**Table S1.** Major and trace element (wt.%) compositions of NPIC granites, southeast Pakistan.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Detection limits** | **Standard (SY-4)** | **NP-RAPG-01** | **NP-RAPG-02** | **NP-RAGG-01** | **NP-RAGG-02** | **NP-**  **GG-01** | **NP-PINK-01** | **NP-**  **100** | **NP-1000** | **NP-**  **GG-(A)2** | **NP-**  **GG-A2** | **NP-**  **GG-A03** |
| Major |  | | | | | | | | | | | | |
| SiO2 | 0.01 | 49.90 | 72.16 | 72.25 | 69.99 | 71.36 | 74.75 | 74.33 | 74.37 | 74.9 | 76 | 75.38 | 75.09 |
| Al2O3 | 0.01 | 20.69 | 14.61 | 14.61 | 14.90 | 14.78 | 11.43 | 11.56 | 12.70 | 11.92 | 11.04 | 10.81 | 11.58 |
| Fe2O3 | 0.01 | 6.21 | 2.52 | 2.79 | 3.18 | 2.85 | 3.16 | 3.23 | 2.09 | 2.46 | 3.47 | 3.57 | 2.59 |
| CaO | 0.01 | 8.05 | 1.84 | 1.89 | 2.60 | 2.60 | 0.32 | 0.28 | 0.45 | 0.58 | 0.30 | 0.35 | 0.36 |
| MgO | 0.01 | 0.54 | 0.67 | 0.60 | 0.69 | 0.68 | 0.07 | 0.10 | 0.15 | 0.14 | 0.06 | 0.07 | 0.11 |
| Na2O | 0.01 | 7.10 | 4.62 | 4.72 | 4.86 | 4.82 | 4.25 | 4.18 | 3.79 | 3.76 | 4.21 | 4.11 | 4.29 |
| K2O | 0.01 | 1.66 | 2.64 | 2.45 | 2.12 | 1.98 | 4.57 | 4.68 | 5.32 | 4.64 | 4.43 | 4.34 | 4.49 |
| TiO2 | 0.01 | 0.29 | 0.24 | 0.24 | 0.28 | 0.27 | 0.17 | 0.19 | 0.24 | 0.15 | 0.13 | 0.14 | 0.15 |
| MnO | 0.01 | 0.11 | 0.05 | 0.06 | 0.07 | 0.07 | 0.04 | 0.08 | 0.04 | 0.03 | 0.05 | 0.06 | 0.04 |
| Cr2O3 | 0.01 | 0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 0.01 | 0.01 | <0.01 | 0.01 | 0.01 | 0.01 | <0.01 |
| P2O5 | 0.01 | 0.13 | 0.08 | 0.09 | 0.09 | 0.08 | 0.00 | 0.02 | 0.01 | 0.01 | 0.00 | 0.00 | 0.02 |
| BaO | 0.01 | 0.04 | 0.08 | 0.07 | 0.08 | 0.07 | 0.03 | 0.02 | 0.05 | 0.02 | 0.02 | 0.02 | 0.02 |
| SrO | 0.01 | 0.14 | 0.03 | 0.03 | 0.04 | 0.04 | <0.01 | <0.01 | <0.02 | <0.03 | <0.04 | <0.05 | <0.06 |
| LOI | 0.01 | 4.56 | 0.65 | 0.56 | 0.49 | 0.50 | 0.21 | 0.50 | 0.29 | 0.58 | 0.23 | 0.29 | 0.27 |
| Total |  |  | 100.19 | 100.36 | 99.39 | 100.12 | 99.02 | 99.18 | 99.51 | 99.20 | 99.96 | 99.16 | 99.01 |
| Na2O+K2O |  |  | 7.26 | 7.17 | 6.98 | 6.80 | 8.82 | 8.86 | 9.11 | 8.40 | 8.64 | 8.45 | 8.78 |
| Na2O/K2O |  |  | 1.75 | 1.93 | 2.29 | 2.43 | 0.93 | 0.89 | 0.71 | 0.81 | 0.95 | 0.95 | 0.96 |
| FeOt/MgO |  |  | 3.38 | 4.18 | 4.15 | 3.77 | 40.62 | 29.06 | 12.54 | 15.81 | 52.04 | 45.89 | 21.19 |
| Trace |  | | | | | | | | | | | | |
| Rb | 0.20 | 55.00 | - | - | - | - | - | - | - | - | - | - | - |
| Ba | 0.50 | 340.00 | 698 | 628 | 666 | 591 | 171.50 | 168.00 | 392.00 | 187.00 | 75.90 | 87.20 | 150.50 |
| Th | 0.05 | 1.29 | 2.28 | 2.97 | 2.33 | 2.20 | 11.40 | 10.05 | 13.95 | 12.05 | 14.75 | 15.45 | 13.15 |
| U | 0.05 | 0.80 | 0.58 | 0.77 | 0.33 | 0.36 | 2.70 | 2.37 | 3.50 | 2.96 | 3.42 | 3.53 | 3.15 |
| Nb | 0.20 | 13.00 | 4.8 | 5.4 | 4.3 | 4.4 | 28.0 | 29.9 | 11.6 | 19.7 | 36.4 | 40.8 | 34.0 |
| Ta | 0.10 | 0.90 | 0.5 | 0.5 | 0.2 | 0.2 | 1.7 | 1.6 | 0.9 | 1.4 | 2.3 | 2.5 | 2.1 |
| La | 0.50 | 58.00 | 2.0 | 3.0 | 6.0 | 5.7 | 7.2 | 5.0 | 4.4 | 8.3 | 3.7 | 3.6 | 7.7 |
| Ce | 0.50 | 122.00 | 28.7 | 30.2 | 34.7 | 33.8 | 89.4 | 148.0 | 80.8 | 108.0 | 109.0 | 110.0 | 116.0 |
| Pr | 0.03 | 15.00 | 3.10 | 3.51 | 4.57 | 4.12 | 12.10 | 17.45 | 10.00 | 13.65 | 14.85 | 14.95 | 14.90 |
| Sr | 0.10 | 1190.00 | 266 | 269 | 335 | 335 | 15.2 | 17.5 | 22.6 | 33.0 | 8.3 | 9.7 | 13.8 |
| Nd | 0.10 | 57.00 | 11.7 | 13.4 | 18.1 | 15.9 | 48.5 | 68.8 | 36.8 | 50.0 | 60.0 | 60.3 | 58.8 |
| Sm | 0.03 | 12.70 | 2.60 | 2.83 | 3.69 | 3.43 | 12.45 | 16.05 | 7.90 | 10.70 | 16.15 | 16.60 | 15.40 |
| Hf | 0.20 | 11.10 | 3.1 | 3.8 | 3.8 | 3.7 | 15.7 | 18.9 | 8.6 | 8.1 | 21.3 | 22.5 | 19.8 |

**Table S1 *continued.***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sample** | **Detection limits** | **Standard (SY-4)** | **NP-RAPG-01** | **NP-RAPG-02** | **NP-RAGG-01** | **NP-RAGG-02** | **NP-**  **GG-01** | **NP-PINK-01** | **NP-**  **100** | **NP-1000** | **NP-**  **GG-(A)2** | **NP-**  **GG-A2** | **NP-**  **GG-A03** |
| Trace |  | | | | | | | | | | | | |
| Zr | 2.00 | 583.00 | 101 | 127 | 144 | 132 | 517 | 727 | 279 | 236 | 681 | 715 | 645 |
| Eu | 0.03 | 2.00 | 0.8 | 0.8 | 1.0 | 0.9 | 0.9 | 1.2 | 0.7 | 0.5 | 1.1 | 1.1 | 1.1 |
| Gd | 0.05 | 14.00 | 2.5 | 2.4 | 3.2 | 3.1 | 12.6 | 16.1 | 7.2 | 9.9 | 18.1 | 18.2 | 16.6 |
| Tb | 0.01 | 2.60 | 0.38 | 0.40 | 0.53 | 0.49 | 2.37 | 2.99 | 1.29 | 1.76 | 3.44 | 3.52 | 3.02 |
| Dy | 0.05 | 18.20 | 2.6 | 2.5 | 2.9 | 2.7 | 15.3 | 18.8 | 8.4 | 10.7 | 23.1 | 24.0 | 20.0 |
| Ho | 0.01 | 4.30 | 0.5 | 0.5 | 0.6 | 0.6 | 3.3 | 4.0 | 1.8 | 2.4 | 5.1 | 5.3 | 4.4 |
| Y | 0.50 | 119.00 | 14.1 | 14.9 | 18.5 | 17.3 | 94.9 | 107.0 | 51.2 | 68.2 | 146.5 | 153.5 | 122.5 |
| Er | 0.03 | 14.20 | 1.8 | 1.5 | 1.7 | 1.8 | 10.2 | 12.1 | 5.5 | 7.4 | 15.6 | 16.5 | 13.4 |
| Tm | 0.01 | 2.30 | 0.25 | 0.28 | 0.29 | 0.28 | 1.67 | 1.88 | 0.89 | 1.16 | 2.39 | 2.62 | 2.06 |
| Yb | 0.03 | 14.80 | 1.75 | 2.01 | 1.92 | 1.80 | 10.95 | 11.95 | 5.81 | 7.93 | 15.20 | 17.70 | 13.70 |
| Lu | 0.01 | 2.10 | 0.28 | 0.31 | 0.33 | 0.30 | 1.64 | 1.81 | 0.86 | 1.22 | 2.23 | 2.53 | 2.04 |
| ΣREE | - | - | 68.98 | 73.63 | 114.53 | 115.89 | 258.54 | 376.02 | 229.70 | 305.75 | 89.5 | 84.92 | 184.22 |

Note: One standard analyzed by this lab is SY-4.