**表1 白马山复式岩体锆石LA-ICP-MS U-Pb年龄测定结果**

Table 1 Results of LA-ICP-MS zircon U-Pb dting of the Baimashan complex pluton

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **测点编号** | **含量/10-6** | **Th/U** | **同位素比值和误差** |  | **年龄值和误差/Ma** |
| **Th**  | **U**  |  | **207Pb/206Pb** | **1σ** | **207Pb/235U** | **1σ** | **206Pb/238U** | **1σ** |  | **207Pb/235U** | **1σ** | **206Pb/238U** | **1σ** |
| **BM-30: 糜棱岩化花岗岩** |
| 01 | 32  | 214  | 0.15  | 0.05869  | 0.00073  | 0.52234  | 0.00713  | 0.06447  | 0.00052  |  | 427  | 5  | 403  | 3  |
| 02 | 29  | 150  | 0.19  | 0.06115  | 0.00115  | 0.57364  | 0.01150  | 0.06788  | 0.00067  |  | 460  | 7  | 423  | 4  |
| 03 | 19  | 143  | 0.13  | 0.05746  | 0.00121  | 0.51016  | 0.01129  | 0.06431  | 0.00070  |  | 419  | 8  | 402  | 4  |
| 04 | 11  | 102  | 0.11  | 0.05640  | 0.00100  | 0.52300  | 0.01035  | 0.06697  | 0.00066  |  | 427  | 7  | 418  | 4  |
| 05 | 14  | 31  | 0.47  | 0.05986  | 0.00145  | 0.54225  | 0.01356  | 0.06559  | 0.00056  |  | 440  | 9  | 410  | 3  |
| 06 | 12  | 106  | 0.11  | 0.05706  | 0.00091  | 0.51028  | 0.00854  | 0.06486  | 0.00059  |  | 419  | 6  | 405  | 4  |
| 07 | 8  | 85  | 0.09  | 0.05683  | 0.00081  | 0.49819  | 0.00787  | 0.06344  | 0.00046  |  | 410  | 5  | 397  | 3  |
| 08 | 14  | 115  | 0.12  | 0.06045  | 0.00144  | 0.54366  | 0.01573  | 0.06453  | 0.00057  |  | 441  | 10  | 403  | 3  |
| 09 | 14  | 96  | 0.15  | 0.05174  | 0.00174  | 0.48464  | 0.01645  | 0.06788  | 0.00058  |  | 401  | 11  | 423  | 4  |
| 10 | 70  | 101  | 0.69  | 0.05692  | 0.00121  | 0.53598  | 0.01291  | 0.06808  | 0.00065  |  | 436  | 9  | 425  | 4  |
| 11 | 12  | 133  | 0.09  | 0.05986  | 0.00129  | 0.54986  | 0.01647  | 0.06592  | 0.00090  |  | 445  | 11  | 412  | 5  |
| 12 | 23  | 285  | 0.08  | 0.05480  | 0.00128  | 0.48288  | 0.01317  | 0.06337  | 0.00066  |  | 400  | 9  | 396  | 4  |
| 13 | 12  | 71  | 0.17  | 0.05764  | 0.00105  | 0.53210  | 0.01244  | 0.06761  | 0.00129  |  | 433  | 8  | 422  | 8  |
| **BM-15: 似斑状黑云母花岗闪长岩** |
| 01 | 7  | 94  | 0.07  | 0.05302  | 0.00097  | 0.23600  | 0.00451  | 0.03235  | 0.00029  |  | 215  | 4  | 205  | 2  |
| 02 | 24  | 199  | 0.12  | 0.05225  | 0.00073  | 0.24264  | 0.00361  | 0.03373  | 0.00025  |  | 221  | 3  | 214  | 2  |
| 03 | 17  | 148  | 0.12  | 0.05271  | 0.00080  | 0.24184  | 0.00416  | 0.03332  | 0.00032  |  | 220  | 3  | 211  | 2  |
| 04 | 50  | 309  | 0.16  | 0.05320  | 0.00070  | 0.23318  | 0.00360  | 0.03178  | 0.00031  |  | 213  | 3  | 202  | 2  |
| 05 | 40  | 243  | 0.17  | 0.05279  | 0.00075  | 0.24352  | 0.00387  | 0.03345  | 0.00027  |  | 221  | 3  | 212  | 2  |
| 06 | 26  | 155  | 0.17  | 0.05502  | 0.00118  | 0.24769  | 0.00518  | 0.03276  | 0.00037  |  | 225  | 4  | 208  | 2  |
| 07 | 4  | 76  | 0.06  | 0.05028  | 0.00065  | 0.23266  | 0.00402  | 0.03345  | 0.00032  |  | 212  | 3  | 212  | 2  |
| 08 | 4  | 141  | 0.03  | 0.05028  | 0.00071  | 0.23782  | 0.00405  | 0.03435  | 0.00040  |  | 217  | 3  | 218  | 3  |
| 09 | 20  | 111  | 0.18  | 0.05162  | 0.00082  | 0.24536  | 0.00432  | 0.03455  | 0.00038  |  | 223  | 4  | 219  | 2  |
| 10 | 18  | 63  | 0.29  | 0.05074  | 0.00076  | 0.23590  | 0.00395  | 0.03372  | 0.00028  |  | 215  | 3  | 214  | 2  |
| 11 | 14  | 271  | 0.05  | 0.05318  | 0.00099  | 0.23549  | 0.00546  | 0.03209  | 0.00043  |  | 215  | 4  | 204  | 3  |
| 12 | 12  | 60  | 0.20  | 0.04909  | 0.00107  | 0.23959  | 0.00553  | 0.03549  | 0.00035  |  | 218  | 5  | 225  | 2  |
| 13 | 43  | 292  | 0.15  | 0.04997  | 0.00073  | 0.23190  | 0.00406  | 0.03370  | 0.00035  |  | 212  | 3  | 214  | 2  |
| 14 | 9  | 42  | 0.22  | 0.04942  | 0.00119  | 0.24108  | 0.00640  | 0.03553  | 0.00047  |  | 219  | 5  | 225  | 3  |
| 15 | 35  | 197  | 0.18  | 0.05109  | 0.00099  | 0.23899  | 0.00456  | 0.03413  | 0.00036  |  | 218  | 4  | 216  | 2  |
| 16 | 22  | 147  | 0.15  | 0.05567  | 0.00083  | 0.24966  | 0.00414  | 0.03259  | 0.00028  |  | 226  | 3  | 207  | 2  |
| 17 | 22  | 317  | 0.07  | 0.05245  | 0.00074  | 0.23164  | 0.00370  | 0.03207  | 0.00025  |  | 212  | 3  | 203  | 2  |

**表2 白马山复式岩体主量和微量元素分析结果**

Table 2 Major and trace element data of the Baimashan complex pluton

|  |  |  |  |
| --- | --- | --- | --- |
| **项目** | **糜棱岩化花岗岩** |  | **似斑状黑云母花岗闪长岩** |
| **BM-31** | **BM-50** |  | **BM-16** | **BM-17** | **BM-19** | **BM-21** |
| SiO2 | 74.93 | 75.99 |  | 68.46 | 68.32 | 69.25 | 69.41 |
| TiO2 | 0.04 | 0.04 |  | 0.45 | 0.45 | 0.26 | 0.25 |
| Al2O3 | 13.67 | 13.31 |  | 14.96 | 15.02 | 15.15 | 15.70 |
| TFe2O3 | 1.23 | 0.93 |  | 3.77 | 3.64 | 2.84 | 2.26 |
| MnO | 0.04 | 0.02 |  | 0.06 | 0.06 | 0.04 | 0.03 |
| MgO | 0.16 | 0.14 |  | 1.70 | 1.74 | 0.98 | 0.72 |
| CaO | 0.46 | 0.96 |  | 2.20 | 2.60 | 2.17 | 2.56 |
| Na2O | 3.93 | 3.16 |  | 2.67 | 2.78 | 2.91 | 3.21 |
| K2O | 4.65 | 4.94 |  | 3.45 | 3.63 | 5.23 | 4.43 |
| P2O5 | 0.01 | <0.01 |  | 0.10 | 0.10 | 0.08 | 0.08 |
| LOI | 0.52 | 0.27 |  | 1.64 | 1.33 | 0.36 | 0.36 |
| Total | 99.64 | 99.76 |  | 99.46 | 99.67 | 99.27 | 99.01 |
| A/CNK | 1.11  | 1.08  |  | 1.23  | 1.13  | 1.05  | 1.06  |
| Li | 7.3 | 40.3 |  | 85.8 | 73.2 | 43.8 | 40.3 |
| Be | 9.56 | 3.35 |  | 3.98 | 3.75 | 3.59 | 4.07 |
| Sc | 5.1 | 2.7 |  | 9.1 | 9.9 | 5.9 | 3.4 |
| V | <5 | <5 |  | 61 | 55 | 31 | 27 |
| Cr | 10 | 10 |  | 70 | 70 | 40 | 20 |
| Ni | 5.2 | 0.9 |  | 25.2 | 25.3 | 13.9 | 3.7 |
| Ga | 18.95 | 14.35 |  | 19.20 | 19.35 | 16.35 | 18.55 |
| Rb | 253 | 250 |  | 200 | 208 | 215 | 204 |
| Sr | 39.2 | 68.3 |  | 171.0 | 184.0 | 182.0 | 259 |
| Y | 21.1 | 41.2 |  | 14.5 | 15.3 | 10.5 | 11.3 |
| Zr | 53 | 45 |  | 219 | 179 | 158 | 382 |
| Nb | 28.8 | 10.0 |  | 12.2 | 10.4 | 8.4 | 8.1 |
| Mo | 0.34 | 0.53 |  | 0.70 | 1.08 | 0.85 | 0.52 |
| Sn | 32 | 11 |  | 10 | 8 | 4 | 9 |
| Cs | 13.85 | 32.4 |  | 12.50 | 13.10 | 14.25 | 13.85 |
| Ba | 158.5 | 377 |  | 499 | 432 | 1290 | 1665 |
| La | 10.4 | 13.0 |  | 27.0 | 37.9 | 17.9 | 139.5 |
| Ce | 20.5 | 26.1 |  | 68.5 | 72.6 | 44.4 | 227 |
| Pr | 2.49 | 3.33 |  | 6.07 | 8.07 | 3.82 | 23.2 |
| Nd | 8.5 | 12.3 |  | 21.2 | 25.9 | 12.0 | 65.0 |
| Sm | 2.54 | 3.34 |  | 4.34 | 4.65 | 2.35 | 7.89 |
| Eu | 0.21 | 0.49 |  | 0.85 | 0.88 | 0.95 | 1.53 |
| Gd | 2.78 | 4.22 |  | 3.32 | 3.90 | 2.30 | 4.10 |
| Tb | 0.55 | 0.79 |  | 0.54 | 0.56 | 0.36 | 0.53 |
| Dy | 3.35 | 5.51 |  | 2.83 | 2.92 | 2.02 | 2.37 |
| Ho | 0.70 | 1.31 |  | 0.55 | 0.58 | 0.41 | 0.44 |
| Er | 1.95 | 3.81 |  | 1.36 | 1.53 | 1.04 | 1.10 |
| Tm | 0.34 | 0.68 |  | 0.23 | 0.23 | 0.16 | 0.17 |
| Yb | 2.49 | 5.01 |  | 1.41 | 1.50 | 1.01 | 1.13 |
| Lu | 0.36 | 0.75 |  | 0.23 | 0.22 | 0.15 | 0.18 |
| Hf | 2.6 | 2.2 |  | 5.7 | 4.6 | 4.4 | 8.3 |
| Ta | 7.54 | 3.60 |  | 1.32 | 1.32 | 0.61 | 0.88 |
| W | 2 | <1 |  | 1 | 1 | 3 | 3 |
| Pb | 60.2 | 69.5 |  | 38.9 | 38.1 | 44.2 | 49.9 |
| Th | 13.15 | 21.5 |  | 25.1 | 28.5 | 13.85 | 53.1 |
| U | 3.57 | 7.56 |  | 4.88 | 3.67 | 2.20 | 3.30 |
| 注：主量元素氧化物质量分数为%，微量元素含量单位为10-6。 |

**表3 白马山复式岩体锆石Lu-Hf同位素测试结果**

Table 3 Results of zircon Lu-Hf isotope analysis of the Baimashan complex pluton

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **测试点号** | **年龄/Ma** | **176Lu/177Hf** | **176Hf/177Hf**  |  **2 σ** | **(176Hf/177Hf)i** | **(176Hf/177Hf)CHUR** | **εHf(t)** | **TDM/Ma** | **TDM,2/Ma** |
| **BM-30: 糜棱岩化花岗岩** |
| 23BM30-01 | 409 | 0.001748  | 0.282300  | 0.000039  | 0.282286  | 0.282518  | -8.2  | 1373  | 1912  |
| 23BM30-02 | 409 | 0.001220  | 0.282331  | 0.000052  | 0.282322  | 0.282518  | -6.9  | 1309  | 1833  |
| 23BM30-03 | 409 | 0.001631  | 0.282379  | 0.000042  | 0.282366  | 0.282518  | -5.4  | 1256  | 1734  |
| 23BM30-04 | 409 | 0.001440  | 0.282316  | 0.000035  | 0.282305  | 0.282518  | -7.5  | 1338  | 1870  |
| 23BM30-05 | 409 | 0.001017  | 0.282346  | 0.000033  | 0.282338  | 0.282518  | -6.4  | 1281  | 1797  |
| 23BM30-06 | 409 | 0.001100  | 0.282371  | 0.000035  | 0.282363  | 0.282518  | -5.5  | 1249  | 1742  |
| 23BM30-07 | 409 | 0.001748  | 0.282359  | 0.000038  | 0.282346  | 0.282518  | -6.1  | 1288  | 1780  |
| 23BM30-08 | 409 | 0.001154  | 0.282146  | 0.000330  | 0.282138  | 0.282518  | -13.4  | 1566  | 2242  |
| 23BM30-09 | 409 | 0.000823  | 0.282366  | 0.000043  | 0.282359  | 0.282518  | -5.6  | 1247  | 1749  |
| 23BM30-10 | 409 | 0.001508  | 0.282331  | 0.000045  | 0.282320  | 0.282518  | -7.0  | 1319  | 1838  |
| **BM-15: 似斑状黑云母花岗闪长岩** |
| 23BM15-01 | 211 | 0.001015  | 0.282428  | 0.000032  | 0.282424  | 0.282641  | -7.7  | 1167  | 1731  |
| 23BM15-02 | 211 | 0.001010  | 0.282355  | 0.000037  | 0.282351  | 0.282641  | -10.3  | 1269  | 1894  |
| 23BM15-03 | 211 | 0.000752  | 0.282435  | 0.000039  | 0.282432  | 0.282641  | -7.4  | 1149  | 1713  |
| 23BM15-04 | 211 | 0.001010  | 0.282435  | 0.000031  | 0.282431  | 0.282641  | -7.4  | 1157  | 1716  |
| 23BM15-05 | 211 | 0.001142  | 0.282386  | 0.000045  | 0.282381  | 0.282641  | -9.2  | 1230  | 1826  |
| 23BM15-06 | 211 | 0.001131  | 0.282426  | 0.000037  | 0.282422  | 0.282641  | -7.7  | 1172  | 1735  |
| 23BM15-07 | 211 | 0.000736  | 0.282414  | 0.000043  | 0.282411  | 0.282641  | -8.1  | 1177  | 1759  |
| 23BM15-08 | 211 | 0.000938  | 0.282409  | 0.000035  | 0.282405  | 0.282641  | -8.3  | 1191  | 1772  |
| 23BM15-09 | 211 | 0.000804  | 0.282422  | 0.000037  | 0.282419  | 0.282641  | -7.9  | 1168  | 1742  |
| 23BM15-10 | 211 | 0.000816  | 0.282385  | 0.000032  | 0.282382  | 0.282641  | -9.2  | 1220  | 1824  |
| 23BM15-11 | 211 | 0.000985  | 0.282392  | 0.000033  | 0.282389  | 0.282641  | -8.9  | 1215  | 1810  |
| 23BM15-12 | 211 | 0.000789  | 0.282435  | 0.000030  | 0.282432  | 0.282641  | -7.4  | 1150  | 1713  |