表**1**熊耳山地区太华杂岩中锆石U-Pb年龄分析结果

**Table 1** Zircon U-Pb ages of Taihua complex in Xiong’ershan area

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 测点 | 同位素比值 | | | | | | | | | 表观年龄（Ma） | | | | | |
| Th | U | Th/U | 207Pb/ | ± 1σ | 207Pb/ | ± 1σ | 206Pb/ | ± 1σ | 207Pb/ | ± 1σ | 207Pb/ | ± 1σ | 206Pb/ | ± 1σ |
| 206Pb | 235U | 238U |  | 206Pb | 235U | 238U |  |
| XNG13-1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 150 | 333 | 0.45 | 0.1652 | 0.0025 | 10.3451 | 0.1991 | 0.4563 | 0.0043 | 2509 | 26 | 2466 | 18 | 2423 | 19 |
| 2 | 85 | 186 | 0.46 | 0.1846 | 0.0028 | 13.302 | 0.2628 | 0.5187 | 0.0047 | 2694 | 25 | 2701 | 19 | 2694 | 20 |
| 3 | 234 | 679 | 0.34 | 0.1655 | 0.0024 | 10.7744 | 0.1904 | 0.4776 | 0.0046 | 2513 | 25 | 2504 | 16 | 2517 | 20 |
| 4 | 354 | 491 | 0.72 | 0.1828 | 0.0038 | 12.7697 | 0.3606 | 0.5149 | 0.0049 | 2679 | 34 | 2663 | 27 | 2678 | 21 |
| 5 | 337 | 697 | 0.48 | 0.1658 | 0.0033 | 10.2296 | 0.263 | 0.4511 | 0.0043 | 2516 | 33 | 2456 | 24 | 2400 | 19 |
| 6 | 121 | 274 | 0.44 | 0.1665 | 0.0025 | 11.0108 | 0.201 | 0.4788 | 0.0045 | 2523 | 25 | 2524 | 17 | 2522 | 19 |
| 7 | 140 | 339 | 0.41 | 0.1665 | 0.0027 | 8.1798 | 0.1634 | 0.3575 | 0.0035 | 2523 | 27 | 2251 | 18 | 1970 | 16 |
| 8 | 274 | 815 | 0.34 | 0.1646 | 0.0028 | 10.7431 | 0.2229 | 0.4752 | 0.0046 | 2503 | 28 | 2501 | 19 | 2507 | 20 |
| 9 | 105 | 283 | 0.37 | 0.1667 | 0.0032 | 10.8349 | 0.2668 | 0.4707 | 0.0044 | 2524 | 32 | 2509 | 23 | 2487 | 19 |
| 10 | 108 | 265 | 0.41 | 0.1653 | 0.0028 | 10.9248 | 0.2408 | 0.4763 | 0.0047 | 2511 | 29 | 2517 | 21 | 2511 | 20 |
| 22-LN-03 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 481 | 1322 | 0.36 | 0.1572 | 0.0038 | 11.211 | 0.2555 | 0.517 | 0.0054 | 2426 | 40 | 2687 | 23 | 2541 | 21 |
| 2 | 166 | 193 | 0.86 | 0.1751 | 0.0043 | 11.8451 | 0.2791 | 0.4906 | 0.0054 | 2607 | 41 | 2573 | 23 | 2592 | 22 |
| 3 | 99 | 1850 | 0.05 | 0.1456 | 0.0035 | 7.1643 | 0.162 | 0.3568 | 0.0037 | 2295 | 40 | 1967 | 18 | 2132 | 20 |
| 4 | 51 | 1202 | 0.04 | 0.1579 | 0.0038 | 10.1965 | 0.2309 | 0.4684 | 0.0049 | 2433 | 40 | 2477 | 21 | 2453 | 21 |
| 5 | 185 | 1362 | 0.14 | 0.1512 | 0.0036 | 8.6805 | 0.1978 | 0.4164 | 0.0044 | 2360 | 40 | 2244 | 20 | 2305 | 21 |
| 6 | 101 | 1602 | 0.06 | 0.1559 | 0.0037 | 9.557 | 0.2193 | 0.4445 | 0.0046 | 2412 | 40 | 2371 | 21 | 2393 | 21 |
| 7 | 151 | 574 | 0.26 | 0.1591 | 0.0039 | 10.4108 | 0.2447 | 0.4745 | 0.0051 | 2446 | 41 | 2503 | 22 | 2472 | 22 |
| 8 | 326 | 439 | 0.74 | 0.1836 | 0.0045 | 12.9722 | 0.3044 | 0.5125 | 0.0055 | 2686 | 40 | 2667 | 23 | 2678 | 22 |
| 9 | 237 | 242 | 0.98 | 0.1788 | 0.0045 | 11.8937 | 0.2868 | 0.4825 | 0.0053 | 2641 | 41 | 2538 | 23 | 2596 | 23 |
| 10 | 67 | 1102 | 0.06 | 0.1557 | 0.0038 | 10.0186 | 0.2341 | 0.4667 | 0.0049 | 2409 | 41 | 2469 | 22 | 2437 | 22 |
| 11 | 124 | 211 | 0.59 | 0.1811 | 0.0047 | 12.8297 | 0.3178 | 0.5139 | 0.0058 | 2663 | 42 | 2673 | 25 | 2667 | 23 |
| 12 | 147 | 247 | 0.6 | 0.1797 | 0.0047 | 12.6354 | 0.3192 | 0.51 | 0.0059 | 2650 | 43 | 2657 | 25 | 2653 | 24 |
| 13 | 128 | 233 | 0.55 | 0.1438 | 0.0041 | 8.5554 | 0.2341 | 0.4316 | 0.0052 | 2273 | 48 | 2313 | 24 | 2292 | 25 |
| 14 | 28 | 1243 | 0.02 | 0.1567 | 0.0039 | 10.2043 | 0.2413 | 0.4723 | 0.005 | 2420 | 41 | 2494 | 22 | 2454 | 22 |
| 15 | 86 | 1373 | 0.06 | 0.1518 | 0.0038 | 9.4593 | 0.2253 | 0.4519 | 0.0048 | 2366 | 42 | 2404 | 21 | 2384 | 22 |
| 16 | 64 | 1196 | 0.05 | 0.1608 | 0.0036 | 10.1972 | 0.2123 | 0.46 | 0.0043 | 2464 | 37 | 2440 | 19 | 2453 | 19 |
| 17 | 93 | 471 | 0.2 | 0.1624 | 0.0037 | 10.9488 | 0.2335 | 0.4889 | 0.0047 | 2481 | 38 | 2566 | 20 | 2519 | 20 |
| 18 | 53 | 1254 | 0.04 | 0.1616 | 0.0036 | 10.4586 | 0.2189 | 0.4696 | 0.0044 | 2472 | 37 | 2482 | 19 | 2476 | 19 |
| 19 | 495 | 662 | 0.75 | 0.1889 | 0.0043 | 13.5986 | 0.2886 | 0.5221 | 0.005 | 2733 | 37 | 2708 | 21 | 2722 | 20 |
| 20 | 29 | 894 | 0.03 | 0.1628 | 0.0038 | 10.3244 | 0.2258 | 0.4602 | 0.0044 | 2485 | 39 | 2440 | 19 | 2464 | 20 |
| 21 | 38 | 965 | 0.04 | 0.1617 | 0.0038 | 10.0701 | 0.2221 | 0.4518 | 0.0043 | 2474 | 39 | 2403 | 19 | 2441 | 20 |
| 22 | 125 | 1495 | 0.08 | 0.1582 | 0.0037 | 9.5185 | 0.2123 | 0.4367 | 0.0042 | 2436 | 40 | 2336 | 19 | 2389 | 20 |
| 23 | 126 | 1697 | 0.07 | 0.1437 | 0.0034 | 6.4596 | 0.1453 | 0.3261 | 0.0031 | 2272 | 41 | 1820 | 15 | 2040 | 20 |
| 24 | 153 | 2335 | 0.07 | 0.1506 | 0.0036 | 7.4989 | 0.1695 | 0.3613 | 0.0035 | 2353 | 40 | 1988 | 16 | 2173 | 20 |
| 25 | 170 | 1781 | 0.1 | 0.1476 | 0.0036 | 7.4684 | 0.1718 | 0.367 | 0.0036 | 2319 | 41 | 2015 | 17 | 2169 | 21 |
| 26 | 1298 | 1939 | 0.67 | 0.1505 | 0.0037 | 6.6236 | 0.1536 | 0.3194 | 0.0031 | 2351 | 41 | 1787 | 15 | 2063 | 20 |
| 27 | 249 | 415 | 0.6 | 0.185 | 0.0047 | 12.7288 | 0.3071 | 0.4992 | 0.0051 | 2698 | 41 | 2610 | 22 | 2660 | 23 |
| 22-MC-01-D |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 168 | 241 | 0.70 | 0.1427 | 0.00377 | 8.30701 | 0.2104 | 0.42218 | 0.00473 | 2260 | 45 | 2270 | 21 | 2265 | 23 |
| 2 | 178 | 323 | 0.55 | 0.14459 | 0.00375 | 8.19707 | 0.20417 | 0.41114 | 0.00453 | 2283 | 44 | 2220 | 21 | 2253 | 23 |
| 3 | 781 | 703 | 1.11 | 0.14297 | 0.00365 | 8.35461 | 0.2046 | 0.42381 | 0.00459 | 2264 | 43 | 2278 | 21 | 2270 | 22 |
| 4 | 296 | 1286 | 0.23 | 0.13913 | 0.00351 | 7.86459 | 0.19029 | 0.40995 | 0.00438 | 2216 | 43 | 2215 | 20 | 2216 | 22 |
| 5 | 90 | 158 | 0.57 | 0.14383 | 0.00394 | 8.39013 | 0.22087 | 0.42307 | 0.00489 | 2274 | 46 | 2274 | 22 | 2274 | 24 |
| 6 | 434 | 407 | 1.07 | 0.14392 | 0.00374 | 8.50958 | 0.21213 | 0.42883 | 0.0047 | 2275 | 44 | 2300 | 21 | 2287 | 23 |
| 7 | 110 | 194 | 0.57 | 0.14394 | 0.00393 | 8.55907 | 0.22488 | 0.43126 | 0.00496 | 2275 | 46 | 2311 | 22 | 2292 | 24 |
| 8 | 388 | 383 | 1.01 | 0.14453 | 0.00379 | 8.70039 | 0.21944 | 0.43659 | 0.00482 | 2282 | 45 | 2335 | 22 | 2307 | 23 |
| 9 | 72 | 142 | 0.51 | 0.14325 | 0.0041 | 8.43374 | 0.23219 | 0.42698 | 0.00512 | 2267 | 49 | 2292 | 23 | 2279 | 25 |
| 10 | 318 | 426 | 0.75 | 0.14402 | 0.00379 | 8.5062 | 0.21544 | 0.42836 | 0.00473 | 2276 | 45 | 2298 | 21 | 2287 | 23 |
| 11 | 133 | 277 | 0.48 | 0.14363 | 0.00392 | 8.59265 | 0.22557 | 0.4339 | 0.00492 | 2271 | 46 | 2323 | 22 | 2296 | 24 |
| 12 | 84 | 128 | 0.66 | 0.14226 | 0.00421 | 8.81964 | 0.25185 | 0.44964 | 0.00553 | 2255 | 50 | 2394 | 25 | 2320 | 26 |
| 13 | 263 | 324 | 0.81 | 0.14441 | 0.00397 | 8.91891 | 0.23626 | 0.44792 | 0.00512 | 2281 | 47 | 2386 | 23 | 2330 | 24 |
| 14 | 179 | 243 | 0.74 | 0.14412 | 0.00404 | 9.02394 | 0.24384 | 0.45413 | 0.00528 | 2277 | 48 | 2414 | 23 | 2340 | 25 |
| 15 | 289 | 524 | 0.55 | 0.14372 | 0.00387 | 8.85882 | 0.22972 | 0.44704 | 0.00498 | 2273 | 46 | 2382 | 22 | 2324 | 24 |
| 16 | 174 | 254 | 0.68 | 0.14453 | 0.00405 | 9.27427 | 0.25062 | 0.4654 | 0.0054 | 2282 | 47 | 2463 | 24 | 2366 | 25 |
| 17 | 160 | 257 | 0.62 | 0.14494 | 0.00409 | 8.97823 | 0.2444 | 0.44926 | 0.00524 | 2287 | 48 | 2392 | 23 | 2336 | 25 |
| 18 | 105 | 171 | 0.61 | 0.14321 | 0.0042 | 9.23553 | 0.26158 | 0.46772 | 0.00567 | 2266 | 50 | 2474 | 25 | 2362 | 26 |
| 19 | 439 | 508 | 0.86 | 0.14474 | 0.00398 | 8.82402 | 0.23421 | 0.44216 | 0.00501 | 2285 | 47 | 2360 | 22 | 2320 | 24 |
| 20 | 327 | 519 | 0.63 | 0.1448 | 0.00399 | 8.7726 | 0.23312 | 0.4394 | 0.00497 | 2285 | 47 | 2348 | 22 | 2315 | 24 |

表**2**熊耳山地区太华杂岩中锆石Hf同位素分析结果

**Table 2** Results of zircon Hf isotope analysis of Taihua complex in Xiong’ershan area

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 测点 | 结晶年龄 | 176Yb/ | 176Lu/ | 176Hf/ | ±2σ | 176Hf/ | *ε*Hf（0） | *ε*Hf(*t*) | *t*DM（Ma） | TDMC(Ma) | fLu/Hf |
| 177Hf | 177Hf | 177Hf | 177Hfi |
| 22-MC-01-D |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 2271 | 0.026662 | 0.000813 | 0.281229 | 0.000015 | 0.281194 | -54.6 | -5.0 | 2805 | 3163 | -0.98 |
| 2 | 2271 | 0.046136 | 0.001372 | 0.281255 | 0.000017 | 0.281196 | -53.6 | -4.9 | 2811 | 3159 | -0.96 |
| 3 | 2271 | 0.034062 | 0.001004 | 0.281247 | 0.000014 | 0.281203 | -53.9 | -4.7 | 2795 | 3142 | -0.97 |
| 4 | 2271 | 0.056750 | 0.001658 | 0.281286 | 0.000016 | 0.281214 | -52.5 | -4.3 | 2789 | 3117 | -0.95 |
| 5 | 2271 | 0.034784 | 0.001036 | 0.281242 | 0.000016 | 0.281197 | -54.1 | -4.9 | 2804 | 3156 | -0.97 |
| 6 | 2271 | 0.035166 | 0.001022 | 0.281247 | 0.000017 | 0.281202 | -53.9 | -4.7 | 2797 | 3144 | -0.97 |
| 7 | 2271 | 0.033506 | 0.000987 | 0.281246 | 0.000017 | 0.281203 | -54.0 | -4.7 | 2795 | 3142 | -0.97 |
| 8 | 2271 | 0.036029 | 0.001055 | 0.281260 | 0.000016 | 0.281215 | -53.5 | -4.2 | 2780 | 3116 | -0.97 |
| 9 | 2271 | 0.026480 | 0.000795 | 0.281206 | 0.000015 | 0.281171 | -55.4 | -5.8 | 2835 | 3214 | -0.98 |
| 10 | 2271 | 0.064141 | 0.001783 | 0.281278 | 0.000018 | 0.281200 | -52.8 | -4.8 | 2810 | 3148 | -0.95 |
| 11 | 2271 | 0.046819 | 0.001380 | 0.281296 | 0.000021 | 0.281236 | -52.2 | -3.5 | 2755 | 3068 | -0.96 |
| 12 | 2271 | 0.051004 | 0.001454 | 0.281259 | 0.000019 | 0.281196 | -53.5 | -4.9 | 2811 | 3158 | -0.96 |
| XNG13-1 |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 2515 | 0.020890 | 0.000715 | 0.281312 | 0.000019 | 0.281278 | -51.6 | +3.6 | 2686 | 2803 | -0.98 |
| 2 | 2515 | 0.010869 | 0.000417 | 0.281190 | 0.000017 | 0.281170 | -55.9 | -0.2 | 2829 | 3048 | -0.99 |
| 3 | 2515 | 0.009941 | 0.000396 | 0.281335 | 0.000016 | 0.281316 | -50.8 | +5.0 | 2633 | 2715 | -0.99 |
| 4 | 2515 | 0.009249 | 0.000326 | 0.281269 | 0.000014 | 0.281253 | -53.2 | +2.7 | 2717 | 2860 | -0.99 |
| 5 | 2515 | 0.060436 | 0.002019 | 0.281309 | 0.000020 | 0.281212 | -51.7 | +1.3 | 2784 | 2953 | -0.94 |
| 6 | 2515 | 0.013060 | 0.000503 | 0.281174 | 0.000017 | 0.281150 | -56.5 | -0.9 | 2857 | 3094 | -0.98 |
| 7 | 2515 | 0.019467 | 0.000720 | 0.281125 | 0.000017 | 0.281090 | -58.3 | -3.1 | 2939 | 3229 | -0.98 |
| 8 | 2515 | 0.022403 | 0.000798 | 0.281307 | 0.000014 | 0.281268 | -51.8 | +3.3 | 2699 | 2824 | -0.98 |
| 9 | 2515 | 0.025615 | 0.000941 | 0.281193 | 0.000015 | 0.281148 | -55.8 | -1.0 | 2863 | 3098 | -0.97 |
| 10 | 2515 | 0.013069 | 0.000485 | 0.281297 | 0.000015 | 0.281274 | -52.1 | +3.5 | 2690 | 2811 | -0.99 |
| 22-LN-03 |  |  |  |  |  |  |  |  |  |  |  |
| 1 | 2437 | 0.072619 | 0.002100 | 0.281273 | 0.000027 | 0.281175 | -53.0 | -1.8 | 2840 | 3090 | -0.94 |
| 2 | 2437 | 0.016063 | 0.000523 | 0.281196 | 0.000024 | 0.281172 | -55.7 | -2.0 | 2829 | 3099 | -0.98 |
| 3 | 2437 | 0.013395 | 0.000410 | 0.281207 | 0.000019 | 0.281188 | -55.3 | -1.4 | 2806 | 3062 | -0.99 |
| 4 | 2437 | 0.013031 | 0.000442 | 0.281158 | 0.000015 | 0.281137 | -57.1 | -3.2 | 2874 | 3176 | -0.99 |
| 5 | 2607 | 0.010784 | 0.000343 | 0.281090 | 0.000015 | 0.281073 | -59.5 | -1.5 | 2957 | 3203 | -0.99 |
| 6 | 2650 | 0.025848 | 0.000811 | 0.281137 | 0.000018 | 0.281096 | -57.8 | +0.3 | 2929 | 3121 | -0.98 |
| 7 | 2437 | 0.009493 | 0.000343 | 0.281164 | 0.000012 | 0.281148 | -56.9 | -2.8 | 2858 | 3152 | -0.99 |
| 8 | 2437 | 0.009442 | 0.000344 | 0.281190 | 0.000013 | 0.281174 | -55.9 | -1.9 | 2824 | 3093 | -0.99 |
| 9 | 2437 | 0.031730 | 0.000905 | 0.281188 | 0.000015 | 0.281146 | -56.0 | -2.9 | 2867 | 3157 | -0.97 |
| 10 | 2437 | 0.012963 | 0.000415 | 0.281209 | 0.000013 | 0.281190 | -55.3 | -1.3 | 2803 | 3058 | -0.99 |
| 11 | 2437 | 0.029358 | 0.000922 | 0.281222 | 0.000013 | 0.281179 | -54.8 | -1.7 | 2823 | 3082 | -0.97 |
| 12 | 2686 | 0.019328 | 0.000630 | 0.281189 | 0.000014 | 0.281157 | -56.0 | +3.3 | 2846 | 2957 | -0.98 |
| 13 | 2437 | 0.020076 | 0.000605 | 0.281218 | 0.000018 | 0.281190 | -55.0 | -1.3 | 2805 | 3057 | -0.98 |
| 14 | 2641 | 0.012912 | 0.000404 | 0.281099 | 0.000014 | 0.281079 | -59.2 | -0.5 | 2949 | 3166 | -0.99 |
| 15 | 2437 | 0.011667 | 0.000386 | 0.281168 | 0.000015 | 0.281150 | -56.7 | -2.7 | 2856 | 3147 | -0.99 |
| 16 | 2663 | 0.018015 | 0.000580 | 0.281141 | 0.000014 | 0.281111 | -57.7 | +1.1 | 2907 | 3076 | -0.98 |
| 17 | 2650 | 0.019801 | 0.000587 | 0.280925 | 0.000013 | 0.280895 | -65.3 | -6.9 | 3196 | 3574 | -0.98 |
| 18 | 2437 | 0.023782 | 0.000907 | 0.281292 | 0.000019 | 0.281250 | -52.3 | +0.8 | 2727 | 2922 | -0.97 |
| 19 | 2437 | 0.008372 | 0.000279 | 0.281220 | 0.000016 | 0.281207 | -54.9 | -0.7 | 2779 | 3019 | -0.99 |

表**3**熊耳山地区太华杂岩中锆石氧同位素分析结果

**Table 3** Results of zircon O isotope analysis of Taihua complex in Xiong’ershan area

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 测点 | δ18OVSMOW（‰） | *±s* | *ε*Hf(t) | 实测U-Pb年龄 |
| abs（‰） |
| TTG岩石 |  |  |  |  |
| XNG13-1 |  |  |  |  |
| 1 | 6.37 | 0.1 |  |  |
| 3 | 5.8 | 0.08 |  |  |
| 4 | 5.65 | 0.07 |  |  |
| 5 | 6.09 | 0.07 |  |  |
| 6 | 5.92 | 0.09 |  |  |
| 7 | 5.55 | 0.06 |  |  |
| 8 | 5.3 | 0.08 |  |  |
| 9 | 6.14 | 0.09 |  |  |
| 10 | 6.58 | 0.1 |  |  |
| 11 | 4.9 | 0.09 |  |  |
| 12 | 5.93 | 0.1 |  |  |
| 13 | 8.14 | 0.07 |  |  |
| 14 | 6.26 | 0.06 |  |  |
| 15 | 5.91 | 0.09 |  |  |
| 16 | 6.72 | 0.09 |  |  |
| 17 | 6.1 | 0.09 |  |  |
| 18 | 5.91 | 0.07 |  |  |
| 19 | 5.91 | 0.07 |  |  |
| 20 | 5.48 | 0.07 |  |  |
| TTG岩石 |  |  |  |  |
| 22-LN-03 |  |  |  |  |
| 1 | 4.26 | 0.13 | -1.8 | 2426 |
| 2 | 5.07 | 0.14 | -2 | 2464 |
| 3 | 5.48 | 0.09 | -1.4 | 2481 |
| 4 | 5.27 | 0.14 | -3.2 | 2472 |
| 5 | 4.89 | 0.16 | -1.5 | 2607 |
| 6 | 4.09 | 0.13 | 0.3 | 2733 |
| 7 | 5.12 | 0.12 | -2.8 | 2485 |
| 8 | 4.85 | 0.18 | -1.9 | 2474 |
| 9 | 4.91 | 0.11 | -2.9 | 2436 |
| 10 | 5.21 | 0.11 | -1.3 | 2433 |
| 11 | 5.32 | 0.15 | -1.7 | 2412 |
| 12 | 5.64 | 0.16 |  | 2319 |
| 13 | 5.21 | 0.14 | 3.3 | 2686 |
| 14 | 4.74 | 0.12 | -1.3 | 2446 |
| 15 | 5.41 | 0.13 | -0.5 | 2641 |
| 16 | 5.42 | 0.15 | -2.7 | 2409 |
| 17 | 5.39 | 0.09 | 1.1 | 2663 |
| 18 | 5.49 | 0.13 | -6.9 | 2650 |
| 19 | 5.84 | 0.17 | 0.8 | 2273 |
| 20 | 5.93 | 0.09 | -0.7 | 2420 |
| 钾质花岗岩 |  |  |  |  |
| 22-MC-01-D |  |  |  |  |
| 1 | 3.02 | 0.16 | -5 | 2260 |
| 2 | 2.8 | 0.12 | -4.9 | 2283 |
| 3 | 3.04 | 0.13 | -4.7 | 2264 |
| 4 | 2.34 | 0.15 | -4.3 | 2216 |
| 5 | 3.42 | 0.38 | -4.9 | 2274 |
| 6 | 3.08 | 0.13 | -4.7 | 2275 |
| 7 | 3.6 | 0.14 | -4.7 | 2275 |
| 8 | 2.96 | 0.14 | -4.2 | 2282 |
| 9 | 2.71 | 0.19 | -5.8 | 2267 |
| 10 | 3.31 | 0.18 |  | 2276 |
| 11 | 3.82 | 0.16 | -4.8 | 2271 |
| 标样 |  |  |  |  |
| 60810S1@1 | 9.34 | 0.1 |  |  |
| 60810S1@4 | 9.06 | 0.08 |  |  |
| 60810S1@5 | 9.03 | 0.09 |  |  |
| 60810S1@6 | 8.18 | 0.05 |  |  |
| 60810S1@7 | 8.3 | 0.09 |  |  |
| 60810S1@9 | 9.21 | 0.06 |  |  |
| 60810S1@10 | 8.98 | 0.09 |  |  |
| 60810S1@12 | 8.85 | 0.06 |  |  |
| 60810S1@14 | 9.46 | 0.08 |  |  |
| 60810S1@17 | 8.68 | 0.07 |  |  |
| 60810S1@18 | 8.72 | 0.06 |  |  |
| 60810S1@19 | 8.92 | 0.08 |  |  |
| Qinghu@01 | 5.47 | 0.09 |  |  |
| Qinghu@02 | 5.29 | 0.1 |  |  |
| Qinghu@03 | 5.53 | 0.1 |  |  |
| Qinghu@04 | 5.39 | 0.08 |  |  |
| Qinghu@05 | 5.45 | 0.07 |  |  |
| [Qinghu@06](mailto:Qinghu@01) | 5.54 | 0.06 |  |  |
| Qinghu@07 | 5.22 | 0.08 |  |  |
| Qinghu@08 | 5.51 | 0.08 |  |  |
| Qinghu@09 | 5.46 | 0.09 |  |  |
| Qinghu@10 | 5.42 | 0.08 |  |  |
| Qinghu@11 | 5.23 | 0.17 |  |  |

表**4** 熊耳山地区锆石微量元素（×10-6）数据

**Table 4**Trace elements data of zircon in Xiong’ershan area（×10-6）data

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 样品号 | XNG-7-2 |  |  |  |  | XNG-12 |  |  |  |  | XNG-13 |  |  |
| 点位 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 |
| Si | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 |
| Ti | 20.76 | 2.76 | 7.59 | 8.26 | 4.95 | 1.47 | 1.89 | 2.33 | 2.00 | 4.99 | 5.87 | 1.63 | 4.06 |
| Y | 22.04 | 0.15 | 0.27 | 0.06 | 0.27 | 5.22 | 0.19 | 1.48 | 1.59 | 0.11 | 1.28 | 2.09 | 0.31 |
| Zr | 2538 | 429 | 317 | 373 | 743 | 726 | 743 | 941 | 728 | 733 | 673 | 264 | 771 |
| Nb | 6.57 | 0.90 | 0.85 | 0.92 | 1.56 | 2.22 | 2.18 | 3.17 | 2.11 | 0.49 | 1.75 | 0.44 | 3.81 |
| La | 53.50 | 0.36 | 2.43 | 0.08 | 0.61 | 0.01 | 0.01 | 0.37 | 0.08 | 0.09 | 2.79 | 5.10 | 1.72 |
| Ce | 388.60 | 10.28 | 29.07 | 11.47 | 25.81 | 7.80 | 9.02 | 13.76 | 8.41 | 7.43 | 59.20 | 23.40 | 34.27 |
| Pr | 77.25 | 0.86 | 3.37 | 0.17 | 1.15 | 0.05 | 0.03 | 0.45 | 0.11 | 0.37 | 3.55 | 2.13 | 1.72 |
| Nd | 501.87 | 5.21 | 23.01 | 1.63 | 10.58 | 0.86 | 0.63 | 3.13 | 1.36 | 3.77 | 20.31 | 9.09 | 9.58 |
| Sm | 278.22 | 4.06 | 13.82 | 2.35 | 9.53 | 1.97 | 1.66 | 4.22 | 2.39 | 3.95 | 14.40 | 2.46 | 6.55 |
| Eu | 58.22 | 0.82 | 2.70 | 0.43 | 1.52 | 0.77 | 0.42 | 1.72 | 0.82 | 1.21 | 5.87 | 0.50 | 2.54 |
| Gd | 272.54 | 11.44 | 19.74 | 9.95 | 24.94 | 12.63 | 11.49 | 19.37 | 13.21 | 14.22 | 31.81 | 5.89 | 20.08 |
| Tb | 43.90 | 3.44 | 3.42 | 3.18 | 6.85 | 4.83 | 4.61 | 7.13 | 4.98 | 4.71 | 9.15 | 1.63 | 6.46 |
| Dy | 275.80 | 36.57 | 26.97 | 34.44 | 69.25 | 58.85 | 56.90 | 83.55 | 59.19 | 56.67 | 80.87 | 18.36 | 67.57 |
| Ho | 90.82 | 14.62 | 10.10 | 13.26 | 27.08 | 24.83 | 24.86 | 35.00 | 24.47 | 25.92 | 25.37 | 7.95 | 26.07 |
| Er | 415.51 | 64.00 | 48.17 | 55.39 | 114.65 | 115.05 | 115.75 | 156.70 | 112.59 | 127.26 | 96.88 | 37.36 | 113.99 |
| Tm | 105.20 | 14.73 | 12.87 | 11.86 | 25.84 | 27.61 | 28.30 | 36.54 | 27.17 | 31.83 | 20.96 | 9.73 | 26.49 |
| Yb | 1041.49 | 139.22 | 126.61 | 104.93 | 232.77 | 268.76 | 282.29 | 349.72 | 263.94 | 314.86 | 185.83 | 106.22 | 250.58 |
| Lu | 231.82 | 29.38 | 33.11 | 21.41 | 48.87 | 61.39 | 64.79 | 76.81 | 59.50 | 74.11 | 37.69 | 25.69 | 54.78 |
| Hf | 8383 | 8891 | 9000 | 7572 | 8944 | 9663 | 8894 | 9191 | 8449 | 6713 | 7527 | 9060 | 8751 |
| Th | 265 | 65 | 113 | 69 | 178 | 115 | 125 | 163 | 124 | 194 | 456 | 69 | 238 |
| U | 2578 | 582 | 593 | 115 | 336 | 1731 | 1796 | 1587 | 1616 | 383 | 586 | 262 | 659 |
| δCe | 1.67 | 14.70 | 4.96 | 50.70 | 14.34 | 125.23 | 221.92 | 49.82 | 78.86 | 25.39 | 11.06 | 28.56 | 28.52 |
| 温度（℃） | 810 | 639 | 717 | 724 | 683 | 596 | 613 | 627 | 617 | 683 | 696 | 603 | 667 |
| lg（*f*O2） | -23.16 | -23.97 | -23.56 | -14.44 | -21.47 | -18.73 | -15.46 | -20.14 | -19.10 | -19.29 | -21.68 | -23.82 | -19.77 |
| Nb/Yb | 0.006 | 0.006 | 0.007 | 0.009 | 0.007 | 0.008 | 0.008 | 0.009 | 0.008 | 0.002 | 0.009 | 0.004 | 0.015 |
| U/Yb | 2.48 | 4.18 | 4.68 | 1.10 | 1.44 | 6.44 | 6.36 | 4.54 | 6.12 | 1.22 | 3.16 | 2.47 | 2.63 |

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| 样品号 |  |  | XNG-9-2 |  |  |  |  | HG-37 |  |  |  |  | HG-43 |
| 点位 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 |
| 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 | 153320 |
| Ti | 3.70 | 1.87 | 4.32 | 4.09 | 4.30 | 4.62 | 5.21 | 3.49 | 3.91 | 2.45 | 3.85 | 2.36 | 7.74 |
| Y | 20.97 | 0.07 | 0.14 | 0.07 | 0.39 | 0.11 | 0.30 | 0.66 | 0.98 | 0.11 | 0.07 | 0.06 | 0.50 |
| Zr | 480 | 232 | 110 | 578 | 621 | 589 | 993 | 563 | 839 | 730 | 439 | 594 | 2218 |
| Nb | 1.44 | 0.73 | 0.24 | 0.42 | 0.43 | 0.45 | 8.20 | 1.56 | 5.09 | 2.29 | 1.48 | 2.81 | 5.56 |
| La | 1.22 | 0.02 | 0.04 | 0.01 | 0.03 | 0.02 | 0.23 | 3.84 | 3.18 | 0.12 | 0.12 | 0.01 | 0.04 |
| Ce | 31.16 | 14.40 | 3.25 | 6.56 | 6.72 | 6.60 | 14.77 | 20.66 | 24.31 | 19.56 | 14.14 | 20.46 | 21.55 |
| Pr | 1.24 | 0.04 | 0.02 | 0.15 | 0.25 | 0.23 | 0.19 | 1.31 | 1.30 | 0.14 | 0.07 | 0.05 | 0.29 |
| Nd | 8.58 | 0.10 | 0.30 | 2.54 | 3.33 | 3.30 | 1.88 | 6.98 | 7.20 | 1.84 | 0.83 | 0.93 | 5.26 |
| Sm | 4.53 | 0.97 | 0.33 | 3.67 | 4.54 | 4.25 | 3.48 | 3.55 | 4.52 | 2.80 | 1.24 | 1.74 | 9.51 |
| Eu | 1.44 | 0.47 | 0.14 | 0.99 | 1.10 | 1.10 | 0.04 | 0.24 | 0.14 | 0.50 | 0.20 | 0.47 | 0.56 |
| Gd | 14.48 | 5.02 | 17.57 | 15.94 | 17.30 | 16.98 | 20.05 | 12.17 | 18.95 | 12.85 | 6.92 | 8.80 | 51.60 |
| Tb | 4.06 | 1.61 | 0.68 | 4.78 | 5.22 | 5.08 | 7.90 | 3.99 | 6.39 | 4.61 | 2.65 | 3.30 | 18.74 |
| Dy | 40.59 | 18.20 | 8.36 | 52.16 | 55.51 | 52.95 | 95.69 | 45.72 | 73.53 | 54.77 | 32.78 | 41.77 | 219.33 |
| Ho | 15.77 | 7.26 | 3.63 | 20.90 | 22.42 | 21.01 | 40.25 | 19.19 | 30.09 | 24.87 | 14.39 | 19.03 | 89.41 |
| Er | 71.18 | 34.06 | 17.51 | 89.84 | 98.38 | 91.77 | 179.73 | 88.31 | 132.55 | 123.88 | 69.28 | 96.00 | 378.77 |
| Tm | 17.01 | 8.58 | 4.21 | 20.13 | 22.53 | 20.85 | 39.95 | 20.93 | 29.27 | 32.86 | 17.47 | 25.27 | 79.44 |
| Yb | 168.19 | 87.55 | 43.24 | 187.26 | 213.30 | 199.41 | 345.19 | 196.19 | 256.50 | 343.25 | 171.99 | 266.00 | 662.09 |
| Lu | 37.81 | 20.49 | 10.47 | 42.00 | 50.15 | 45.44 | 67.46 | 43.36 | 52.02 | 81.34 | 39.14 | 64.92 | 129.61 |
| Hf | 9043 | 9355 | 7829 | 6917 | 7070 | 7112 | 9642 | 7635 | 8969 | 9329 | 8408 | 8887 | 8473 |
| Th | 127 | 111 | 23 | 121 | 132 | 118 | 226 | 103 | 178 | 254 | 222 | 210 | 451 |
| U | 313 | 305 | 81 | 235 | 316 | 264 | 607 | 215 | 414 | 678 | 389 | 507 | 839 |
| δCe | 29.12 | 1327.80 | 92.75 | 20.95 | 16.39 | 15.85 | 89.08 | 31.79 | 33.00 | 161.66 | 265.43 | 375.92 | 36.81 |
| 温度（℃） | 661 | 612 | 672 | 668 | 672 | 677 | 687 | 656 | 665 | 631 | 663 | 628 | 719 |
| lg（*f*O2） | -20.10 | -8.79 | -15.06 | -20.89 | -21.59 | -21.40 | -14.38 | -20.03 | -19.39 | -15.50 | -11.62 | -12.49 | -15.94 |
| Nb/Yb | 0.009 | 0.008 | 0.006 | 0.002 | 0.002 | 0.002 | 0.024 | 0.008 | 0.020 | 0.007 | 0.009 | 0.011 | 0.008 |
| U/Yb | 1.86 | 3.48 | 1.88 | 1.25 | 1.48 | 1.32 | 1.76 | 1.10 | 1.61 | 1.97 | 2.26 | 1.91 | 1.27 |

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| 样品号 |  |  |  | 22-LN-03 |  |  |  |  |  |  |  |  |  |
| 点位 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Si | 153320 | 153320 | 153320 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 |
| Ti | 3.25 | 3.47 | 6.66 | 8.09 | 7.87 | 2.25 | 5.23 | 11.65 | 2.42 | 4.91 | 4.17 | 4.50 | 4.30 |
| Y | 0.46 | 0.07 | 0.85 | 1446.64 | 367.15 | 562.31 | 422.23 | 761.32 | 648.16 | 600.88 | 822.21 | 668.22 | 356.72 |
| Zr | 757 | 947 | 1988 | 216363 | 276301 | 228955 | 266356 | 242848 | 245495 | 243314 | 259269 | 265056 | 251951 |
| Nb | 7.29 | 5.48 | 9.89 | 11.17 | 0.51 | 9.09 | 5.07 | 2.84 | 3.90 | 2.06 | 2.75 | 1.00 | 4.13 |
| La | 0.02 | 0.01 | 0.33 | 0.52 | 0.68 | 0.53 | 0.83 | 7.19 | 0.43 | 1.75 | 3.40 | 0.05 | 0.01 |
| Ce | 9.46 | 12.02 | 21.00 | 26.64 | 40.91 | 7.11 | 5.03 | 18.35 | 8.49 | 24.24 | 55.11 | 44.12 | 4.51 |
| Pr | 0.10 | 0.04 | 0.32 | 0.77 | 0.51 | 0.34 | 0.56 | 5.13 | 0.31 | 1.58 | 1.50 | 0.29 | 0.02 |
| Nd | 1.68 | 0.88 | 3.60 | 7.05 | 4.08 | 1.45 | 4.93 | 28.63 | 2.14 | 8.62 | 8.75 | 4.68 | 0.13 |
| Sm | 3.02 | 2.28 | 6.74 | 12.45 | 4.93 | 1.01 | 3.29 | 15.15 | 1.25 | 5.34 | 7.16 | 6.41 | 0.50 |
| Eu | 0.31 | 0.08 | 0.24 | 3.82 | 0.82 | 0.22 | 0.81 | 3.59 | 0.21 | 1.80 | 1.91 | 1.51 | 0.19 |
| Gd | 16.63 | 16.11 | 40.01 | 36.07 | 13.99 | 5.45 | 8.79 | 32.02 | 7.32 | 18.69 | 22.82 | 31.23 | 4.05 |
| Tb | 5.99 | 6.36 | 15.68 | 10.65 | 2.97 | 2.62 | 2.29 | 7.67 | 2.43 | 5.12 | 6.58 | 6.29 | 1.56 |
| Dy | 69.45 | 79.34 | 190.41 | 123.44 | 32.25 | 37.62 | 30.19 | 71.86 | 41.50 | 51.18 | 71.60 | 62.98 | 22.93 |
| Ho | 28.38 | 34.62 | 80.59 | 41.34 | 11.28 | 15.45 | 10.71 | 22.28 | 17.34 | 17.26 | 24.09 | 20.72 | 9.45 |
| Er | 126.43 | 156.63 | 353.00 | 200.22 | 48.36 | 83.91 | 60.14 | 101.50 | 103.49 | 84.79 | 122.33 | 91.60 | 55.34 |
| Tm | 28.76 | 35.17 | 76.55 | 42.77 | 9.76 | 22.18 | 15.31 | 19.05 | 26.21 | 16.04 | 25.75 | 17.79 | 15.05 |
| Yb | 258.91 | 308.78 | 649.98 | 407.45 | 104.21 | 254.33 | 180.63 | 175.88 | 285.86 | 154.03 | 252.90 | 158.01 | 172.51 |
| Lu | 55.07 | 62.83 | 126.22 | 75.50 | 20.53 | 50.76 | 39.47 | 35.79 | 58.28 | 29.59 | 49.82 | 34.17 | 36.24 |
| Hf | 8026 | 9965 | 8887 | 6993 | 10564 | 11844 | 14051 | 12408 | 11613 | 9017 | 10062 | 9987 | 11787 |
| Ta |  |  |  | 4.19 | 0.28 | 23.53 | 7.96 | 1.189 | 5.22 | 1.073 | 0.643 | 0.262 | 7.67 |
| Pb |  |  |  | 3659.93 | 538.97 | 3355.91 | 2890.93 | 2926.51 | 3657.68 | 1433.58 | 1270.21 | 668.31 | 2640.28 |
| Th | 83 | 157 | 485 | 481 | 166 | 99 | 51 | 185 | 101 | 151 | 326 | 237 | 67 |
| U | 361 | 513 | 1136 | 1322 | 193 | 1850 | 1202 | 1362 | 1602 | 574 | 439 | 242 | 1102 |
| δCe | 59.26 | 176.47 | 64.18 | 8.45 | 16.23 | 4.02 | 1.74 | 0.71 | 5.45 | 3.30 | 5.98 | 43.90 | 64.21 |
| 温度（℃） | 651 | 656 | 706 | 686 | 669 | 643 | 679 | 885 | 633 | 757 | 778 | 604 | 458 |
| lg（*f*O2） | -18.01 | -13.62 | -14.52 | -21.07 | -15.72 | -27.18 | -34.03 | -41.39 | -24.67 | -28.78 | -23.91 | -7.55 | -4.43 |
| 年龄 |  |  |  | 2426 | 2607 | 2295 | 2433 | 2360 | 2412 | 2446 | 2686 | 2641 | 2409 |
| Ui |  |  |  | 2034 | 311 | 2847 | 1850 | 2095 | 2465 | 883 | 708 | 390 | 1696 |
| ΔFMQ |  |  |  | -0.45 | 1.95 | -1.92 | -2.88 | -1.44 | -1.55 | 0.54 | 2.31 | 2.37 | -2.83 |
| Nb/Yb | 0.028 | 0.018 | 0.015 | 0.027 | 0.005 | 0.036 | 0.028 | 0.016 | 0.014 | 0.013 | 0.011 | 0.006 | 0.024 |
| U/Yb | 1.39 | 1.66 | 1.75 | 3.24 | 1.85 | 7.27 | 6.66 | 7.74 | 5.6 | 3.73 | 1.74 | 1.53 | 6.39 |

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| 样品号 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 点位 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| Si | 149581 | 149581 | 149581 | 149581 | 149581 | 154255 | 154255 | 154255 | 154255 | 154255 | 154255 | 154255 | 154255 |
| Ti | 4.87 | 3.00 | 5.70 | 4.64 | 2.50 | 4.79 | 5.21 | 2.04 | 4.64 | 2.73 | 3.83 | 6.98 | 3.24 |
| Y | 490.95 | 691.11 | 295.56 | 240.75 | 378.58 | 599.20 | 362.61 | 424.36 | 1233.56 | 180.03 | 181.67 | 687.07 | 511.44 |
| Zr | 255392 | 251019 | 231316 | 234403 | 226107 | 265143 | 280400 | 256600 | 270318 | 254507 | 264716 | 240673 | 225202 |
| Nb | 1.08 | 3.13 | 5.32 | 1.07 | 3.11 | 3.37 | 1.17 | 6.31 | 5.29 | 1.64 | 1.88 | 4.45 | 3.12 |
| La | 0.01 | 0.57 | 0.95 | 0.20 | 0.04 | 0.20 | 0.39 | 0.08 | 0.73 | 0.01 | 0.17 | 1.11 | 0.73 |
| Ce | 17.09 | 24.31 | 32.07 | 2.74 | 4.11 | 6.05 | 16.37 | 3.06 | 69.47 | 2.03 | 3.40 | 7.80 | 10.51 |
| Pr | 0.06 | 0.51 | 0.50 | 0.15 | 0.03 | 0.06 | 0.28 | 0.04 | 0.61 | 0.02 | 0.17 | 0.69 | 0.42 |
| Nd | 0.79 | 3.47 | 3.73 | 0.89 | 0.50 | 0.36 | 2.66 | 0.25 | 5.74 | 0.09 | 1.28 | 4.69 | 2.08 |
| Sm | 2.23 | 2.00 | 2.99 | 0.40 | 0.57 | 0.53 | 3.94 | 0.31 | 5.48 | 0.07 | 1.00 | 2.54 | 1.32 |
| Eu | 0.82 | 0.37 | 0.43 | 0.66 | 0.15 | 0.18 | 1.51 | 0.23 | 1.44 | 0.08 | 0.17 | 1.14 | 0.18 |
| Gd | 11.27 | 14.33 | 7.65 | 5.48 | 4.06 | 3.65 | 10.89 | 3.02 | 26.96 | 1.98 | 2.98 | 14.73 | 5.91 |
| Tb | 3.37 | 4.83 | 2.17 | 1.52 | 1.91 | 2.08 | 2.93 | 1.53 | 8.50 | 0.80 | 0.97 | 4.48 | 2.55 |
| Dy | 39.86 | 60.36 | 21.43 | 17.14 | 20.32 | 33.68 | 32.72 | 27.72 | 94.02 | 10.78 | 10.61 | 53.42 | 30.31 |
| Ho | 14.78 | 21.79 | 8.04 | 5.95 | 9.65 | 16.36 | 9.94 | 10.36 | 36.35 | 4.86 | 4.74 | 20.28 | 13.80 |
| Er | 73.50 | 105.18 | 45.22 | 36.40 | 59.68 | 96.50 | 51.09 | 63.33 | 187.80 | 25.03 | 25.49 | 88.54 | 75.79 |
| Tm | 14.53 | 20.46 | 11.52 | 8.57 | 15.57 | 25.56 | 9.04 | 16.70 | 40.93 | 6.60 | 7.04 | 17.74 | 19.89 |
| Yb | 144.58 | 186.12 | 130.38 | 109.86 | 173.56 | 284.63 | 86.92 | 193.15 | 406.02 | 82.51 | 87.12 | 184.89 | 212.19 |
| Lu | 29.56 | 35.83 | 31.21 | 25.69 | 44.09 | 61.64 | 18.46 | 43.55 | 87.72 | 19.99 | 21.20 | 38.94 | 46.32 |
| Hf | 10554 | 9992 | 8957 | 9610 | 10492 | 12873 | 10494 | 13141 | 9721 | 11651 | 11853 | 10794 | 9467 |
| Ta | 0.55 | 1.195 | 0.935 | 1.14 | 3.63 | 6.08 | 0.453 | 12.22 | 1.85 | 2.54 | 2.77 | 3.11 | 4.44 |
| Pb | 650.23 | 757.86 | 610.02 | 3055.64 | 3172.47 | 2824.44 | 1211.07 | 3022.32 | 1956.93 | 2121.04 | 2244.79 | 3362.14 | 2823.59 |
| Th | 124 | 147 | 128 | 28 | 86 | 64 | 93 | 53 | 495 | 29 | 38 | 125 | 126 |
| U | 211 | 247 | 233 | 1243 | 1373 | 1196 | 471 | 1254 | 662 | 894 | 965 | 1495 | 1697 |
| δCe | 89.91 | 10.20 | 11.35 | 3.81 | 26.51 | 13.63 | 11.59 | 13.00 | 23.94 | 29.08 | 4.40 | 2.12 | 4.60 |
| 温度（℃） | 506 | 664 | 677 | 582 | 496 | 553 | 627 | 518 | 679 | 458 | 587 | 698 | 661 |
| lg（*f*O2） | -1.66 | -19.53 | -18.65 | -27.61 | -11.69 | -17.15 | -18.48 | -17.54 | -12.52 | -10.93 | -26.43 | -32.41 | -26.07 |
| 年龄 | 2663 | 2650 | 2273 | 2420 | 2366 | 2464 | 2481 | 2472 | 2733 | 2485 | 2474 | 2436 | 2272 |
| Ui | 341 | 398 | 358 | 1913 | 2114 | 1840 | 725 | 1929 | 1083 | 1376 | 1485 | 2301 | 2611 |
| ΔFMQ | 0.77 | 1.67 | 1.69 | -3.86 | -2.71 | -2.48 | -0.02 | -2.96 | 2.25 | -3.64 | -3.1 | -2.56 | -1.49 |
| Nb/Yb | 0.007 | 0.017 | 0.041 | 0.010 | 0.018 | 0.012 | 0.013 | 0.033 | 0.013 | 0.020 | 0.022 | 0.024 | 0.015 |
| U/Yb | 1.46 | 1.33 | 1.78 | 11.32 | 7.91 | 4.2 | 5.42 | 6.49 | 1.63 | 10.84 | 11.08 | 8.09 | 8 |

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| 样品号 |  |  |  |  | 22-MC-01-D |  |  |  |  |  |  |  |  |
| 点位 | 24 | 25 | 26 | 27 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Si | 154255 | 154255 | 154255 | 154255 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 |
| Ti | 13.91 | 7.39 | 44.09 | 204.51 | 7.29 | 4.79 | 4.22 | 4.26 | 6.89 | 2.82 | 6.14 | 2.12 | 38.17 |
| Y | 840.65 | 806.52 | 1709.87 | 737.11 | 679.81 | 1011.36 | 1426.85 | 1240.77 | 567.16 | 1577.17 | 625.02 | 948.21 | 681.43 |
| Zr | 232587 | 245690 | 237116 | 243929 | 261021 | 266071 | 258803 | 252997 | 266521 | 264459 | 268351 | 256266 | 247745 |
| Nb | 12.93 | 4.72 | 3.17 | 2.43 | 1.05 | 2.50 | 3.56 | 21.42 | 1.33 | 2.35 | 0.98 | 1.84 | 2.82 |
| La | 17.18 | 3.75 | 139.59 | 1.00 | 0.09 | 0.00 | 0.01 | 2.65 | 0.01 | 0.03 | 0.02 | 0.12 | 0.21 |
| Ce | 45.82 | 15.78 | 274.46 | 41.76 | 13.94 | 16.49 | 28.98 | 12.44 | 9.68 | 19.02 | 8.01 | 29.30 | 7.82 |
| Pr | 13.00 | 3.54 | 107.05 | 0.45 | 0.09 | 0.10 | 0.22 | 1.09 | 0.08 | 0.38 | 0.07 | 0.20 | 0.15 |
| Nd | 62.71 | 16.86 | 474.16 | 3.19 | 2.18 | 2.07 | 3.25 | 6.99 | 1.68 | 5.57 | 1.33 | 2.51 | 2.02 |
| Sm | 28.95 | 10.95 | 192.58 | 3.59 | 3.28 | 3.87 | 5.13 | 4.02 | 2.11 | 8.70 | 3.50 | 4.63 | 3.09 |
| Eu | 5.57 | 1.64 | 50.70 | 1.39 | 0.49 | 0.59 | 1.07 | 0.25 | 0.27 | 1.71 | 0.54 | 0.85 | 0.58 |
| Gd | 41.29 | 16.89 | 198.15 | 18.65 | 16.32 | 21.28 | 36.35 | 16.39 | 11.32 | 44.73 | 14.31 | 24.98 | 13.18 |
| Tb | 8.12 | 4.98 | 38.89 | 4.86 | 5.13 | 6.30 | 10.51 | 7.00 | 4.28 | 12.89 | 4.10 | 7.37 | 4.21 |
| Dy | 69.99 | 61.95 | 253.44 | 56.60 | 58.13 | 82.49 | 128.86 | 94.31 | 49.29 | 152.85 | 51.24 | 84.47 | 56.38 |
| Ho | 22.19 | 21.40 | 54.50 | 21.69 | 21.49 | 33.07 | 48.20 | 38.48 | 17.66 | 52.97 | 19.77 | 31.50 | 22.60 |
| Er | 116.54 | 128.23 | 202.49 | 108.75 | 107.38 | 164.83 | 223.80 | 211.52 | 93.47 | 250.87 | 99.07 | 146.25 | 111.29 |
| Tm | 27.12 | 26.70 | 39.20 | 21.60 | 22.03 | 35.14 | 44.77 | 44.89 | 18.39 | 46.63 | 19.73 | 30.98 | 22.83 |
| Yb | 308.40 | 309.02 | 391.25 | 221.98 | 206.45 | 313.95 | 406.47 | 434.34 | 168.95 | 413.10 | 191.95 | 273.12 | 226.45 |
| Lu | 65.23 | 59.19 | 80.27 | 45.87 | 40.46 | 63.08 | 77.61 | 83.90 | 35.55 | 83.39 | 40.82 | 56.04 | 46.18 |
| Hf | 14008 | 10154 | 7604 | 8937 | 8020 | 8861 | 7844 | 14842 | 8310 | 7759 | 7858 | 8359 | 7104 |
| Ta | 37.33 | 4.09 | 2.76 | 0.831 | 0.657 | 0.817 | 1.068 | 8.06 | 0.357 | 0.678 | 0.394 | 0.836 | 0.367 |
| Pb | 4315.47 | 3350.83 | 3236.44 | 1163.07 | 549.77 | 708.73 | 1665.69 | 2699.8 | 360.57 | 973.54 | 447.86 | 928.49 | 325.16 |
| Th | 153 | 170 | 1298 | 249 | 168 | 178 | 781 | 296 | 90 | 434 | 110 | 388 | 72 |
| U | 2335 | 1781 | 1939 | 415 | 241 | 323 | 703 | 1286 | 158 | 407 | 194 | 383 | 142 |
| δCe | 0.72 | 0.97 | 0.52 | 15.14 | 33.63 | 49.17 | 39.83 | 1.80 | 37.89 | 15.07 | 34.71 | 36.20 | 10.64 |
| 温度（℃） | 1000 | 835 | 1378 | 675 | 714 | 680 | 670 | 671 | 709 | 641 | 700 | 621 | 874 |
| lg（*f*O2） | -41.34 | -38.83 | -43.92 | -16.29 | -9.74 | -6.62 | -8.35 | -33.77 | -8.76 | -16.32 | -9.48 | -9.13 | -19.18 |
| 年龄 | 2353 | 2319 | 2351 | 2698 | 2260 | 2283 | 2264 | 2216 | 2274 | 2275 | 2275 | 2282 | 2267 |
| Ui | 3593 | 2741 | 2984 | 673 | 359 | 481 | 1047 | 1915 | 236 | 607 | 289 | 570 | 211 |
| ΔFMQ | -0.47 | -1.54 | 1.8 | -1.51 | 0.02 | 0.42 | 0.84 | -1.16 | -0.2 | 0.93 | -0.6 | 1.98 | -1.96 |
| Nb/Yb | 0.042 | 0.015 | 0.008 | 0.011 | 0.005 | 0.008 | 0.009 | 0.049 | 0.008 | 0.006 | 0.005 | 0.007 | 0.012 |
| U/Yb | 7.57 | 5.76 | 4.96 | 1.87 | 1.17 | 1.03 | 1.73 | 2.96 | 0.94 | 0.99 | 1.01 | 1.4 | 0.63 |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 样品号 |  |  |  |  |  |  |  |  |  |  |  |
| 点位 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Si | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 | 149581 |
| Ti | 1.48 | 2.14 | 8.69 | 4.83 | 2.32 | 1.86 | 5.13 | 1.89 | 3.78 | 1.80 | 2.81 |
| Y | 1638.24 | 1019.84 | 479.56 | 1881.25 | 1418.00 | 1318.51 | 759.45 | 817.34 | 505.33 | 1116.73 | 1406.49 |
| Zr | 247274 | 249573 | 252416 | 246797 | 245751 | 246551 | 241039 | 243139 | 244998 | 256699 | 223839 |
| Nb | 3.15 | 3.03 | 0.47 | 2.11 | 1.02 | 3.93 | 2.33 | 2.05 | 1.05 | 3.00 | 4.37 |
| La | 0.83 | 0.01 | 0.02 | 0.04 | 0.04 | 0.00 | 0.01 | 0.02 | 0.01 | 0.03 | 12.87 |
| Ce | 22.13 | 13.66 | 6.18 | 14.77 | 9.46 | 23.19 | 12.46 | 14.19 | 8.67 | 22.57 | 60.31 |
| Pr | 0.87 | 0.15 | 0.09 | 0.47 | 0.38 | 0.11 | 0.10 | 0.11 | 0.02 | 0.12 | 4.57 |
| Nd | 7.75 | 2.31 | 2.28 | 7.19 | 6.85 | 1.70 | 1.70 | 1.75 | 0.88 | 1.97 | 23.78 |
| Sm | 9.56 | 2.53 | 1.32 | 11.21 | 7.71 | 3.42 | 3.06 | 3.85 | 1.87 | 5.92 | 13.01 |
| Eu | 1.33 | 0.61 | 0.83 | 2.20 | 1.76 | 0.45 | 0.69 | 0.54 | 0.28 | 0.98 | 0.66 |
| Gd | 41.60 | 20.59 | 12.40 | 56.54 | 40.26 | 26.61 | 16.76 | 20.19 | 10.28 | 23.71 | 37.68 |
| Tb | 12.70 | 6.45 | 3.17 | 15.11 | 11.72 | 9.55 | 4.69 | 5.67 | 3.62 | 7.85 | 10.29 |
| Dy | 143.52 | 82.37 | 40.12 | 183.65 | 140.03 | 115.67 | 66.26 | 72.20 | 42.19 | 101.29 | 126.13 |
| Ho | 55.11 | 32.75 | 15.28 | 63.31 | 47.64 | 41.96 | 24.23 | 26.82 | 16.73 | 36.81 | 46.39 |
| Er | 267.65 | 170.49 | 77.20 | 303.39 | 216.88 | 214.19 | 127.05 | 131.55 | 78.84 | 176.55 | 226.20 |
| Tm | 50.64 | 34.74 | 15.85 | 56.87 | 42.85 | 43.88 | 24.34 | 26.02 | 16.49 | 35.45 | 47.69 |
| Yb | 465.92 | 326.22 | 149.03 | 508.55 | 379.67 | 417.56 | 242.41 | 248.09 | 163.46 | 325.79 | 418.37 |
| Lu | 88.62 | 67.39 | 31.04 | 92.78 | 71.22 | 79.19 | 44.42 | 45.44 | 29.78 | 60.76 | 83.21 |
| Hf | 8183 | 7512 | 6309 | 7881 | 7290 | 9113 | 7362 | 7952 | 7787 | 8336 | 7086 |
| Ta | 0.874 | 0.81 | 0.197 | 0.695 | 0.206 | 1.425 | 0.755 | 0.842 | 0.458 | 0.933 | 1.234 |
| Pb | 994.37 | 641.36 | 313.8 | 795.26 | 603.84 | 1276.43 | 654.2 | 619.72 | 435.48 | 1232.45 | 1232.41 |
| Th | 318 | 133 | 84 | 263 | 179 | 289 | 174 | 160 | 105 | 439 | 327 |
| U | 426 | 277 | 128 | 324 | 243 | 524 | 254 | 257 | 171 | 508 | 519 |
| δCe | 5.70 | 27.77 | 20.97 | 9.46 | 7.45 | 67.92 | 38.25 | 37.33 | 100.11 | 53.64 | 1.92 |
| 温度（℃） | 597 | 621 | 729 | 681 | 627 | 612 | 686 | 613 | 662 | 610 | 640 |
| lg（*f*O2） | -24.30 | -11.31 | -13.61 | -20.15 | -22.11 | -3.97 | -8.68 | -8.88 | -0.78 | -5.90 | -33.22 |
| 年龄 | 2276 | 2271 | 2255 | 2281 | 2277 | 2273 | 2282 | 2287 | 2266 | 2285 | 2285 |
| Ui | 634 | 413 | 190 | 483 | 362 | 781 | 378 | 382 | 255 | 757 | 773 |
| ΔFMQ | 1.72 | 0.93 | -0.99 | 0.22 | 0.34 | 1.42 | 0.09 | 1.17 | 0.07 | 1.43 | 2.73 |
| Nb/Yb | 0.007 | 0.009 | 0.003 | 0.004 | 0.003 | 0.009 | 0.010 | 0.008 | 0.006 | 0.009 | 0.010 |
| U/Yb | 0.91 | 0.85 | 0.86 | 0.64 | 0.64 | 1.25 | 1.05 | 1.03 | 1.05 | 1.56 | 1.24 |

注释：年龄指实测U-Pb年龄，ΔFMQ是相对于FMQ缓冲区的岩浆*f*O2，Ui是放射性衰变校正的初始U