C2 | | | | | | | | C3 | | | | | | | C4 | | CI | | C1 | |
|  | |  | | | | | | | |  | | | | | | |  | |  | |  | |
| State | | duricrust | | | | Wheathered duricrust | | | | Cortex+nucleus | | Cortex | | Nucleus | | | duricrust | | duricrust duricrust | | | |  | | | |
|  | |  | | | |  | | | |  | |  | |  | | |  | |  | | | |
| Samples | | M11 M21 M31 M41 | | | | M12 M22 M32 M42 | | | | M13 M33 | | M23 M25 | | M24 M26 M27 | | | M36 M44 | | M45 M46 M47 | | | | PAAS Chondrites | | |
| Color | | Dark-red | | | | Dark-red | | | | Yellow-red | | Yellow | | Red | | | Red | | Red | | | |  | | |
| Depth (m) | | | 2.3 | | | 1.9 | | | | 1.6 | | | | | | | 0.4 | | 0.2 | | | 7.5 |  |  | | |
| Ba | 21.8 | | 7.2 | 20.7 | 17.3 | 15.8 | 8.4 | 48.7 | 121 | 34.4 | 108 | 876 | 509 | 989 | 831 | 68.8 | 25.6 | 28.2 | 48 | 73.8 | | 14.5 | 650 | |  | |
| Rb | 0.3 | | 0.3 | 0.4 | 0.5 | 0.8 | 0.5 | 2.5 | 0.9 | 3.5 | 7 | 16.9 | 16.2 | 19.5 | 17.9 | 14.5 | 1.6 | 2 | 0.2 | 0.3 | | 0.3 | 160 | |  | |
| Sr | 9.5 | | 3 | 4.5 | 3.2 | 2.9 | 2.3 | 6.9 | 4.6 | 12.6 | 12.5 | 31.7 | 27.4 | 29.3 | 27.7 | 13.7 | 11.3 | 11 | 4.7 | 4.1 | | 9.9 | 200 | |  | |
| Cs | 0.03 | | 0.03 | <0.01 | <0.01 | 0.07 | 0.04 | 0.14 | 0.06 | 0.33 | 0.3 | 1.28 | 1.3 | 2.2 | 2.13 | 0.88 | 0.06 | 0.11 | <0.01 | <0.01 | | 0.06 | 15 | |  | |
| Nb | 4 | | 7 | 3.6 | 6.5 | 8.1 | 9.5 | 17.7 | 15.5 | 43.5 | 33 | 41.1 | 40.2 | 38.6 | 38.9 | 61.7 | 25 | 30.3 | 5.9 | 6 | | 4.7 | 19 | |  | |
| Ta | 0.3 | | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 1 | 0.6 | 2.7 | 1.8 | 2.3 | 2.5 | 2.2 | 2.2 | 3.1 | 1.5 | 1.9 | 0.5 | 0.4 | | 0.4 | 0.026 | |  | |
| Th | 1.63 | | 3.03 | 1.68 | 3.68 | 3.73 | 3.71 | 9.09 | 6.32 | 19.5 | 14.4 | 11.1 | 10.7 | 14.9 | 12.85 | 20.8 | 8.67 | 9.02 | 4.58 | 4.25 | | 1.81 | 14.6 | |  | |
| Zr | 105 | | 248 | 101 | 254 | 270 | 361 | 649 | 595 | 607 | 913 | 533 | 510 | 564 | 538 | 440 | 304 | 251 | 485 | 581 | | 136 | 210 | |  | |
| Hf | 2.6 | | 6.2 | 2.8 | 6.4 | 7.3 | 8.4 | 16.4 | 14.6 | 16.7 | 23.2 | 13.3 | 13.4 | 15 | 13.3 | 12.8 | 7.9 | 6.3 | 12.6 | 14.4 | | 3.2 | 5 | |  | |
| Y | 5.6 | | 5.1 | 4.3 | 5.5 | 5.7 | 7.5 | 6.2 | 6 | 12.2 | 10.6 | 15.7 | 15.3 | 14.8 | 13.6 | 13.1 | 6.8 | 7.9 | 4.6 | 3.7 | | 4.1 | 27 | |  | |
| V | 55 | | 37 | 43 | 61 | 153 | 42 | 348 | 77 | 469 | 602 | 451 | 320 | 450 | 395 | 780 | 132 | 86 | 24 | 16 | | 37 | 150 | |  | |
| W | <1 | | 1 | <1 | <1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 2.7 | |  | |
| Ga | 1.7 | | 6.5 | 3.8 | 6.8 | 2.9 | 3.7 | 8.8 | 6.6 | 16.8 | 11.4 | 14 | 12.9 | 15 | 12.6 | 13.8 | 12.9 | 12.9 | 6.9 | 7.3 | | 5.6 | 20 | |  | |
| U | 2.45 | | 2.13 | 2.38 | 3.31 | 1.99 | 1.57 | 2.55 | 4.43 | 4.86 | 2.56 | 1.57 | 1.52 | 1.89 | 1.7 | 2.49 | 2.71 | 3.13 | 2.02 | 2.25 | | 1.98 | 3.1 | |  | |
| Cr | 170 | | 820 | 190 | 610 | 290 | 930 | 280 | 770 | 330 | 420 | 310 | 150 | 240 | 190 | 620 | 80 | 80 | 1030 | 1060 | | 940 | 110 | |  | |
| La | 30.1 | | 7.9 | 10.2 | 10.6 | 8.2 | 10.7 | 12.6 | 11.3 | 15.2 | 17.4 | 22.2 | 22.6 | 20.6 | 20.3 | 21.9 | 12.3 | 11.7 | 11.1 | 13 | | 13.3 | 38 | | 0.367 | |
| Ce | 70.9 | | 19.2 | 24.1 | 29 | 19.4 | 26.9 | 27.5 | 30 | 31.6 | 40.8 | 44 | 45.7 | 39.1 | 44.3 | 48.9 | 20.8 | 19.3 | 21.8 | 21.3 | | 31 | 80 | | 0.957 | |
| Pr | 6.64 | | 2.47 | 2.95 | 2.71 | 2.24 | 3.23 | 3.17 | 2.53 | 3.87 | 4.83 | 4.8 | 5.19 | 4.4 | 5.18 | 5.75 | 2.44 | 2.36 | 2.37 | 2.25 | | 2.96 | 8.9 | | 0.137 | |
| Nd | 19.2 | | 8.8 | 10.6 | 10.6 | 8.6 | 12.9 | 12.8 | 9.2 | 15.1 | 19 | 19.8 | 21.6 | 16.7 | 19.6 | 23.4 | 9.9 | 8.8 | 8.7 | 7.9 | | 9.7 | 34 | | 0.711 | |
| Sm | 2.81 | | 1.97 | 2.03 | 2.24 | 2.3 | 2.78 | 2.64 | 2.41 | 3.41 | 3.35 | 3.97 | 3.91 | 3.6 | 4.01 | 4.74 | 1.84 | 1.74 | 1.66 | 1.4 | | 1.8 | 5.6 | | 0.231 | |
| Eu | 0.45 | | 0.4 | 0.37 | 0.47 | 0.34 | 0.37 | 0.3 | 0.38 | 0.71 | 0.51 | 0.69 | 0.81 | 0.59 | 0.58 | 0.8 | 0.38 | 0.44 | 0.31 | 0.21 | | 0.24 | 1.1 | | 0.087 | |
| Gd | 1.96 | | 1.56 | 1.5 | 1.86 | 1.45 | 2.23 | 1.51 | 1.43 | 2.79 | 2.64 | 2.96 | 3.06 | 3.22 | 3.23 | 3.35 | 1.53 | 1.54 | 1.23 | 1.04 | | 1.36 | 4.7 | | 0.306 | |
| Tb | 0.34 | | 0.22 | 0.2 | 0.34 | 0.28 | 0.33 | 0.26 | 0.22 | 0.48 | 0.45 | 0.52 | 0.49 | 0.5 | 0.57 | 0.59 | 0.23 | 0.29 | 0.2 | 0.17 | | 0.23 | 0.8 | | 0.058 | |
| Dy | 2.04 | | 1.38 | 1.39 | 1.71 | 1.71 | 2.02 | 1.63 | 1.56 | 3.37 | 2.5 | 3.4 | 3.78 | 2.84 | 3.03 | 3.34 | 1.34 | 1.92 | 0.98 | 0.82 | | 1.59 | 4.4 | | 0.381 | |
| Ho | 0.31 | | 0.25 | 0.27 | 0.29 | 0.37 | 0.42 | 0.28 | 0.22 | 0.58 | 0.43 | 0.64 | 0.65 | 0.54 | 0.59 | 0.64 | 0.27 | 0.34 | 0.17 | 0.16 | | 0.23 | 1 | | 0.0851 | |
| Er | 1.07 | | 0.68 | 0.79 | 0.85 | 1.39 | 1.11 | 0.86 | 0.73 | 1.9 | 1.5 | 2 | 1.97 | 2.05 | 2.11 | 1.97 | 0.93 | 1.15 | 0.65 | 0.58 | | 0.88 | 2.9 | | 0.249 | |
| Tm | 0.15 | | 0.12 | 0.14 | 0.14 | 0.32 | 0.17 | 0.15 | 0.15 | 0.31 | 0.22 | 0.29 | 0.33 | 0.25 | 0.28 | 0.3 | 0.17 | 0.17 | 0.11 | 0.09 | | 0.14 | 0.4 | | 0.0356 | |
| Yb | 1.02 | | 0.63 | 0.75 | 0.95 | 1.39 | 0.94 | 1.2 | 1.18 | 2.39 | 1.81 | 2.11 | 2.13 | 2.13 | 2.07 | 2.34 | 1.2 | 1.32 | 0.83 | 0.62 | | 0.64 | 2.8 | | 0.248 | |
| Lu | 0.16 | | 0.1 | 0.11 | 0.13 | 0.21 | 0.15 | 0.19 | 0.17 | 0.37 | 0.33 | 0.34 | 0.33 | 0.29 | 0.28 | 0.36 |  | 0.12 | 0.12 | 0.09 | | 0.11 | 0.43 | | 0.0381 | |
| ΣREE | 137.15 | | 45.68 | 55.40 | 61.89 | 48.20 | 64.25 | 65.09 | 61.48 | 82.08 | 95.77 | 107.72 | 112.55 | 96.81 | 106.13 | 118.38 | 51.19 | 0.20 | 50.23 | 49.63 | | 64.18 | 185.03 | | 3.8908 | |
| ΣLREE | 126.84 | | 38.37 | 47.85 | 52.91 | 38.44 | 53.73 | 56.07 | 53.03 | 65.77 | 82.03 | 90.80 | 95.09 | 80.80 | 89.38 | 99.95 | 45.44 | 42.16 | 43.97 | 44.45 | | 56.96 | 160.9 | | 2.172 | |
| ΣMREE | 7.60 | | 5.53 | 5.49 | 6.62 | 6.08 | 7.73 | 6.34 | 6.00 | 10.76 | 9.45 | 11.54 | 12.05 | 10.75 | 11.42 | 12.82 | 5.32 | 5.93 | 4.38 | 3.64 | | 5.22 | 16.6 | | 1.063 | |
| ΣHREE | 2.71 | | 1.78 | 2.06 | 2.36 | 3.68 | 2.79 | 2.68 | 2.45 | 5.55 | 4.29 | 5.38 | 5.41 | 5.26 | 5.33 | 5.61 | 3.10 | 0.20 | 1.88 | 1.54 | | 2.00 | 7.53 | | 0.6558 | |
| ΣLREE/ΣHREE | 46.80 | | 21.56 | 23.23 | 22.42 | 10.45 | 19.26 | 20.92 | 21.64 | 11.85 | 19.12 | 16.88 | 17.58 | 15.36 | 16.77 | 17.82 | 14.66 | 210.80 | 23.39 | 28.86 | | 28.48 | 21.37 | | 3.31 | |
| (Ce/Ce\*)N | 11.77 | | 6.00 | 6.76 | 7.92 | 5.87 | 7.80 | 7.13 | 7.49 | 7.64 | 9.73 | 9.04 | 9.56 | 7.98 | 9.63 | 10.72 | 5.03 | 4.64 | 5.41 | 4.60 | | 7.07 |  | |
| (Eu/Eu\*)N | 1.76 | | 1.72 | 1.51 | 2.14 | 1.43 | 1.45 | 1.12 | 1.43 | 4.02 | 3.33 | 3.99 | 3.75 | 4.16 | 4.17 | 4.44 | 1.73 | 2.25 | 1.45 | 1.04 | | 1.11 |  | |
| (La/Yb)N | 19.94 | | 8.47 | 9.19 | 7.54 | 3.99 | 7.69 | 7.10 | 6.47 | 4.30 | 6.50 | 7.11 | 7.17 | 6.54 | 6.63 | 6.32 | 6.93 | 5.99 | 9.04 | 14.17 | | 14.04 |  | |
| Th/U | 2.35 | | 1.85 | 2.07 | 1.79 | 2.55 | 2.83 | 3.31 | 2.39 | 1.44 | 1.84 | 1.62 | 1.79 | 1.51 | 1.59 | 1.60 | 1.82 | 1.49 | 2.02 | 2.51 | | 2.82 |  | |
| La/Th | 0.53 | | 0.60 | 0.56 | 0.63 | 0.48 | 0.61 | 0.43 | 0.45 | 0.38 | 0.22 | 0.28 | 0.31 | 0.29 | 0.24 | 0.28 | 0.63 | 0.67 | 0.56 | 0.56 | | 0.57 |  | |
| U/Th | 0.43 | | 0.54 | 0.48 | 0.56 | 0.39 | 0.35 | 0.30 | 0.42 | 0.70 | 0.54 | 0.62 | 0.56 | 0.66 | 0.63 | 0.62 | 0.55 | 0.67 | 0.50 | 0.40 | | 0.35 |  | |
| V/Cr | 0.32 | | 0.05 | 0.23 | 0.10 | 0.53 | 0.05 | 1.24 | 0.10 | 1.42 | 1.43 | 1.45 | 2.13 | 1.88 | 2.08 | 1.26 | 1.65 | 1.08 | 0.02 | 0.02 | | 0.04 |  | |
| Cr/Th | 104.29 | | 270.63 | 113.1 | 165.76 | 77.75 | 250.67 | 30.80 | 121.84 | 16.92 | 29.17 | 27.93 | 14.02 | 16.11 | 14.79 | 29.81 | 9.23 | 8.87 | 224.89 | 249.41 | | 519.34 |  | |

Normalized rare earth elements (REE) of iron duricrusts to PAAS and chondrites after Taylor and McLennan (1985)