附件2 山东章丘、邹平和莱阳地区早白垩世中基性火山岩全岩主量（wt.%）和微量元素（ppm）组成表

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 样品号 | 19ZQ01 | 19ZQ02 | 19ZQ03 | 19ZQ04 | 19ZQ06 | 19ZQ07 | 19ZQ08 | 19ZQ09 | 19ZQ10 | 20ZP01 | 20ZP02 | |
| SiO2 | 59.9 | 52.8 | 55.0 | 53.0 | 53.1 | 53.3 | 53.6 | 54.1 | 55.2 | 53.5 | 53.3 | |
| TiO2 | 1.06 | 0.81 | 0.77 | 0.87 | 0.73 | 0.80 | 0.94 | 0.68 | 0.70 | 0.95 | 0.96 | |
| Al2O3 | 16.7 | 16.2 | 14.8 | 15.3 | 14.9 | 14.5 | 15.8 | 14.8 | 15.7 | 18.0 | 17.8 | |
| Fe2O3T | 6.75 | 8.27 | 10.2 | 8.47 | 8.55 | 9.53 | 8.64 | 7.97 | 8.30 | 8.64 | 8.48 | |
| MnO | 0.05 | 0.12 | 0.13 | 0.12 | 0.15 | 0.11 | 0.11 | 0.15 | 0.10 | 0.14 | 0.13 | |
| MgO | 2.06 | 6.68 | 6.54 | 6.40 | 7.12 | 7.99 | 6.32 | 6.86 | 5.62 | 3.55 | 3.60 | |
| CaO | 3.19 | 8.22 | 6.02 | 7.11 | 7.82 | 6.58 | 7.36 | 6.90 | 6.24 | 6.89 | 6.82 | |
| Na2O | 4.27 | 3.42 | 2.96 | 4.77 | 3.33 | 2.66 | 3.61 | 4.33 | 4.09 | 3.56 | 3.52 | |
| K2O | 3.76 | 1.02 | 1.89 | 1.29 | 1.64 | 2.29 | 1.36 | 1.81 | 1.23 | 2.77 | 2.79 | |
| P2O5 | 0.50 | 0.45 | 0.30 | 0.45 | 0.28 | 0.39 | 0.47 | 0.29 | 0.36 | 0.48 | 0.47 | |
| LOI | 1.30 | 1.38 | 1.19 | 1.45 | 1.80 | 1.42 | 1.45 | 1.45 | 1.85 | 0.70 | 1.00 | |
| Total | 99.5 | 99.3 | 99.8 | 99.2 | 99.4 | 99.6 | 99.7 | 99.4 | 99.3 | 99.2 | 98.9 | |
| Mg# | 37.6 | 61.5 | 56.0 | 60.0 | 62.3 | 62.4 | 59.2 | 63.0 | 57.0 | 44.9 | 45.7 | |
| La | 27.2 | 20.3 | 17.9 | 23.4 | 15.5 | 15.2 | 24.5 | 19.4 | 24.8 | 26.0 | 26.7 | |
| Ce | 64.7 | 48.5 | 34.0 | 54.0 | 32.3 | 33.7 | 57.4 | 35.3 | 49.8 | 54.5 | 55.4 | |
| Pr | 8.23 | 6.47 | 3.81 | 6.85 | 4.04 | 4.44 | 7.43 | 3.94 | 5.73 | 6.90 | 6.90 | |
| Nd | 34.6 | 27.2 | 14.9 | 28.3 | 16.9 | 19.3 | 31.3 | 15.8 | 22.6 | 29.1 | 28.9 | |
| Sm | 6.76 | 5.48 | 2.74 | 5.45 | 3.54 | 4.16 | 6.00 | 3.11 | 4.04 | 5.86 | 6.01 | |
| Eu | 1.97 | 1.73 | 0.80 | 1.80 | 1.06 | 1.17 | 2.05 | 0.95 | 1.27 | 1.79 | 1.82 | |
| Gd | 5.62 | 4.76 | 2.46 | 4.65 | 3.22 | 3.89 | 5.12 | 2.85 | 3.46 | 5.25 | 5.21 | |
| Tb | 0.78 | 0.64 | 0.35 | 0.62 | 0.46 | 0.54 | 0.69 | 0.39 | 0.49 | 0.69 | 0.65 | |
| Dy | 4.31 | 3.64 | 2.08 | 3.48 | 2.61 | 3.15 | 3.72 | 2.37 | 2.87 | 3.79 | 3.70 | |
| Ho | 0.84 | 0.66 | 0.42 | 0.64 | 0.54 | 0.62 | 0.69 | 0.49 | 0.55 | 0.68 | 0.68 | |
| Er | 2.40 | 1.89 | 1.23 | 1.78 | 1.53 | 1.75 | 1.87 | 1.38 | 1.53 | 1.83 | 1.90 | |
| Tm | 0.36 | 0.27 | 0.17 | 0.25 | 0.22 | 0.25 | 0.28 | 0.19 | 0.22 | 0.27 | 0.27 | |
| Yb | 2.17 | 1.66 | 1.16 | 1.62 | 1.38 | 1.47 | 1.72 | 1.33 | 1.38 | 1.68 | 1.63 | |
| Lu | 0.31 | 0.24 | 0.18 | 0.25 | 0.21 | 0.23 | 0.26 | 0.19 | 0.22 | 0.25 | 0.24 | |
| Rb | 60.1 | 25.2 | 45.5 | 30.3 | 31.7 | 54.3 | 31.7 | 37.3 | 27.1 | 59.3 | 66.4 | |
| Ba | 1862 | 462 | 669 | 593 | 744 | 666 | 649 | 721 | 520 | 1363 | 1277 | |
| Th | 5.10 | 1.89 | 2.54 | 2.48 | 1.79 | 1.89 | 2.37 | 2.56 | 2.74 | 6.00 | 5.66 | |
| U | 1.67 | 0.73 | 0.61 | 0.92 | 0.54 | 0.54 | 0.92 | 0.74 | 0.80 | 1.84 | 1.53 | |
| Nb | 9.29 | 4.25 | 4.14 | 6.76 | 4.12 | 4.93 | 6.73 | 4.47 | 4.60 | 7.73 | 7.45 | |
| Ta | 0.50 | 0.20 | 0.21 | 0.34 | 0.22 | 0.25 | 0.34 | 0.24 | 0.23 | 0.45 | 0.44 | |
| Ti | 6624 | 5030 | 4791 | 5723 | 4815 | 5092 | 5903 | 4543 | 4507 | 6063 | 6150 | |
| Pb | 4.39 | 1.43 | 1.70 | 2.47 | 1.55 | 0.96 | 1.38 | 23.01 | 2.57 | 10.10 | 6.40 | |
| Sr | 530 | 675 | 511 | 691 | 603 | 541 | 722 | 614 | 649 | 918 | 940 | |
| Zr | 183 | 90.69 | 87.45 | 134 | 96.52 | 101 | 132 | 92.18 | 93.12 | 118 | 116 | |
| Hf | 4.43 | 2.26 | 2.21 | 3.24 | 2.39 | 2.59 | 3.24 | 2.36 | 2.36 | 3.25 | 3.16 | |
| Y | 25.2 | 20.0 | 12.2 | 19.4 | 15.6 | 18.2 | 20.4 | 14.1 | 16.2 | 20.3 | 19.8 | |
| V | 201 | 219 | 219 | 205 | 221 | 203 | 210 | 162 | 190 | 239 | 251 | |
| Cr | 2.43 | 226 | 339 | 225 | 288 | 291 | 210 | 246 | 316 | 11.8 | 13.4 | |
| Co | 12.7 | 23.5 | 35.2 | 27.6 | 32.1 | 36.5 | 23.0 | 37.5 | 32.1 | 20.9 | 23.66 | |
| Ni | 6.47 | 67.4 | 88.4 | 84.0 | 93.3 | 94.5 | 68.1 | 74.9 | 78.8 | 12.3 | 13.0 | |
| Sc | 13.8 | 24.7 | 23.9 | 23.5 | 27.8 | 27.7 | 25.0 | 24.1 | 24.6 | 20.0 | 20.3 | |
| 续表1 | | | | | | | | | | | | |
| 样品号 | 20ZP03 | 20ZP04 | 20ZP05 | 20ZP06 | 20ZP11 | 20ZP12 | 20ZP13 | 20LY01 | 20LY02 | 20LY03 | 20LY05 |
| SiO2 | 56.5 | 56.5 | 56.8 | 58.8 | 56.3 | 56.6 | 57.9 | 62.7 | 60.8 | 62.2 | 52.6 |
| TiO2 | 0.73 | 0.72 | 0.69 | 0.67 | 0.62 | 0.65 | 0.60 | 0.66 | 0.67 | 0.64 | 0.92 |
| Al2O3 | 18.4 | 18.3 | 17.6 | 17.3 | 20.9 | 19.2 | 19.7 | 15.2 | 16.6 | 15.4 | 16.4 |
| Fe2O3T | 6.78 | 7.46 | 7.05 | 6.86 | 5.11 | 5.64 | 4.69 | 4.21 | 4.22 | 4.63 | 5.99 |
| MnO | 0.05 | 0.06 | 0.06 | 0.07 | 0.10 | 0.10 | 0.09 | 0.08 | 0.05 | 0.04 | 0.09 |
| MgO | 3.23 | 2.82 | 2.60 | 2.79 | 1.91 | 2.23 | 1.54 | 2.31 | 3.44 | 3.45 | 3.18 |
| CaO | 6.43 | 5.92 | 6.05 | 5.43 | 5.66 | 5.89 | 5.21 | 3.67 | 2.70 | 2.47 | 8.33 |
| Na2O | 4.21 | 3.95 | 4.05 | 4.24 | 4.20 | 4.20 | 4.42 | 3.57 | 3.52 | 3.26 | 3.28 |
| K2O | 1.85 | 2.90 | 2.85 | 2.88 | 3.61 | 3.41 | 3.68 | 4.04 | 3.98 | 3.92 | 2.40 |
| P2O5 | 0.38 | 0.38 | 0.38 | 0.35 | 0.38 | 0.38 | 0.35 | 0.22 | 0.21 | 0.21 | 0.43 |
| LOI | 1.15 | 0.65 | 0.94 | 0.61 | 0.61 | 0.60 | 0.79 | 2.70 | 3.01 | 2.62 | 5.69 |
| Total | 99.6 | 99.6 | 99.0 | 99.9 | 99.4 | 98.9 | 98.9 | 99.4 | 99.3 | 98.8 | 99.3 |
| Mg# | 48.6 | 42.8 | 42.2 | 44.6 | 42.5 | 44.0 | 39.4 | 52.1 | 61.7 | 59.6 | 51.3 |
| La | 26.6 | 25.5 | 25.0 | 29.0 | 30.0 | 30.0 | 31.4 | 74.1 | 71.9 | 70.2 | 68.3 |
| Ce | 52.1 | 51.8 | 50.0 | 56.9 | 59.2 | 60.0 | 62.7 | 157 | 151 | 145 | 148 |
| Pr | 6.17 | 6.28 | 6.11 | 6.75 | 6.93 | 7.00 | 7.30 | 14.2 | 13.8 | 13.4 | 14.0 |
| Nd | 24.8 | 26.4 | 25.3 | 27.6 | 27.6 | 28.1 | 29.0 | 49.5 | 48.3 | 47.1 | 51.5 |
| Sm | 5.09 | 5.24 | 4.99 | 5.26 | 5.51 | 5.35 | 5.44 | 7.12 | 7.38 | 6.48 | 7.93 |
| Eu | 1.60 | 1.58 | 1.61 | 1.48 | 1.68 | 1.71 | 1.72 | 1.55 | 1.57 | 1.49 | 2.05 |
| Gd | 4.19 | 4.44 | 4.34 | 4.43 | 4.32 | 4.45 | 4.36 | 4.93 | 4.95 | 4.54 | 5.86 |
| Tb | 0.57 | 0.60 | 0.58 | 0.60 | 0.58 | 0.59 | 0.57 | 0.66 | 0.66 | 0.61 | 0.76 |
| Dy | 3.18 | 3.27 | 3.17 | 3.20 | 2.97 | 3.12 | 3.02 | 3.51 | 3.42 | 3.21 | 4.30 |
| Ho | 0.63 | 0.58 | 0.61 | 0.64 | 0.55 | 0.59 | 0.58 | 0.66 | 0.64 | 0.63 | 0.82 |
| Er | 1.65 | 1.60 | 1.65 | 1.72 | 1.47 | 1.52 | 1.57 | 1.88 | 1.84 | 1.71 | 2.27 |
| Tm | 0.24 | 0.25 | 0.24 | 0.25 | 0.21 | 0.21 | 0.23 | 0.26 | 0.27 | 0.26 | 0.33 |
| Yb | 1.50 | 1.51 | 1.49 | 1.51 | 1.34 | 1.37 | 1.37 | 1.79 | 1.68 | 1.55 | 2.00 |
| Lu | 0.23 | 0.23 | 0.23 | 0.24 | 0.20 | 0.21 | 0.24 | 0.25 | 0.25 | 0.24 | 0.30 |
| Rb | 52.3 | 68.7 | 60.3 | 67.9 | 93.8 | 89.4 | 93.6 | 113 | 107 | 112 | 48.13 |
| Ba | 1190 | 1475 | 1696 | 1465 | 1580 | 1526 | 1632 | 1954 | 1807 | 1823 | 2104 |
| Th | 4.36 | 4.56 | 4.60 | 6.97 | 8.54 | 8.32 | 9.36 | 18.1 | 17.7 | 16.7 | 11.8 |
| U | 1.38 | 1.34 | 1.45 | 2.07 | 2.45 | 2.42 | 2.72 | 3.19 | 3.28 | 2.93 | 2.40 |
| Nb | 6.14 | 6.05 | 6.07 | 8.14 | 9.05 | 8.81 | 9.72 | 12.1 | 11.6 | 11.4 | 12.6 |
| Ta | 0.34 | 0.32 | 0.35 | 0.46 | 0.51 | 0.53 | 0.59 | 0.70 | 0.68 | 0.65 | 0.68 |
| Ti | 4587 | 4541 | 4565 | 4419 | 4011 | 4221 | 3844 | 4270 | 4239 | 4206 | 5999 |
| Pb | 5.50 | 5.69 | 5.81 | 10.56 | 18.55 | 20.27 | 18.72 | 27.7 | 25.3 | 25.2 | 18.3 |
| Sr | 1074 | 996 | 1026 | 916 | 1068 | 1025 | 1014 | 592 | 587 | 569 | 1153 |
| Zr | 115 | 116 | 117 | 144 | 144 | 142 | 156 | 327 | 328 | 313 | 286 |
| Hf | 2.97 | 3.02 | 3.04 | 3.70 | 3.70 | 3.60 | 3.95 | 6.94 | 6.82 | 6.59 | 5.63 |
| Y | 18.1 | 17.8 | 17.9 | 18.8 | 16.6 | 17.4 | 17.4 | 19.9 | 19.6 | 18.3 | 23.7 |
| V | 153 | 153 | 153 | 132 | 91 | 106 | 73 | 77.1 | 74.2 | 71.9 | 138 |
| Cr | 13.1 | 12.7 | 15.8 | 13.5 | 12.8 | 19.4 | 4.93 | 76.5 | 77.0 | 86.4 | 136 |
| Co | 23.66 | 13.1 | 17.9 | 14.9 | 14.5 | 11.4 | 13.2 | 12.3 | 12.6 | 12.6 | 20.2 |
| Ni | 13.0 | 11.3 | 11.7 | 11.0 | 10.9 | 6.91 | 9.54 | 31.4 | 34.7 | 33.7 | 40.5 |
| Sc | 20.3 | 15.6 | 15.7 | 15.0 | 13.8 | 9.37 | 11.4 | 9.78 | 9.77 | 9.81 | 17.2 |