表1 绿梁山复式花岗岩体的锆石U-Pb定年结果

Table 1 U-Pb dating data of zircons from the Lüliangshan composite pluton

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Spot No. | Element（×10-6） | | Th/U | Isotopic ratios | | | | Age(Ma) | | | |
| U | Th | 207Pb/  235U | 1σ | 206Pb/  238U | 1σ | 207Pb/235U | 1σ | 206Pb/238U | 1σ |
| 斑状花岗闪长岩（15QH42） | | | | | | | | | | | | |
|  | 3 | 293 | 411 | 1.40 | 0.5271 | 0.0172 | 0.0690 | 0.0011 | 430 | 11 | 436 | 7 |
|  | 4 | 1054 | 530 | 0.50 | 0.4883 | 0.0107 | 0.0614 | 0.0009 | 404 | 7 | 431 | 6 |
|  | 7 | 829 | 384 | 0.46 | 0.4935 | 0.0112 | 0.0629 | 0.0010 | 407 | 8 | 430 | 6 |
|  | 12 | 903 | 393 | 0.44 | 0.5096 | 0.0123 | 0.0652 | 0.0010 | 418 | 8 | 430 | 6 |
|  | 14 | 590 | 582 | 0.99 | 0.5065 | 0.0107 | 0.0648 | 0.0010 | 416 | 7 | 430 | 6 |
|  | 16 | 815 | 381 | 0.47 | 0.4885 | 0.0120 | 0.0614 | 0.0009 | 404 | 8 | 430 | 6 |
|  | 22 | 310 | 63.2 | 0.20 | 0.5304 | 0.0189 | 0.0690 | 0.0012 | 432 | 13 | 430 | 7 |
|  | 20 | 898 | 302 | 0.34 | 0.4890 | 0.0094 | 0.0617 | 0.0009 | 404 | 6 | 430 | 6 |
|  | 23 | 491 | 340 | 0.69 | 0.4829 | 0.0112 | 0.0602 | 0.0009 | 400 | 8 | 422 | 6 |
|  | 25 | 1032 | 437 | 0.42 | 0.4856 | 0.0085 | 0.0609 | 0.0009 | 402 | 6 | 410 | 5 |
|  | 26 | 983 | 431 | 0.44 | 0.4996 | 0.0085 | 0.0633 | 0.0009 | 411 | 6 | 407 | 6 |
|  | 29 | 452 | 215 | 0.48 | 0.5241 | 0.0134 | 0.0700 | 0.0011 | 428 | 9 | 405 | 7 |
|  | 30 | 385 | 292 | 0.76 | 0.5262 | 0.0105 | 0.0690 | 0.0010 | 429 | 7 | 396 | 6 |
|  | 31 | 2071 | 1081 | 0.52 | 0.4644 | 0.0080 | 0.0570 | 0.0008 | 387 | 6 | 393 | 5 |
|  | 33 | 605 | 257 | 0.42 | 0.5272 | 0.0096 | 0.0690 | 0.0010 | 430 | 6 | 388 | 6 |
|  | 34 | 1427 | 1091 | 0.76 | 0.4668 | 0.0084 | 0.0577 | 0.0009 | 389 | 6 | 386 | 5 |
|  | 35 | 1180 | 486 | 0.41 | 0.4905 | 0.0091 | 0.0621 | 0.0009 | 405 | 6 | 384 | 6 |
|  | 37 | 324 | 352 | 1.09 | 0.5312 | 0.0113 | 0.0690 | 0.0010 | 433 | 7 | 384 | 6 |
|  | 38 | 652 | 474 | 0.73 | 0.5227 | 0.0094 | 0.0676 | 0.0010 | 427 | 6 | 381 | 6 |
|  | 39 | 356 | 210 | 0.59 | 0.5280 | 0.0117 | 0.0690 | 0.0011 | 431 | 8 | 377 | 6 |
|  | 41 | 382 | 246 | 0.64 | 0.4760 | 0.0140 | 0.0591 | 0.0010 | 395 | 10 | 370 | 6 |
|  | 42 | 780 | 284 | 0.36 | 0.4717 | 0.0093 | 0.0587 | 0.0009 | 392 | 6 | 368 | 5 |
|  | 43 | 527 | 321 | 0.61 | 0.4608 | 0.0114 | 0.0566 | 0.0009 | 385 | 8 | 362 | 5 |
|  | 45 | 333 | 351 | 1.05 | 0.5275 | 0.0165 | 0.0691 | 0.0011 | 430 | 11 | 357 | 7 |
|  | 46 | 333 | 358 | 1.08 | 0.5112 | 0.0129 | 0.0657 | 0.0010 | 419 | 9 | 355 | 6 |
| 英云闪长岩（15QH44） | | | | | | | | | | | | |
| Core | 1 | 209 | 20.4 | 0.10 | 1.3768 | 0.0274 | 0.1449 | 0.0022 | 879 | 12 | 872 | 12 |
|  | 3 | 520 | 156 | 0.30 | 1.3302 | 0.0253 | 0.1383 | 0.0021 | 859 | 11 | 835 | 12 |
|  | 5 | 393 | 582 | 1.48 | 1.4092 | 0.0253 | 0.1468 | 0.0022 | 893 | 11 | 883 | 12 |
|  | 13 | 151 | 39.1 | 0.26 | 1.4124 | 0.0278 | 0.1474 | 0.0022 | 894 | 12 | 886 | 12 |
|  | 16 | 460 | 62.5 | 0.14 | 1.2550 | 0.0215 | 0.1328 | 0.0020 | 826 | 10 | 804 | 11 |
|  | 17 | 234 | 128 | 0.55 | 1.2136 | 0.0349 | 0.1290 | 0.0021 | 807 | 16 | 782 | 12 |
|  | 21 | 445 | 170 | 0.38 | 1.4143 | 0.0227 | 0.1488 | 0.0022 | 895 | 10 | 894 | 12 |
|  | 24 | 886 | 10.1 | 0.01 | 0.5356 | 0.0089 | 0.0689 | 0.0010 | 436 | 6 | 429 | 6 |
|  | 30 | 450 | 40.8 | 0.09 | 0.9050 | 0.0183 | 0.1029 | 0.0015 | 654 | 10 | 631 | 9 |
|  | 38 | 243 | 34.2 | 0.14 | 1.2804 | 0.0227 | 0.1357 | 0.0020 | 837 | 10 | 820 | 11 |
|  | 43 | 195 | 36.9 | 0.19 | 1.3917 | 0.0263 | 0.1486 | 0.0022 | 885 | 11 | 893 | 12 |
|  | 45 | 316 | 79.4 | 0.25 | 1.0366 | 0.0222 | 0.1138 | 0.0017 | 722 | 11 | 695 | 10 |
|  | 49 | 545 | 76 | 0.14 | 1.0135 | 0.0251 | 0.1103 | 0.0017 | 711 | 13 | 675 | 10 |
|  | 51 | 618 | 27 | 0.04 | 1.3014 | 0.0241 | 0.1376 | 0.0021 | 846 | 11 | 831 | 12 |
| Rim | 2 | 661 | 5.6 | 0.01 | 0.4879 | 0.0084 | 0.0644 | 0.0009 | 404 | 6 | 403 | 6 |
|  | 32 | 853 | 22.5 | 0.03 | 0.4847 | 0.0089 | 0.0645 | 0.0010 | 401 | 6 | 403 | 6 |
|  | 35 | 2151 | 64.2 | 0.03 | 0.4882 | 0.0082 | 0.0640 | 0.0009 | 404 | 6 | 400 | 6 |
|  | 37 | 1043 | 16.6 | 0.02 | 0.4947 | 0.0086 | 0.0633 | 0.0009 | 408 | 6 | 396 | 6 |
|  | 39 | 769 | 13.8 | 0.02 | 0.4888 | 0.0083 | 0.0642 | 0.0009 | 404 | 6 | 401 | 6 |
|  | 44 | 940 | 9.7 | 0.01 | 0.4891 | 0.0084 | 0.0640 | 0.0009 | 404 | 6 | 400 | 6 |
|  | 46 | 729 | 58.9 | 0.08 | 0.4861 | 0.0088 | 0.0643 | 0.0010 | 402 | 6 | 402 | 6 |
|  | 47 | 679 | 15.4 | 0.02 | 0.4828 | 0.0093 | 0.0638 | 0.0010 | 400 | 6 | 399 | 6 |
|  | 50 | 564 | 27.1 | 0.05 | 0.4828 | 0.0098 | 0.0643 | 0.0010 | 400 | 7 | 402 | 6 |
|  | 52 | 830 | 220 | 0.27 | 0.4831 | 0.0093 | 0.0641 | 0.0010 | 400 | 6 | 401 | 6 |
| 正长花岗岩（15QH40） | | | | | | | | | | | | |
| Rim | 15 | 1073 | 341 | 0.32 | 0.4782 | 0.0136 | 0.0628 | 0.0010 | 397 | 9 | 393 | 6 |
|  | 16 | 1153 | 597 | 0.52 | 0.4933 | 0.0082 | 0.0633 | 0.0009 | 407 | 6 | 395 | 6 |
|  | 17 | 906 | 331 | 0.37 | 0.5316 | 0.0090 | 0.0630 | 0.0009 | 433 | 6 | 394 | 6 |
|  | 22 | 1119 | 787 | 0.70 | 0.5216 | 0.0090 | 0.0632 | 0.0009 | 426 | 6 | 395 | 6 |
|  | 23 | 607 | 228 | 0.38 | 0.5027 | 0.0098 | 0.0630 | 0.0009 | 414 | 7 | 394 | 6 |
|  | 24 | 1200 | 149 | 0.12 | 0.4723 | 0.0127 | 0.0627 | 0.0009 | 393 | 9 | 392 | 6 |
|  | 25 | 972 | 415 | 0.43 | 0.4726 | 0.0159 | 0.0625 | 0.0010 | 393 | 11 | 391 | 6 |
|  | 26 | 3319 | 794 | 0.24 | 0.4960 | 0.0078 | 0.0633 | 0.0009 | 409 | 5 | 395 | 6 |
|  | 28 | 517 | 340 | 0.66 | 0.4948 | 0.0115 | 0.0638 | 0.0010 | 408 | 8 | 398 | 6 |
|  | 29 | 1841 | 341 | 0.19 | 0.5564 | 0.0088 | 0.0625 | 0.0009 | 449 | 6 | 391 | 6 |
|  | 32 | 345 | 192 | 0.56 | 0.5058 | 0.0123 | 0.0631 | 0.0010 | 416 | 8 | 394 | 6 |
|  | 33 | 1005 | 304 | 0.30 | 0.5539 | 0.0099 | 0.0627 | 0.0009 | 448 | 6 | 392 | 6 |
| Core | 27 | 266 | 128 | 0.48 | 0.5487 | 0.0153 | 0.0710 | 0.0011 | 444 | 10 | 442 | 7 |
|  | 1 | 220 | 38.3 | 0.17 | 1.6019 | 0.0290 | 0.1624 | 0.0025 | 971 | 11 | 970 | 14 |
|  | 2 | 260 | 22.9 | 0.09 | 1.2409 | 0.0255 | 0.1330 | 0.0020 | 819 | 12 | 805 | 11 |
|  | 4 | 290 | 31.8 | 0.11 | 1.4691 | 0.0253 | 0.1526 | 0.0023 | 918 | 10 | 915 | 13 |
|  | 5 | 246 | 29.8 | 0.12 | 1.1242 | 0.0246 | 0.1222 | 0.0018 | 765 | 12 | 743 | 10 |
|  | 6 | 821 | 35 | 0.04 | 1.2126 | 0.0194 | 0.1285 | 0.0019 | 806 | 9 | 780 | 11 |
|  | 7 | 206 | 28.2 | 0.14 | 1.4743 | 0.0311 | 0.1539 | 0.0024 | 920 | 13 | 923 | 13 |
|  | 8 | 1300 | 91.8 | 0.07 | 0.9730 | 0.0161 | 0.1050 | 0.0016 | 690 | 8 | 643 | 9 |
|  | 9 | 123 | 156 | 1.26 | 1.1847 | 0.0292 | 0.1232 | 0.0019 | 793 | 14 | 749 | 11 |
|  | 11 | 671 | 123 | 0.18 | 1.2478 | 0.0270 | 0.1357 | 0.0020 | 822 | 12 | 820 | 11 |
|  | 12 | 335 | 31.4 | 0.09 | 1.5268 | 0.0272 | 0.1571 | 0.0024 | 941 | 11 | 941 | 13 |
|  | 13 | 1402 | 119 | 0.08 | 0.9429 | 0.0149 | 0.1022 | 0.0015 | 674 | 8 | 627 | 9 |
|  | 14 | 440 | 68.9 | 0.16 | 1.2576 | 0.0244 | 0.1301 | 0.0020 | 827 | 11 | 788 | 11 |
|  | 18 | 81.9 | 58 | 0.71 | 3.1298 | 0.0656 | 0.2480 | 0.0039 | 1440 | 16 | 1428 | 20 |
|  | 19 | 517 | 29.8 | 0.06 | 1.4843 | 0.0263 | 0.1543 | 0.0023 | 924 | 11 | 925 | 13 |
|  | 21 | 333 | 33.1 | 0.10 | 1.3550 | 0.0238 | 0.1401 | 0.0021 | 870 | 10 | 845 | 12 |
|  | 30 | 3281 | 632 | 0.19 | 0.4365 | 0.0108 | 0.0586 | 0.0009 | 368 | 8 | 367 | 5 |
|  | 31 | 410 | 66.8 | 0.16 | 1.6526 | 0.0299 | 0.1659 | 0.0025 | 991 | 11 | 990 | 14 |
|  | 34 | 127 | 62.4 | 0.49 | 1.4591 | 0.0364 | 0.1502 | 0.0024 | 914 | 15 | 902 | 13 |
|  | 35 | 502 | 35.5 | 0.07 | 1.4274 | 0.0229 | 0.1471 | 0.0022 | 900 | 10 | 884 | 12 |
|  | 36 | 757 | 38.6 | 0.05 | 1.3582 | 0.0217 | 0.1425 | 0.0020 | 871 | 9 | 859 | 11 |
|  | 37 | 241 | 43 | 0.18 | 1.5122 | 0.0338 | 0.1574 | 0.0023 | 935 | 14 | 943 | 13 |
|  | 39 | 392 | 29.5 | 0.08 | 1.1991 | 0.0241 | 0.1299 | 0.0019 | 800 | 11 | 787 | 11 |
|  | 40 | 209 | 29.2 | 0.14 | 1.4886 | 0.0273 | 0.1545 | 0.0023 | 926 | 11 | 926 | 13 |
|  | 41 | 1717 | 82.3 | 0.05 | 0.4815 | 0.0085 | 0.0588 | 0.0008 | 399 | 6 | 368 | 5 |
|  | 42 | 271 | 34.7 | 0.13 | 1.4962 | 0.0301 | 0.1537 | 0.0023 | 929 | 12 | 922 | 13 |
| 二长花岗岩（15QH41） | | | | | | | | | | | | |
| Core | 1 | 178 | 89.8 | 0.5 | 0.3863 | 0.0120 | 0.0488 | 0.0008 | 332 | 9 | 307 | 5 |
|  | 2 | 306 | 140 | 0.46 | 0.4639 | 0.0126 | 0.0615 | 0.0010 | 387 | 9 | 384 | 6 |
|  | 3 | 270 | 156 | 0.58 | 0.3886 | 0.0139 | 0.0487 | 0.0008 | 333 | 10 | 306 | 5 |
|  | 4 | 795 | 466 | 0.59 | 0.4233 | 0.0100 | 0.0545 | 0.0008 | 358 | 7 | 342 | 5 |
|  | 6 | 396 | 180 | 0.45 | 0.4185 | 0.0106 | 0.0542 | 0.0008 | 355 | 8 | 340 | 5 |
|  | 7 | 318 | 171 | 0.54 | 0.4561 | 0.0122 | 0.0601 | 0.0009 | 382 | 8 | 376 | 6 |
|  | 11 | 106 | 34.1 | 0.32 | 0.4196 | 0.0175 | 0.0537 | 0.0009 | 356 | 13 | 337 | 6 |
|  | 13 | 330 | 213 | 0.65 | 0.4283 | 0.0113 | 0.0555 | 0.0009 | 362 | 8 | 348 | 5 |
|  | 15 | 168 | 61.7 | 0.37 | 0.4409 | 0.0133 | 0.0573 | 0.0009 | 371 | 9 | 359 | 6 |
|  | 17 | 214 | 58.1 | 0.27 | 0.4387 | 0.0117 | 0.0577 | 0.0009 | 369 | 8 | 362 | 5 |
|  | 18 | 352 | 187 | 0.53 | 0.4346 | 0.0119 | 0.0567 | 0.0009 | 366 | 8 | 355 | 5 |
|  | 20 | 246 | 121 | 0.49 | 0.4688 | 0.0128 | 0.0624 | 0.0010 | 390 | 9 | 390 | 6 |
|  | 26 | 215 | 95.9 | 0.45 | 0.4506 | 0.0119 | 0.0593 | 0.0009 | 378 | 8 | 371 | 6 |
|  | 28 | 407 | 227 | 0.56 | 0.4019 | 0.0170 | 0.0511 | 0.0009 | 343 | 12 | 321 | 6 |
|  | 30 | 287 | 134 | 0.46 | 0.4677 | 0.0122 | 0.0626 | 0.0010 | 390 | 8 | 391 | 6 |
|  | 31 | 283 | 133 | 0.47 | 0.4222 | 0.0126 | 0.0549 | 0.0009 | 358 | 9 | 344 | 5 |
|  | 32 | 541 | 379 | 0.70 | 0.4458 | 0.0095 | 0.0581 | 0.0009 | 374 | 7 | 364 | 5 |
|  | 34 | 466 | 221 | 0.47 | 0.4697 | 0.0168 | 0.0626 | 0.0010 | 391 | 12 | 392 | 6 |
|  | 37 | 449 | 332 | 0.74 | 0.4356 | 0.0122 | 0.0566 | 0.0009 | 367 | 9 | 355 | 5 |
|  | 38 | 382 | 261 | 0.68 | 0.4585 | 0.0120 | 0.0605 | 0.0009 | 383 | 8 | 379 | 6 |
|  | 39 | 316 | 152 | 0.48 | 0.4740 | 0.0119 | 0.0628 | 0.0010 | 394 | 8 | 393 | 6 |
| Rim | 10 | 643 | 359 | 0.56 | 1.5794 | 0.0260 | 0.0407 | 0.0006 | 637 | 20 | 219 | 4 |
|  | 21 | 1576 | 254 | 0.16 | 0.6718 | 0.0113 | 0.0517 | 0.0008 | 522 | 7 | 325 | 5 |
|  | 27 | 3757 | 730 | 0.19 | 1.3676 | 0.0206 | 0.0568 | 0.0008 | 875 | 9 | 356 | 5 |
|  | 29 | 2659 | 394 | 0.15 | 0.4338 | 0.0082 | 0.0563 | 0.0008 | 366 | 6 | 353 | 5 |
|  | 36 | 5767 | 501 | 0.09 | 1.1879 | 0.0179 | 0.0492 | 0.0007 | 319 | 21 | 266 | 4 |
|  | 40 | 2008 | 241 | 0.12 | 0.6600 | 0.0132 | 0.0713 | 0.0011 | 515 | 8 | 444 | 6 |
|  | 42 | 585 | 280 | 0.48 | 0.6622 | 0.0127 | 0.0540 | 0.0008 | 408 | 13 | 330 | 5 |
| 二云母花岗岩（14QH29） | | | | | | | | | | | | |
| Core | 1 | 432 | 64 | 0.15 | 1.0935 | 0.0167 | 0.1135 | 0.0015 | 750 | 8 | 693 | 8 |
| 15 | 504 | 241 | 0.48 | 1.4630 | 0.0194 | 0.1473 | 0.0009 | 915 | 8 | 886 | 5 |
| 17 | 367 | 82 | 0.22 | 1.0028 | 0.0098 | 0.1031 | 0.0009 | 705 | 5 | 633 | 5 |
| Rim | 2 | 976 | 145 | 0.15 | 0.4470 | 0.0201 | 0.0581 | 0.0017 | 375 | 14 | 364 | 10 |
| 4 | 1006 | 531 | 0.53 | 0.4504 | 0.0213 | 0.0576 | 0.0018 | 378 | 15 | 361 | 11 |
| 5 | 1148 | 600 | 0.52 | 0.4431 | 0.0095 | 0.0578 | 0.0009 | 372 | 7 | 362 | 5 |
| 6 | 502 | 16 | 0.03 | 0.4995 | 0.0099 | 0.0618 | 0.0009 | 411 | 7 | 387 | 5 |
| 12 | 592 | 415 | 0.70 | 0.4486 | 0.0187 | 0.0575 | 0.0010 | 376 | 13 | 360 | 6 |
| 13 | 867 | 263 | 0.30 | 0.4458 | 0.0167 | 0.0578 | 0.0015 | 374 | 12 | 362 | 9 |
| 14 | 551 | 198 | 0.36 | 0.4400 | 0.0123 | 0.0578 | 0.0009 | 370 | 9 | 362 | 5 |
| 16 | 633 | 222 | 0.35 | 0.4328 | 0.0324 | 0.0580 | 0.0022 | 365 | 23 | 363 | 14 |
| 19 | 889 | 12 | 0.01 | 0.4433 | 0.0080 | 0.0581 | 0.0008 | 373 | 6 | 364 | 5 |
| 20 | 635 | 444 | 0.70 | 0.4317 | 0.0090 | 0.0582 | 0.0009 | 364 | 6 | 365 | 5 |
| 21 | 1065 | 372 | 0.35 | 0.4248 | 0.0125 | 0.0577 | 0.0009 | 359 | 9 | 361 | 5 |

表2绿梁山复式花岗岩体的主量（wt%）和微量元素（×10-6）分析结果

Table 2 Major and trace element analysis results of the Lüliangshan composite pluton

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 斑状花岗闪长岩（15QH-42） | | | | | 英云闪长岩（15QH-44） | | | | | | 正长花岗岩  （15QH-40） | |
| 样号 | 42-1 | 42-2 | 42-3 | 42-4 | 42-5 | 44-1 | 44-2 | 44-3 | 44-4 | 44-5 | 44-6 | 40-1 | 40-2 |
| SiO2 | 69.37 | 69.75 | 70.18 | 69.46 | 69.44 | 69.7 | 69.51 | 69.9 | 69.33 | 69.72 | 69.28 | 73.08 | 74.48 |
| TiO2 | 0.39 | 0.36 | 0.36 | 0.34 | 0.38 | 0.34 | 0.34 | 0.32 | 0.35 | 0.35 | 0.36 | 0.01 | 0.02 |
| Al2O3 | 15.33 | 15.27 | 15.2 | 15.33 | 15.38 | 15.74 | 15.85 | 15.65 | 15.85 | 15.65 | 15.97 | 14.31 | 14.09 |
| Fe2O3T | 2.53 | 2.33 | 2.36 | 2.32 | 2.41 | 2.19 | 2.18 | 2.13 | 2.21 | 2.23 | 2.24 | 0.37 | 0.42 |
| MnO | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.03 | 0.03 | 0.04 | 0.03 | 0.03 | 0.03 | 0.02 | 0.04 |
| MgO | 0.9 | 0.84 | 0.87 | 0.87 | 0.87 | 0.8 | 0.81 | 0.76 | 0.82 | 0.81 | 0.83 | 0.07 | 0.07 |
| CaO | 2.52 | 2.45 | 2.42 | 2.48 | 2.54 | 2.68 | 2.71 | 2.63 | 2.76 | 2.74 | 2.81 | 0.70 | 0.76 |
| Na2O | 3.67 | 3.63 | 3.64 | 3.63 | 3.88 | 4.49 | 4.52 | 4.54 | 4.6 | 4.53 | 4.65 | 5.45 | 4.05 |
| K2O | 3.47 | 3.61 | 3.54 | 3.68 | 3.22 | 2.72 | 2.63 | 2.61 | 2.49 | 2.45 | 2.47 | 5.38 | 4.88 |
| P2O5 | 0.12 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.12 | 0.02 | 0.02 |
| LOI | 1.18 | 1.18 | 1.19 | 1.25 | 1.23 | 0.76 | 0.93 | 0.85 | 0.98 | 0.93 | 1.01 | 0.67 | 0.70 |
| TOTAL | 99.52 | 99.57 | 99.91 | 99.51 | 99.5 | 99.56 | 99.62 | 99.54 | 99.53 | 99.55 | 99.77 | 100.08 | 99.53 |
| Li | 36.4 | 33.8 | 35.0 | 33.3 | 34.3 | 48.3 | 46.5 | 49.0 | 49.2 | 48.8 | 47.8 | 4.35 | 7.18 |
| Be | 3.49 | 3.29 | 3.33 | 3.33 | 3.23 | 1.59 | 1.83 | 1.65 | 1.62 | 1.69 | 1.66 | 5.85 | 5.96 |
| Sc | 5.15 | 4.65 | 4.70 | 4.62 | 4.71 | 4.15 | 3.93 | 4.27 | 4.27 | 4.19 | 4.24 | 3.27 | 3.64 |
| V | 30.7 | 28.8 | 28.5 | 27.8 | 28.3 | 26.9 | 25 | 27.2 | 27.3 | 27.3 | 27.9 | 1.35 | 1.66 |
| Cr | 10.8 | 8.52 | 9.3 | 8.17 | 11.0 | 8.75 | 8.68 | 7.06 | 7.83 | 7.86 | 9.63 | 5.93 | 4.81 |
| Co | 57.6 | 58.4 | 54.9 | 62.4 | 55.7 | 55.6 | 40.8 | 50.9 | 52.6 | 54.9 | 54.8 | 101 | 125 |
| Ni | 5.39 | 4.8 | 5.18 | 4.64 | 5.81 | 4.83 | 6.83 | 3.63 | 4.25 | 4.35 | 5.31 | 5.06 | 5.19 |
| Cu | 1.63 | 1.58 | 1.68 | 1.72 | 1.87 | 1.59 | 1.50 | 1.39 | 1.48 | 1.44 | 1.44 | 1.31 | 0.86 |
| Zn | 60.5 | 54.9 | 48.6 | 69 | 53.9 | 71.4 | 73 | 51.2 | 51.5 | 53.2 | 58 | 10.0 | 17.7 |
| Ga | 21.5 | 20.7 | 20.7 | 20.7 | 20.7 | 19 | 19.1 | 19.4 | 19.1 | 19.5 | 19.4 | 20.4 | 21.2 |
| Ge | 1.25 | 1.19 | 1.21 | 1.19 | 1.21 | 0.95 | 0.96 | 0.95 | 0.96 | 0.95 | 0.95 | 1.96 | 2.09 |
| Rb | 149 | 145 | 150 | 145 | 150 | 83.5 | 83.6 | 83.1 | 80.7 | 78.8 | 80.8 | 178 | 190 |
| Sr | 421 | 434 | 430 | 427 | 431 | 516 | 518 | 525 | 515 | 531 | 529 | 99.5 | 67.3 |
| Y | 12.3 | 10.5 | 10.6 | 11.5 | 11.5 | 8.72 | 8.37 | 9.18 | 9.21 | 9.20 | 9.22 | 21 | 30.8 |
| Zr | 178 | 181 | 167 | 165 | 168 | 155 | 157 | 158 | 163 | 168 | 165 | 29.9 | 35.5 |
| Nb | 10.9 | 9.48 | 9.63 | 9.66 | 9.87 | 5.8 | 6.07 | 5.97 | 5.9 | 6.04 | 5.99 | 11.0 | 14.5 |
| Cs | 4.54 | 3.97 | 3.67 | 3.84 | 3.75 | 2.2 | 2.21 | 2.20 | 2.20 | 1.99 | 2.0 | 5.22 | 5.66 |
| Ba | 739 | 834 | 762 | 791 | 932 | 665 | 716 | 628 | 619 | 612 | 605 | 136 | 93.5 |
| La | 46.1 | 38.8 | 40.3 | 38.5 | 45.6 | 36.0 | 35.2 | 37.3 | 38.6 | 38.1 | 37.7 | 8.11 | 9.50 |
| Ce | 88.1 | 71.9 | 74.0 | 71.7 | 85.3 | 70.3 | 68.3 | 73.0 | 76.0 | 74.4 | 73.8 | 16.8 | 21.5 |
| Pr | 9.12 | 7.46 | 7.75 | 7.49 | 8.89 | 7.67 | 7.41 | 7.91 | 8.21 | 8.11 | 7.98 | 2.13 | 2.73 |
| Nd | 31.0 | 25.3 | 26.3 | 25.5 | 30.0 | 27.0 | 26.2 | 27.8 | 29.0 | 28.6 | 28.3 | 8.15 | 10.7 |
| Sm | 4.86 | 4.0 | 4.14 | 4.13 | 4.75 | 4.37 | 4.25 | 4.52 | 4.69 | 4.65 | 4.55 | 2.59 | 3.67 |
| Eu | 0.95 | 0.93 | 0.93 | 0.91 | 0.98 | 0.98 | 0.97 | 0.99 | 0.99 | 1.0 | 0.98 | 0.13 | 0.14 |
| Gd | 3.8 | 3.17 | 3.27 | 3.3 | 3.71 | 3.33 | 3.18 | 3.45 | 3.52 | 3.50 | 3.45 | 2.72 | 3.95 |
| Tb | 0.46 | 0.39 | 0.39 | 0.41 | 0.44 | 0.38 | 0.36 | 0.40 | 0.40 | 0.40 | 0.40 | 0.54 | 0.78 |
| Dy | 2.33 | 2.0 | 2.03 | 2.15 | 2.25 | 1.89 | 1.79 | 1.95 | 1.97 | 1.99 | 1.94 | 3.42 | 4.98 |
| Ho | 0.41 | 0.36 | 0.36 | 0.38 | 0.4 | 0.32 | 0.3 | 0.33 | 0.34 | 0.34 | 0.34 | 0.68 | 0.99 |
| Er | 1.15 | 1.02 | 1.04 | 1.09 | 1.11 | 0.87 | 0.84 | 0.91 | 0.92 | 0.93 | 0.91 | 2.04 | 3.0 |
| Tm | 0.17 | 0.15 | 0.15 | 0.16 | 0.16 | 0.12 | 0.11 | 0.12 | 0.13 | 0.13 | 0.12 | 0.33 | 0.49 |
| Yb | 1.04 | 0.94 | 0.97 | 1.01 | 1.00 | 0.72 | 0.70 | 0.76 | 0.78 | 0.76 | 0.77 | 2.16 | 3.32 |
| Lu | 0.16 | 0.14 | 0.14 | 0.15 | 0.15 | 0.11 | 0.11 | 0.11 | 0.12 | 0.12 | 0.12 | 0.31 | 0.48 |
| Hf | 4.75 | 4.88 | 4.47 | 4.51 | 4.60 | 4.03 | 4.08 | 4.09 | 4.22 | 4.38 | 4.28 | 1.98 | 2.35 |
| Ta | 1.06 | 0.86 | 0.86 | 1.01 | 0.93 | 0.50 | 0.48 | 0.50 | 0.48 | 0.51 | 0.51 | 2.33 | 2.98 |
| Pb | 29.2 | 30.2 | 29.6 | 30.3 | 30.6 | 20.6 | 19.2 | 20.1 | 20.0 | 19.5 | 19.3 | 30.6 | 30.4 |
| Th | 27.9 | 24.1 | 25.5 | 24.6 | 28.0 | 13.2 | 12.0 | 13.2 | 13.8 | 13.0 | 12.7 | 9.03 | 10.4 |
| U | 2.71 | 2.46 | 2.53 | 2.55 | 2.66 | 3.90 | 2.36 | 3.85 | 3.66 | 2.06 | 2.01 | 5.94 | 6.04 |
|  | 正长花岗岩  （15QH-40） | | | 二长花岗岩（15QH-41） | | | | | | 二云母花岗岩（15QH-29） | | | |
| 样号 | 40-3 | 40-4 | 40-5 | 41-1 | 41-2 | 41-3 | 41-4 | 41-5 | 41-6 | 29-1 | 29-2 | 29-3 | 29-4 |
| SiO2 | 74.43 | 74.85 | 73.84 | 74.96 | 74.43 | 74.74 | 74.98 | 74.69 | 74.69 | 74.34 | 74.27 | 74.84 | 74.19 |
| TiO2 | 0.02 | 0.02 | 0.01 | 0.05 | 0.04 | 0.05 | 0.03 | 0.04 | 0.04 | 0.07 | 0.07 | 0.06 | 0.07 |
| Al2O3 | 14.22 | 14.16 | 14.22 | 14.09 | 14.08 | 14.02 | 13.99 | 14.06 | 14.02 | 14.18 | 14.38 | 14.2 | 14.53 |
| Fe2O3T | 0.37 | 0.54 | 0.56 | 0.54 | 0.42 | 0.41 | 0.43 | 0.45 | 0.43 | 1.15 | 1.11 | 1.02 | 1.13 |
| MnO | 0.06 | 0.06 | 0.05 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | 0.03 | 0.03 | 0.03 |
| MgO | 0.05 | 0.05 | 0.06 | 0.15 | 0.11 | 0.11 | 0.12 | 0.1 | 0.11 | 0.25 | 0.23 | 0.22 | 0.24 |
| CaO | 0.71 | 0.69 | 0.59 | 1.12 | 1.20 | 1.11 | 1.11 | 1.18 | 1.15 | 1.3 | 1.09 | 1.04 | 1.06 |
| Na2O | 4.59 | 3.99 | 3.98 | 4.18 | 4.42 | 4.25 | 4.2 | 4.41 | 4.35 | 4.33 | 4.30 | 4.15 | 4.31 |
| K2O | 4.56 | 5.31 | 5.50 | 3.97 | 3.61 | 4.02 | 3.96 | 3.74 | 3.87 | 3.07 | 3.28 | 3.26 | 3.27 |
| P2O5 | 0.02 | 0.02 | 0.02 | 0.04 | 0.03 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| LOI | 0.53 | 0.70 | 0.67 | 0.84 | 1.21 | 0.79 | 0.88 | 0.78 | 0.81 | 0.93 | 0.82 | 0.86 | 1.00 |
| TOTAL | 99.56 | 100.39 | 99.5 | 99.95 | 99.56 | 99.55 | 99.75 | 99.5 | 99.52 | 99.69 | 99.62 | 99.72 | 99.87 |
| Li | 4.25 | 6.15 | 5.49 | 12.3 | 10.0 | 8.96 | 9.84 | 10.2 | 9.18 | 50.0 | 32.5 | 31.6 | 34.8 |
| Be | 7.84 | 6.78 | 5.78 | 1.52 | 1.56 | 1.55 | 1.44 | 1.61 | 1.56 | 1.33 | 1.52 | 1.56 | 1.51 |
| Sc | 2.84 | 4.01 | 3.51 | 1.39 | 1.20 | 1.19 | 1.20 | 1.21 | 1.25 | 2.60 | 2.44 | 2.02 | 2.40 |
| V | 1.07 | 1.01 | 1.04 | 2.20 | 1.98 | 1.83 | 2.0 | 1.97 | 2.00 | 2.32 | 2.13 | 2.21 | 2.27 |
| Cr | 0.81 | 1.67 | 0.80 | 3.33 | 1.11 | 3.37 | 1.34 | 12.2 | 1.30 | 1.85 | 1.14 | 2.42 | 1.66 |
| Co | 74.9 | 68.8 | 77.4 | 81.5 | 82.5 | 79.9 | 103 | 78 | 85.7 | 55.6 | 53.4 | 61.6 | 60.1 |
| Ni | 1.97 | 2.63 | 2.14 | 3.23 | 2.73 | 3.48 | 3.16 | 8.30 | 2.69 | 2.07 | 1.76 | 2.41 | 2.16 |
| Cu | 0.69 | 3.50 | 0.71 | 0.97 | 0.87 | 0.75 | 0.77 | 1.15 | 0.81 | 0.75 | 0.69 | 0.70 | 0.75 |
| Zn | 31.4 | 35.0 | 37.0 | 16.4 | 14.8 | 9.4 | 15.3 | 15.9 | 15.1 | 28.9 | 26.1 | 26.3 | 30.3 |
| Ga | 22.7 | 22.7 | 22.5 | 14.8 | 14.6 | 14.1 | 14.3 | 14.8 | 14.9 | 16.2 | 15.6 | 15.6 | 16.1 |
| Ge | 2.26 | 2.15 | 2.05 | 1.10 | 1.08 | 1.08 | 1.09 | 1.12 | 1.10 | 1.42 | 1.28 | 1.40 | 1.41 |
| Rb | 164 | 212 | 229 | 122 | 110 | 119 | 117 | 113 | 119 | 115 | 106 | 106 | 107 |
| Sr | 73.5 | 42.2 | 47.4 | 184 | 190 | 176 | 177 | 193 | 183 | 233 | 222 | 222 | 245 |
| Y | 29.2 | 33.8 | 27.7 | 7.92 | 7.46 | 7.62 | 7.97 | 7.56 | 8.28 | 15.2 | 12.9 | 11.1 | 12.5 |
| Zr | 45.1 | 37.9 | 33.8 | 48.7 | 46 | 45.7 | 44.9 | 49.3 | 46.1 | 55.2 | 57.5 | 51.1 | 54.6 |
| Nb | 14.8 | 15.10 | 14.40 | 5.27 | 4.49 | 4.08 | 4.23 | 4.31 | 4.44 | 5.89 | 5.35 | 5.49 | 5.73 |
| Cs | 4.76 | 5.76 | 7.46 | 1.37 | 1.30 | 1.38 | 1.35 | 1.34 | 1.34 | 4.52 | 1.82 | 2.02 | 1.86 |
| Ba | 84.8 | 47.3 | 50.2 | 672 | 599 | 656 | 650 | 638 | 633 | 769 | 655 | 653 | 746 |
| La | 11.8 | 9.76 | 10.4 | 9.28 | 8.97 | 8.99 | 8.61 | 9.22 | 9.77 | 14.8 | 13.6 | 12.1 | 13.2 |
| Ce | 27.3 | 22.2 | 24.0 | 18.6 | 17.9 | 17.8 | 17.0 | 18.2 | 19.5 | 30.9 | 28.6 | 25.0 | 27.5 |
| Pr | 3.50 | 2.88 | 3.10 | 1.93 | 1.84 | 1.87 | 1.77 | 1.88 | 2.05 | 3.50 | 3.26 | 2.83 | 3.13 |
| Nd | 13.6 | 11.3 | 12.3 | 6.74 | 6.36 | 6.5 | 6.18 | 6.53 | 7.09 | 13.0 | 12.2 | 10.6 | 11.7 |
| Sm | 4.57 | 3.93 | 4.04 | 1.35 | 1.27 | 1.31 | 1.23 | 1.28 | 1.43 | 2.88 | 2.64 | 2.28 | 2.51 |
| Eu | 0.13 | 0.11 | 0.10 | 0.32 | 0.33 | 0.32 | 0.32 | 0.34 | 0.33 | 0.44 | 0.41 | 0.40 | 0.44 |
| Gd | 4.12 | 4.29 | 4.02 | 1.30 | 1.23 | 1.26 | 1.23 | 1.23 | 1.38 | 2.71 | 2.42 | 2.07 | 2.31 |
| Tb | 0.76 | 0.85 | 0.74 | 0.21 | 0.20 | 0.20 | 0.21 | 0.21 | 0.22 | 0.44 | 0.39 | 0.33 | 0.38 |
| Dy | 4.83 | 5.46 | 4.59 | 1.30 | 1.24 | 1.28 | 1.29 | 1.25 | 1.37 | 2.56 | 2.23 | 1.87 | 2.12 |
| Ho | 0.96 | 1.08 | 0.90 | 0.26 | 0.24 | 0.25 | 0.26 | 0.24 | 0.27 | 0.49 | 0.42 | 0.36 | 0.41 |
| Er | 2.90 | 3.28 | 2.69 | 0.75 | 0.71 | 0.72 | 0.75 | 0.72 | 0.79 | 1.34 | 1.14 | 0.97 | 1.09 |
| Tm | 0.48 | 0.53 | 0.44 | 0.11 | 0.11 | 0.11 | 0.12 | 0.11 | 0.12 | 0.19 | 0.16 | 0.14 | 0.16 |
| Yb | 3.26 | 3.61 | 2.89 | 0.74 | 0.71 | 0.72 | 0.74 | 0.71 | 0.75 | 1.19 | 0.99 | 0.92 | 0.97 |
| Lu | 0.46 | 0.53 | 0.42 | 0.11 | 0.10 | 0.10 | 0.11 | 0.1 | 0.11 | 0.17 | 0.14 | 0.13 | 0.14 |
| Hf | 3.36 | 2.66 | 2.38 | 1.81 | 1.66 | 1.71 | 1.67 | 1.78 | 1.69 | 1.91 | 2.10 | 1.81 | 1.98 |
| Ta | 3.41 | 3.09 | 2.90 | 0.87 | 0.78 | 0.70 | 0.82 | 0.73 | 0.78 | 0.66 | 0.70 | 0.70 | 0.68 |
| Pb | 29.6 | 31.7 | 33.6 | 23.0 | 22.2 | 23.0 | 21.0 | 22.8 | 22.0 | 22.5 | 20.6 | 22.0 | 22.3 |
| Th | 11.8 | 11.1 | 11.0 | 3.70 | 3.54 | 3.54 | 3.45 | 3.58 | 3.59 | 6.31 | 5.70 | 4.99 | 5.47 |
| U | 7.16 | 5.90 | 5.33 | 0.92 | 0.88 | 0.88 | 0.85 | 0.90 | 0.88 | 2.10 | 1.31 | 1.47 | 1.30 |