表1 小乌兰沟正长花岗岩锆石LA-ICP-MS U-Pb年龄

Table 1 LA-ICP-MS U-Pb ages of zircons from the syenogranite in Xiaowulangou area

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 测点 | 含量（×10-6） | | | Th/U | 同位素比值 | | | | | | 年龄（Ma） | |
| Pb | Th | U | 207Pb/206Pb | 1σ | 207Pb/235U | 1σ | 206Pb/238U | 1σ | 206Pb/238U | 1σ |
| 1 | 6 | 121 | 252 | 0.48 | 0.0555 | 0.0028 | 0.1664 | 0.0082 | 0.0219 | 0.0003 | 139.8 | 1.8 |
| 2 | 16 | 227 | 679 | 0.33 | 0.0511 | 0.0017 | 0.1534 | 0.0051 | 0.0218 | 0.0002 | 139.0 | 1.3 |
| 3 | 5 | 70 | 210 | 0.33 | 0.0472 | 0.0034 | 0.1436 | 0.0106 | 0.0221 | 0.0003 | 140.7 | 2.2 |
| 4 | 8 | 117 | 320 | 0.37 | 0.0571 | 0.0040 | 0.1716 | 0.0118 | 0.0218 | 0.0004 | 138.8 | 2.3 |
| 5 | 14 | 253 | 560 | 0.45 | 0.0539 | 0.0025 | 0.1601 | 0.0071 | 0.0217 | 0.0003 | 138.5 | 1.9 |
| 6 | 27 | 473 | 1101 | 0.43 | 0.0495 | 0.0021 | 0.1458 | 0.0061 | 0.0215 | 0.0003 | 137.0 | 1.7 |
| 8 | 26 | 633 | 1043 | 0.61 | 0.0490 | 0.0018 | 0.1463 | 0.0055 | 0.0217 | 0.0003 | 138.3 | 1.6 |
| 9 | 10 | 211 | 387 | 0.54 | 0.0560 | 0.0028 | 0.1656 | 0.0079 | 0.0217 | 0.0004 | 138.6 | 2.3 |
| 10 | 5 | 102 | 229 | 0.45 | 0.0519 | 0.0039 | 0.1484 | 0.0102 | 0.0215 | 0.0004 | 136.9 | 2.5 |
| 11 | 9 | 173 | 382 | 0.45 | 0.0516 | 0.0046 | 0.1491 | 0.0124 | 0.0216 | 0.0005 | 137.7 | 3.1 |
| 12 | 10 | 166 | 431 | 0.39 | 0.0529 | 0.0032 | 0.1600 | 0.0099 | 0.0220 | 0.0004 | 140.1 | 2.2 |
| 13 | 28 | 464 | 1176 | 0.39 | 0.0482 | 0.0016 | 0.1455 | 0.0052 | 0.0219 | 0.0003 | 139.4 | 1.8 |
| 14 | 23 | 346 | 983 | 0.35 | 0.0510 | 0.0019 | 0.1525 | 0.0057 | 0.0217 | 0.0002 | 138.5 | 1.5 |
| 15 | 18 | 286 | 745 | 0.38 | 0.0475 | 0.0019 | 0.1433 | 0.0056 | 0.0220 | 0.0002 | 140.1 | 1.5 |
| 16 | 17 | 365 | 679 | 0.54 | 0.0499 | 0.0019 | 0.1515 | 0.0056 | 0.0221 | 0.0003 | 140.6 | 1.7 |
| 17 | 21 | 240 | 907 | 0.27 | 0.0478 | 0.0020 | 0.1453 | 0.0063 | 0.0220 | 0.0003 | 140.6 | 1.8 |
| 18 | 18 | 271 | 737 | 0.37 | 0.0462 | 0.0021 | 0.1417 | 0.0069 | 0.0221 | 0.0003 | 140.9 | 1.7 |
| 19 | 6 | 100 | 262 | 0.38 | 0.0502 | 0.0029 | 0.1491 | 0.0093 | 0.0214 | 0.0004 | 136.3 | 2.3 |
| 20 | 8 | 150 | 323 | 0.46 | 0.0529 | 0.0037 | 0.1527 | 0.0105 | 0.0215 | 0.0004 | 137.0 | 2.4 |
| 21 | 19 | 259 | 796 | 0.33 | 0.0486 | 0.0022 | 0.1478 | 0.0068 | 0.0221 | 0.0002 | 140.9 | 1.6 |
| 22 | 11 | 186 | 477 | 0.39 | 0.0496 | 0.0026 | 0.1476 | 0.0076 | 0.0217 | 0.0003 | 138.7 | 2.2 |
| 23 | 11 | 192 | 434 | 0.44 | 0.0512 | 0.0028 | 0.1551 | 0.0085 | 0.0220 | 0.0003 | 140.3 | 1.9 |
| 25 | 19 | 414 | 752 | 0.55 | 0.0530 | 0.0024 | 0.1598 | 0.0072 | 0.0219 | 0.0003 | 139.6 | 1.9 |
| 26 | 7 | 142 | 274 | 0.52 | 0.0472 | 0.0028 | 0.1422 | 0.0086 | 0.0219 | 0.0004 | 139.9 | 2.6 |
| 27 | 14 | 270 | 562 | 0.48 | 0.0474 | 0.0028 | 0.1406 | 0.0077 | 0.0219 | 0.0003 | 139.8 | 1.9 |
| 28 | 28 | 437 | 1162 | 0.38 | 0.0538 | 0.0021 | 0.1614 | 0.0058 | 0.0219 | 0.0002 | 139.8 | 1.6 |
| 29 | 29 | 365 | 1206 | 0.30 | 0.0480 | 0.0020 | 0.1458 | 0.0060 | 0.0220 | 0.0003 | 140.6 | 1.9 |
| 30 | 24 | 544 | 915 | 0.59 | 0.0463 | 0.0025 | 0.1398 | 0.0065 | 0.0222 | 0.0003 | 141.2 | 1.6 |
| 31 | 22 | 424 | 906 | 0.47 | 0.0490 | 0.0021 | 0.1458 | 0.0056 | 0.0217 | 0.0003 | 138.6 | 1.8 |

表2 小乌兰沟正长花岗岩主量元素(wt%)、微量元素(×10-6)含量

Table 2 Major elements contents (%) and trace elements contents (×10-6) of syenogranite from the Xiaowulangou area

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 样品号 | CG-5 | CG-6 | CG-7 | CG-8 | CG-9 |
| SiO2 | 75.80 | 76.84 | 75.35 | 75.94 | 74.08 |
| TiO2 | 0.13 | 0.13 | 0.14 | 0.15 | 0.12 |
| Al2O3 | 12.41 | 12.09 | 12.68 | 12.83 | 13.04 |
| Fe2O3 | 1.24 | 1.24 | 0.95 | 0.84 | 0.86 |
| FeO | 0.46 | 0.56 | 0.88 | 1.06 | 0.86 |
| MnO | 0.021 | 0.023 | 00.028 | 0.025 | 0.021 |
| MgO | 0.18 | 0.14 | 0.13 | 0.15 | 0.14 |
| CaO | 0.49 | 0.47 | 0.60 | 0.53 | 0.59 |
| Na2O | 3.54 | 3.19 | 3.16 | 3.10 | 3.53 |
| K2O | 5.12 | 4.89 | 4.90 | 5.02 | 5.67 |
| P2O5 | 0.068 | 0.059 | 0.077 | 0.039 | 0.056 |
| H2O+ | 0.43 | 0.64 | 0.43 | 0.31 | 0.62 |
| LOI | 0.43 | 0.59 | 0.53 | 0.59 | 0.58 |
| K2O+Na2O | 8.66 | 8.08 | 8.06 | 8.12 | 9.2 |
| FeOT | 1.57 | 1.67 | 1.73 | 1.81 | 1.63 |
| A/CNK | 1.01 | 1.06 | 1.09 | 1.11 | 1.00 |
| A/NK | 1.09 | 1.15 | 1.21 | 1.22 | 1.09 |
| DI | 94.9 | 94.39 | 93.26 | 93.16 | 94.54 |
| Ga | 24.0 | 23.2 | 22.8 | 23.2 | 22.6 |
| Rb | 235 | 249 | 223 | 249 | 248 |
| Ba | 106 | 66.7 | 58.1 | 67.5 | 66.5 |
| Th | 33.7 | 21.0 | 29.9 | 26.2 | 22.7 |
| U | 2.53 | 2.72 | 4.62 | 3.42 | 2.63 |
| Nb | 21.3 | 15.7 | 16.7 | 16.5 | 16.1 |
| Ta | 1.06 | 0.80 | 0.72 | 0.90 | 0.72 |
| Sr | 20.3 | 19.5 | 14.9 | 18.3 | 20.7 |
| Zr | 210 | 168 | 179 | 167 | 184 |
| Hf | 9.19 | 9.10 | 9.36 | 10.3 | 9.79 |
| La | 34.10 | 26.11 | 21.66 | 30.91 | 22.30 |
| Ce | 134.16 | 105.67 | 114.54 | 127.56 | 103.06 |
| Pr | 10.49 | 8.33 | 7.67 | 10.11 | 7.20 |
| Nd | 38.91 | 32.61 | 28.87 | 39.48 | 27.96 |
| Sm | 8.17 | 7.24 | 6.26 | 8.58 | 6.26 |
| Eu | 0.21 | 0.18 | 0.16 | 0.19 | 0.17 |
| Gd | 6.89 | 6.19 | 5.73 | 6.98 | 5.72 |
| Tb | 1.36 | 1.12 | 1.03 | 1.37 | 1.09 |
| Dy | 7.77 | 6.71 | 6.13 | 7.39 | 6.59 |
| Ho | 1.56 | 1.28 | 1.25 | 1.50 | 1.33 |
| Er | 4.48 | 3.56 | 3.43 | 4.06 | 3.83 |
| Tm | 0.70 | 0.57 | 0.59 | 0.66 | 0.63 |
| Yb | 4.84 | 4.26 | 4.03 | 4.55 | 4.45 |
| Lu | 0.72 | 0.59 | 0.64 | 0.65 | 0.66 |
| Sc | 5.36 | 4.34 | 3.13 | 4.43 | 3.94 |
| Y | 40.5 | 34.0 | 29.6 | 36.8 | 35.6 |
| LREE/HREE | 7.98 | 7.43 | 7.87 | 8.00 | 6.87 |
| ∑REE | 254.20 | 204.73 | 202.52 | 244.43 | 191.23 |
| δEu | 0.008 | 0.008 | 0.008 | 0.007 | 0.009 |
| δCe | 1.69 | 1.72 | 2.14 | 1.74 | 1.95 |
| (La/Yb)N | 4.75 | 4.13 | 3.63 | 4.58 | 3.38 |
| (La/Sm)N | 2.63 | 2.27 | 2.18 | 2.27 | 2.24 |
| (Gd/Yb)N | 1.15 | 1.17 | 1.15 | 1.24 | 1.04 |
| Tzr(℃) | 812 | 798 | 805 | 801 | 796 |

表3小乌兰沟正长花岗岩锆石Hf同位素数据

Table 3 Zircon Hf isotopic data for Xiaowulangousyenogranite

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 测点号 | 176Yb/177Hf | 2б | 176Lu/177Hf | 2б | 176Hf/177Hf | 2б | (176Hf/177Hf)*i* | εHf(0) | εHf(t) | *t*DM1(Ma) | *t*DM2(Ma) | *f*Lu/Hf |
| CG-2 | 0.029098 | 0.000125 | 0.000863 | 0.000004 | 0.282913 | 0.000014 | 0.282911 | 5.0 | 8.0 | 479 | 767 | -0.97 |
| CG-3 | 0.018024 | 0.000108 | 0.000538 | 0.000003 | 0.282894 | 0.000014 | 0.282892 | 4.3 | 7.3 | 502 | 815 | -0.98 |
| CG-6 | 0.040607 | 0.000340 | 0.001132 | 0.000008 | 0.282900 | 0.000014 | 0.282897 | 4.5 | 7.4 | 500 | 802 | -0.97 |
| CG-7 | 0.030901 | 0.000672 | 0.001125 | 0.000026 | 0.282833 | 0.000019 | 0.282826 | 2.2 | 8.8 | 596 | 833 | -0.97 |
| CG-8 | 0.048926 | 0.000233 | 0.001366 | 0.000005 | 0.282933 | 0.000014 | 0.282929 | 5.7 | 8.6 | 457 | 718 | -0.96 |
| CG-9 | 0.035609 | 0.000066 | 0.001064 | 0.000002 | 0.282901 | 0.000018 | 0.282899 | 4.6 | 7.5 | 498 | 798 | -0.97 |
| CG-10 | 0.035218 | 0.000130 | 0.001015 | 0.000007 | 0.282887 | 0.000018 | 0.282884 | 4.1 | 7.0 | 518 | 837 | -0.97 |
| CG-13 | 0.053224 | 0.000783 | 0.001570 | 0.000021 | 0.282927 | 0.000013 | 0.282923 | 5.5 | 8.4 | 468 | 732 | -0.95 |
| CG-15 | 0.032131 | 0.000193 | 0.000956 | 0.000008 | 0.282911 | 0.000014 | 0.282908 | 4.9 | 7.9 | 483 | 772 | -0.97 |
| CG-16 | 0.036338 | 0.000188 | 0.001157 | 0.000002 | 0.282938 | 0.000015 | 0.282935 | 5.9 | 8.9 | 446 | 700 | -0.97 |
| CG-17 | 0.034559 | 0.000728 | 0.001076 | 0.000028 | 0.282916 | 0.000017 | 0.282913 | 5.1 | 8.1 | 477 | 759 | -0.97 |
| CG-18 | 0.040390 | 0.000075 | 0.001258 | 0.000003 | 0.282934 | 0.000015 | 0.282930 | 5.7 | 8.7 | 454 | 713 | -0.96 |
| CG-21 | 0.039193 | 0.000730 | 0.001168 | 0.000021 | 0.282916 | 0.000013 | 0.282913 | 5.1 | 8.1 | 478 | 758 | -0.96 |
| CG-22 | 0.042847 | 0.000223 | 0.001312 | 0.000011 | 0.282922 | 0.000012 | 0.282918 | 5.3 | 8.2 | 472 | 746 | -0.96 |
| CG-23 | 0.030739 | 0.000156 | 0.000876 | 0.000005 | 0.282889 | 0.000013 | 0.282887 | 4.1 | 7.1 | 512 | 828 | -0.97 |
| CG-24 | 0.042074 | 0.000411 | 0.001315 | 0.000016 | 0.282745 | 0.000015 | 0.282738 | -1.0 | 5.4 | 724 | 1070 | -0.96 |
| CG-25 | 0.033426 | 0.000084 | 0.000935 | 0.000003 | 0.282923 | 0.000013 | 0.282921 | 5.3 | 8.3 | 465 | 740 | -0.97 |
| CG-26 | 0.020433 | 0.000235 | 0.000650 | 0.000005 | 0.282844 | 0.000017 | 0.282842 | 2.5 | 5.5 | 573 | 947 | -0.98 |
| CG-27 | 0.037621 | 0.000095 | 0.000967 | 0.000005 | 0.282892 | 0.000015 | 0.282890 | 4.2 | 7.2 | 510 | 821 | -0.97 |
| CG-28 | 0.045124 | 0.000231 | 0.001213 | 0.000005 | 0.282913 | 0.000015 | 0.282910 | 5.0 | 8.0 | 483 | 767 | -0.96 |
| CG-29 | 0.029442 | 0.000038 | 0.000798 | 0.000002 | 0.282868 | 0.000013 | 0.282866 | 3.4 | 6.4 | 541 | 883 | -0.98 |
| CG-30 | 0.045626 | 0.000193 | 0.001206 | 0.000004 | 0.282915 | 0.000015 | 0.282912 | 5.1 | 8.1 | 480 | 759 | -0.96 |