| **Whole rock major, trace and REE element analyses of the Qaidam and Suganhu basin basement rocks** | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Southwestern, Southern Qaidam** | | | | | | | | | | **Northern Qaidam** | | | **Northwestern Qaidam** | | | | **Suganhu** |
| Sample | **Q608** | **D3** | **Q1616** | **Q30** | **ST1** | **ADT5** | **A3** | **Q404** | **Q1615** | **GC1** | **MB18** | **MB14** | **P1** | **DP106** | **P1-2-3** | **DP105** | **NB1** | **SC1** |
|  | Granodiorite | Granodiorite | Granite | Monzogranite | Monzogranite | Granite | Syenogranite | Syenogranite | Monzogranite | Granodiorite | Granodiorite | Granodiorite | Monzogranite | Granite | Syenite | Tonalite | Monzogranite | Diorite |
| Zircon U-Pb Age (Ma) | 467 | 467 | 448 | 428 | 402 | 384 | 381 | 265 | 261 | 236 | 291 | 271 | 271 | 955 | 916 | 460 | 275 | 454 |
| SiO2 (wt %) | 70.63 | 70.51 |  | 72.95 | 76.51 | 71.84 | 74.2 | 75.59 | 73.2 | 63.27 | 70.46 | 64.27 | 71.38 | 70.01 | 63.23 | 60.28 | 75.79 | 47.69 |
| TiO2 | 0.50 | 0.36 |  | 0.176 | 0.08 | 0.36 | 0.26 | 0.13 | 0.25 | 0.52 | 0.45 | 0.68 | 0.35 | 0.40 | 1.00 | 0.80 | 0.16 | 1.46 |
| Al2O3 | 12.85 | 14.03 |  | 14.18 | 12.34 | 14.15 | 12.83 | 12.67 | 12.84 | 15.23 | 14.53 | 16.82 | 14.17 | 14.1 | 15.11 | 15.66 | 12.14 | 13.91 |
| Fe2O3 | 0.88 | 2.00 |  | 0.46 | 0.66 | 0.74 | 0.42 | 0.44 | 1.52 | 0.93 | 1.21 | 3.20 | 1.80 | 0.62 | 0.72 | 1.84 | 0.35 | 2.58 |
| FeO | 3.02 | 1.71 |  | 1.21 | 0.4 | 1.72 | 1.35 | 0.94 | 0.45 | 2.53 | 1.84 | 0.91 | 0.51 | 1.09 | 2.91 | 4.89 | 0.72 | 7.68 |
| MnO | 0.08 | 0.17 |  | 0.05 | 0.02 | 0.05 | 0.04 | 0.04 | 0.06 | 0.07 | 0.06 | 0.06 | 0.05 | 0.03 | 0.05 | 0.1 | 0.03 | 0.16 |
| MgO | 1.35 | 0.81 |  | 0.40 | 0.20 | 0.99 | 0.38 | 0.16 | 0.36 | 1.28 | 0.97 | 1.83 | 0.86 | 0.4 | 1.33 | 3.5 | 0.07 | 9.35 |
| CaO | 1.71 | 1.4 |  | 1.39 | 0.49 | 1.76 | 1.12 | 0.68 | 1.44 | 4.89 | 1.97 | 3.94 | 1.47 | 3.27 | 2.11 | 4.83 | 1.19 | 9.03 |
| Na2O | 2.78 | 4.91 |  | 3.87 | 3.54 | 4.22 | 3.37 | 3.57 | 3.66 | 3.4 | 3.03 | 4.04 | 3.55 | 2.03 | 1.28 | 2.77 | 3.68 | 2.21 |
| K2O | 3.7 | 1.85 |  | 4.78 | 4.65 | 3.3 | 4.86 | 5.19 | 4.91 | 2.87 | 3.8 | 2.19 | 3.98 | 3.61 | 8.82 | 2.44 | 4.49 | 3.04 |
| P2O5 | 0.08 | 0.15 |  | 0.04 | 0.01 | 0.09 | 0.06 | 0.03 | 0.06 | 0.14 | 0.14 | 0.22 | 0.09 | 0.11 | 0.12 | 0.17 | 0.03 | 0.58 |
| LOI | 2 | 1.87 |  | 0.36 | 1.03 | 1.01 | 0.95 | 0.47 | 1.18 | 4.47 | 1.31 | 1.71 | 1.69 | 4.1 | 2.92 | 2.18 | 1.25 | 1.49 |
| Total | 99.58 | 99.78 |  | 99.86 | 99.92 | 100.23 | 99.83 | 99.89 | 99.93 | 99.60 | 99.78 | 99.86 | 99.89 | 99.77 | 99.60 | 99.47 | 99.89 | 99.18 |
| Na2O+ K2O | 6.48 | 6.76 |  | 8.65 | 8.19 | 7.52 | 8.23 | 8.76 | 8.57 | 6.27 | 6.83 | 6.23 | 7.53 | 5.64 | 10.1 | 5.21 | 8.17 | 5.25 |
| K2O/ Na2O | 1.33 | 0.38 |  | 1.24 | 1.31 | 0.78 | 1.44 | 1.45 | 1.34 | 0.84 | 1.25 | 0.54 | 1.12 | 1.78 | 6.89 | 0.88 | 1.22 | 1.38 |
| σ | 1.52 | 1.66 |  | 2.50 | 2.00 | 1.96 | 2.17 | 2.35 | 2.43 | 1.94 | 1.70 | 1.82 | 2.00 | 1.18 | 5.04 | 1.57 | 2.04 | 5.88 |
| A/NK | 1.50 | 1.39 |  | 1.23 | 1.14 | 1.34 | 1.19 | 1.10 | 1.13 | 1.75 | 1.60 | 1.86 | 1.39 | 1.94 | 1.29 | 2.17 | 1.11 | 2.01 |
| A/CNK | 1.10 | 1.11 |  | 1.01 | 1.05 | 1.03 | 1.00 | 0.99 | 0.92 | 0.86 | 1.14 | 1.04 | 1.10 | 1.07 | 0.97 | 0.98 | 0.93 | 0.59 |
| La | 32.3 | 36.7 | 45.4 | 19.2 | 23.6 | 33.1 | 51.4 | 35.3 | 34 | 38.5 | 57.1 | 15.2 | 16 | 49.8 | 213 | 66.6 | 31.9 | 62.7 |
| Ce | 61.7 | 71.3 | 54.8 | 37.1 | 51.3 | 59.2 | 94.8 | 73.6 | 71.3 | 67.5 | 101 | 38 | 32.3 | 89.6 | 411 | 122 | 64.7 | 135 |
| Pr | 7.41 | 8.08 | 10.3 | 4.37 | 6.53 | 6.33 | 10.4 | 8.76 | 7.37 | 7.32 | 11.8 | 4.17 | 4.06 | 9.82 | 48.5 | 14.6 | 7.53 | 18.4 |
| Nd | 29.3 | 31.4 | 36.8 | 17 | 25.8 | 20.8 | 36.7 | 32.5 | 26 | 25.9 | 44.4 | 18.1 | 16.3 | 36.2 | 184 | 57.6 | 26.7 | 79.8 |
| Sm | 5.97 | 6.29 | 7.46 | 3.86 | 6.32 | 3.27 | 6.28 | 7.45 | 5.02 | 3.93 | 7.58 | 3.68 | 3.6 | 5.98 | 33.7 | 11.2 | 5.02 | 15 |
| Eu | 1.06 | 0.69 | 0.53 | 0.51 | 0.15 | 0.94 | 0.78 | 0.30 | 0.58 | 0.93 | 1.35 | 1.07 | 0.68 | 1.03 | 2.74 | 1.46 | 0.41 | 3.45 |
| Gd | 5.39 | 5.41 | 7.63 | 3.32 | 5.95 | 2.67 | 5.38 | 6.63 | 4.27 | 2.84 | 6.15 | 3.17 | 2.81 | 4.46 | 27.2 | 9.37 | 3.85 | 11.2 |
| Tb | 1.13 | 1.09 | 1.14 | 0.66 | 1.24 | 0.38 | 1.01 | 1.66 | 0.98 | 0.45 | 0.95 | 0.53 | 0.60 | 0.68 | 4.52 | 1.51 | 0.70 | 1.88 |
| Dy | 6.11 | 5.74 | 6.64 | 4.00 | 7.11 | 2.12 | 5.54 | 9.77 | 5.35 | 2.24 | 4.58 | 2.7 | 3.24 | 2.9 | 21.4 | 6.76 | 3.71 | 7.65 |
| Ho | 1.36 | 1.11 | 1.3 | 0.77 | 1.48 | 0.4 | 1.15 | 2.18 | 1.08 | 0.40 | 0.87 | 0.47 | 0.64 | 0.52 | 4.5 | 1.11 | 0.79 | 1.36 |
| Er | 4.11 | 3.24 | 3.79 | 2.31 | 4.33 | 1.22 | 3.3 | 7.43 | 3.62 | 1.01 | 2.2 | 1.3 | 1.98 | 1.45 | 13.1 | 2.39 | 2.44 | 3.34 |
| Tm | 0.71 | 0.57 | 0.55 | 0.35 | 0.80 | 0.18 | 0.60 | 1.35 | 0.66 | 0.141 | 0.31 | 0.20 | 0.32 | 0.20 | 2.09 | 0.32 | 0.44 | 0.49 |
| Yb | 4.92 | 3.71 | 3.57 | 2.5 | 4.97 | 1.24 | 3.75 | 9.2 | 4.53 | 1.02 | 2.04 | 1.15 | 2.2 | 1.31 | 12.5 | 1.31 | 3.19 | 2.95 |
| Lu | 0.68 | 0.57 | 0.53 | 0.35 | 0.74 | 0.2 | 0.54 | 1.43 | 0.75 | 0.15 | 0.29 | 0.16 | 0.35 | 0.18 | 1.75 | 0.18 | 0.48 | 0.40 |
| ∑REE | 162.15 | 175.90 | 180.44 | 96.30 | 140.32 | 132.05 | 221.62 | 197.56 | 165.50 | 152.33 | 240.62 | 89.90 | 85.08 | 204.13 | 980.00 | 296.40 | 151.86 | 343.62 |
| LREE | 137.74 | 154.46 | 155.29 | 82.04 | 113.70 | 123.64 | 200.36 | 157.91 | 144.27 | 144.08 | 223.23 | 80.22 | 72.94 | 192.43 | 892.94 | 273.46 | 136.26 | 314.35 |
| HREE | 24.41 | 21.44 | 25.15 | 14.26 | 26.62 | 8.41 | 21.26 | 39.65 | 21.23 | 8.25 | 17.39 | 9.68 | 12.14 | 11.70 | 87.06 | 22.94 | 15.60 | 29.27 |
| LREE/HREE | 5.64 | 7.21 | 6.17 | 5.75 | 4.27 | 14.70 | 9.42 | 3.98 | 6.80 | 17.46 | 12.84 | 8.29 | 6.01 | 16.44 | 10.26 | 11.92 | 8.73 | 10.74 |
| δEu | 0.56 | 0.35 | 0.21 | 0.42 | 0.07 | 0.94 | 0.40 | 0.13 | 0.37 | 0.81 | 0.59 | 0.93 | 0.63 | 0.58 | 0.27 | 0.42 | 0.27 | 0.78 |
| δCe | 0.94 | 0.97 | 0.60 | 0.95 | 1.00 | 0.94 | 0.95 | 1.00 | 1.05 | 0.92 | 0.90 | 1.15 | 0.96 | 0.93 | 0.95 | 0.92 | 0.99 | 0.96 |
| (La/Yb)N | 4.71 | 7.10 | 9.12 | 5.51 | 3.41 | 19.15 | 9.83 | 2.75 | 5.38 | 27.07 | 20.08 | 9.48 | 5.22 | 27.27 | 12.22 | 36.47 | 7.17 | 15.25 |
| (La/Sm)N | 5.41 | 5.83 | 6.09 | 4.97 | 3.73 | 10.12 | 8.18 | 4.74 | 6.77 | 9.80 | 7.53 | 4.13 | 4.44 | 8.33 | 6.32 | 5.95 | 6.35 | 4.18 |
| (Gd/Yb)N | 1.10 | 1.46 | 2.14 | 1.33 | 1.20 | 2.15 | 1.43 | 0.72 | 0.94 | 2.78 | 3.01 | 2.76 | 1.28 | 3.40 | 2.18 | 7.15 | 1.21 | 3.80 |
| Y (ppm) | 38.30 | 30.30 | 42.10 | 21.10 | 37.20 | 11.10 | 32.50 | 74.10 | 34.80 | 10.30 | 21.10 | 13.90 | 18.50 | 14.50 | 121.00 | 26.90 | 24.50 | 36.90 |
| Zr | 137.00 | 60.70 | 85.90 | 102.00 | 138.00 | 154.00 | 102.00 | 139.00 | 131.00 | 15.70 | 106.00 | 33.70 | 106.00 | 218.00 | 179.00 | 96.00 | 114.00 | 32.30 |
| Hf | 4.94 | 3.20 | 3.15 | 4.43 | 6.39 | 4.36 | 3.49 | 7.48 | 5.07 | 0.84 | 3.93 | 1.31 | 3.88 | 7.26 | 5.99 | 2.73 | 4.92 | 1.73 |
| Cr | 25.50 | 8.33 | 11.70 | 4.91 | 6.14 | 10.20 | 3.95 | 1.90 | 3.27 | 9.38 | 12.30 | 15.80 | 8.32 | 158.00 | 20.30 | 63.50 | 1.66 | 515.00 |
| Co | 7.32 | 5.49 | 1.80 | 2.22 | 0.35 | 4.27 | 1.86 | 0.91 | 2.44 | 6.45 | 5.63 | 9.05 | 4.19 | 1.61 | 5.92 | 16.70 | 0.97 | 49.60 |
| Ni | 7.50 | 5.43 | 9.45 | 3.81 | 2.03 | 4.52 | 1.95 | 1.06 | 2.04 | 5.69 | 6.96 | 9.98 | 4.57 | 1.97 | 6.63 | 14.90 | 1.24 | 128.00 |
| Ga | 19.20 | 24.40 | 9.72 | 16.10 | 18.30 | 12.50 | 19.10 | 22.10 | 18.60 | 19.80 | 23.50 | 18.20 | 16.40 | 20.50 | 60.60 | 29.50 | 17.20 | 33.20 |
| Rb | 144.00 | 148.00 | 152.00 | 255.00 | 235.00 | 104.00 | 180.00 | 438.00 | 278.00 | 80.90 | 146.00 | 67.90 | 197.00 | 153.00 | 275.00 | 142.00 | 215.00 | 170.00 |
| Sr | 143.00 | 91.00 | 122.00 | 77.90 | 29.30 | 202.00 | 110.00 | 30.00 | 73.30 | 388.00 | 230.00 | 771.00 | 166.00 | 104.00 | 324.00 | 416.00 | 57.20 | 738.00 |
| Nb | 14.80 | 70.50 | 5.87 | 12.80 | 21.30 | 5.29 | 10.70 | 40.60 | 17.80 | 8.44 | 18.40 | 9.02 | 18.40 | 22.30 | 22.00 | 22.20 | 18.10 | 20.50 |
| Cs | 6.83 | 9.20 | 6.81 | 11.80 | 5.58 | 1.21 | 3.57 | 16.40 | 28.50 | 1.18 | 6.98 | 4.44 | 15.70 | 3.52 | 3.21 | 9.73 | 3.43 | 4.80 |
| Ba | 1002.00 | 247.00 | 264.00 | 254.00 | 168.00 | 930.00 | 514.00 | 108.00 | 201.00 | 906.00 | 657.00 | 1422.00 | 359.00 | 1455.00 | 1968.00 | 650.00 | 171.00 | 856.00 |
| Ta | 1.47 | 17.00 | 0.65 | 1.44 | 2.05 | 0.39 | 1.17 | 5.64 | 2.42 | 0.62 | 1.92 | 0.59 | 1.98 | 1.40 | 1.01 | 1.49 | 2.94 | 0.98 |
| Pb | 26.00 | 15.80 | 18.10 | 41.60 | 15.90 | 10.60 | 19.00 | 44.20 | 36.80 | 21.40 | 31.10 | 16.60 | 39.70 | 751.00 | 97.90 | 11.90 | 20.50 | 7.80 |
| Th | 17.00 | 13.10 | 10.50 | 36.10 | 28.40 | 9.23 | 16.60 | 50.80 | 41.90 | 10.60 | 22.80 | 5.20 | 22.70 | 32.00 | 141.00 | 15.10 | 45.70 | 5.95 |
| U | 15.60 | 3.45 | 1.94 | 2.96 | 5.00 | 1.14 | 4.53 | 11.80 | 4.03 | 4.26 | 2.51 | 1.35 | 3.08 | 2.37 | 5.69 | 1.04 | 5.63 | 1.52 |