**表2** 石竹山矿床多金属矿化矽卡岩中石榴石稀土元素组成（10-6）

**Table 2.** Rare earth element composition (10-6) of garnet in polymetallic mineralized skarns of the Shizhushan deposit

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **测试点** | **石榴子石类型** | **La** | **Ce** | **Pr** | **Nd** | **Sm** | **Eu** | **Gd** | **Tb** | **Dy** | **Ho** | **Er** | **Tm** | **Yb** | **Lu** |
| **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 | **10**-6 |
| 24JX-168-Grt1-01 | Grt-1 | 0.03  | 0.68  | 0.41  | 5.4  | 4.2  | 0.03  | 4.6  | 0.81  | 4.7  | 0.80  | 1.9  | 0.26  | 1.6  | 0.18  |
| 24JX-168-Grt1-02 | Grt-1 | 0.02  | 0.37  | 0.27  | 4.5  | 4.8  | 0.03  | 6.7  | 1.3  | 8.0  | 1.4  | 3.4  | 0.47  | 2.8  | 0.31  |
| 24JX-168-Grt1-03 | Grt-1 | 0.02  | 0.40  | 0.30  | 4.6  | 5.2  | 0.03  | 7.3  | 1.5  | 8.7  | 1.6  | 3.8  | 0.52  | 3.2  | 0.37  |
| 24JX-168-Grt1-04 | Grt-1 | 0.05  | 1.2  | 0.64  | 7.4  | 6.2  | 0.04  | 7.9  | 1.5  | 9.3  | 1.6  | 3.9  | 0.55  | 3.3  | 0.40  |
| 24JX-168-Grt1-05 | Grt-1 | 0.02  | 0.29  | 0.20  | 3.2  | 3.6  | 0.02  | 4.7  | 0.92  | 5.7  | 1.0  | 2.5  | 0.36  | 2.1  | 0.23  |
| 24JX-168-Grt1-06 | Grt-1 | 0.01  | 0.16  | 0.15  | 2.8  | 4.2  | 0.05  | 6.4  | 1.3  | 8.1  | 1.5  | 3.7  | 0.53  | 3.2  | 0.40  |
| 24JX-168-Grt1-07 | Grt-1 | 0.03  | 0.72  | 0.50  | 6.6  | 7.1  | 0.04  | 11  | 2.5  | 17  | 3.4  | 9.3  | 1.4  | 8.9  | 1.1  |
| 24JX-168-Grt1-08 | Grt-1 | 0.16  | 1.4  | 0.83  | 10  | 7.4  | 0.04  | 9.5  | 2.0  | 13  | 2.5  | 6.5  | 0.96  | 6.0  | 0.70  |
| 24JX-168-Grt1-09 | Grt-1 | 0.04  | 0.38  | 0.25  | 4.1  | 5.6  | 0.02  | 8.8  | 1.9  | 13  | 2.7  | 6.9  | 1.0  | 6.4  | 0.75  |
| 24JX-168-Grt1-10 | Grt-1 | 0.02  | 0.29  | 0.21  | 3.6  | 3.7  | 0.03  | 5.8  | 1.3  | 7.6  | 1.4  | 3.5  | 0.50  | 3.3  | 0.37  |
| 24JX-168-Grt1-11 | Grt-1 | 0.14  | 1.4  | 0.66  | 7.4  | 5.2  | 0.03  | 5.5  | 0.98  | 5.9  | 1.1  | 2.4  | 0.32  | 2.0  | 0.25  |
| 24JX-168-Grt1-12 | Grt-1 | 0.03  | 0.49  | 0.35  | 4.7  | 4.0  | 0.03  | 4.8  | 0.85  | 4.9  | 0.86  | 2.1  | 0.28  | 1.6  | 0.20  |
| 24JX-168-Grt1-13 | Grt-1 | 0.02  | 0.43  | 0.29  | 4.3  | 3.9  | 0.02  | 4.9  | 0.94  | 5.5  | 0.92  | 2.2  | 0.30  | 1.8  | 0.20  |
| 24JX-168-Grt1-14 | Grt-1 | 0.05  | 0.30  | 0.17  | 2.4  | 2.5  | 0.02  | 3.4  | 0.69  | 4.1  | 0.80  | 1.9  | 0.26  | 1.7  | 0.20  |
| 24JX-168-Grt1-15 | Grt-1 | 0.03  | 0.28  | 0.18  | 3.0  | 3.0  | 0.01  | 3.5  | 0.68  | 4.0  | 0.68  | 1.7  | 0.23  | 1.5  | 0.18  |
| 24JX-168-Grt1-16 | Grt-1 | 0.07  | 1.5  | 0.79  | 7.5  | 4.7  | 0.03  | 5.3  | 0.97  | 5.6  | 0.99  | 2.3  | 0.33  | 1.9  | 0.25  |
| 24JX-168-Grt1-17 | Grt-1 | 0.08  | 1.8  | 0.92  | 9.0  | 7.1  | 0.05  | 9.7  | 2.2  | 15  | 3.0  | 7.9  | 1.2  | 7.3  | 0.84  |
| 24JX-168-Grt1-18 | Grt-1 | 0.03  | 0.45  | 0.31  | 4.5  | 5.4  | 0.03  | 8.6  | 1.9  | 13  | 2.6  | 6.7  | 0.99  | 6.2  | 0.76  |
| 24JX-168-Grt1-19 | Grt-1 | 0.05  | 0.80  | 0.49  | 6.4  | 6.6  | 0.04  | 8.8  | 1.6  | 9.0  | 1.5  | 3.5  | 0.47  | 2.8  | 0.33  |
| 24JX-168-Grt1-20 | Grt-1 | 0.04  | 0.73  | 0.42  | 5.2  | 5.1  | 0.03  | 7.0  | 1.4  | 7.7  | 1.3  | 3.1  | 0.41  | 2.5  | 0.30  |
| 24JX-181-Grt1-01 | Grt-1 | 0.00  | 0.03  | 0.01  | 0.09  | 0.25  | 0.00  | 0.77  | 0.27  | 2.6  | 0.82  | 3.2  | 0.70  | 6.3  | 0.99  |
| 24JX-181-Grt1-02 | Grt-1 | 0.02  | 0.04  | 0.01  | 0.11  | 0.30  | 0.02  | 1.4  | 0.70  | 8.5  | 2.7  | 10  | 2.0  | 17  | 2.4  |
| 24JX-181-Grt1-03 | Grt-1 | 0.01  | 0.06  | 0.03  | 0.33  | 0.68  | 0.01  | 2.1  | 0.78  | 9.0  | 2.9  | 11  | 2.3  | 19  | 2.8  |
| 24JX-181-Grt1-05 | Grt-1 | 0.03  | 0.05  | 0.02  | 0.39  | 0.75  | 0.01  | 2.3  | 0.81  | 7.6  | 2.0  | 6.8  | 1.2  | 9.4  | 1.3  |
| 24JX-181-Grt1-06 | Grt-1 | 0.01  | 0.05  | 0.02  | 0.26  | 0.43  | 0.03  | 1.9  | 0.81  | 8.5  | 2.5  | 8.8  | 1.7  | 14  | 2.0  |
| 24JX-181-Grt1-07 | Grt-1 | 0.01  | 0.05  | 0.02  | 0.14  | 0.33  | 0.02  | 1.7  | 0.78  | 8.5  | 2.4  | 8.2  | 1.5  | 12  | 1.6  |
| 24JX-181-Grt1-08 | Grt-1 | 0.00  | 0.05  | 0.02  | 0.21  | 0.35  | 0.02  | 1.3  | 0.62  | 6.8  | 2.0  | 7.7  | 1.5  | 13  | 1.8  |
| 24JX-181-Grt1-09 | Grt-1 | 0.02  | 0.09  | 0.05  | 0.62  | 0.85  | 0.02  | 2.8  | 1.2  | 13  | 4.0  | 15  | 3.0  | 24  | 3.6  |
| 24JX-181-Grt1-10 | Grt-1 | 0.03  | 0.16  | 0.08  | 1.0  | 1.5  | 0.02  | 4.0  | 1.4  | 14  | 4.0  | 15  | 2.9  | 24  | 3.6  |
| 24JX-181-Grt1-11 | Grt-1 | 0.01  | 0.03  | 0.02  | 0.19  | 0.44  | 0.01  | 1.5  | 0.65  | 7.4  | 2.3  | 8.9  | 1.8  | 15  | 2.2  |
| 24JX-181-Grt1-12 | Grt-1 | 0.01  | 0.03  | 0.01  | 0.10  | 0.24  | 0.01  | 1.3  | 0.68  | 8.8  | 2.8  | 11  | 2.2  | 18  | 2.6  |
| 24JX-181-Grt1-13 | Grt-1 | 0.02  | 0.05  | 0.01  | 0.15  | 0.31  | 0.01  | 1.3  | 0.70  | 9.0  | 3.1  | 13  | 2.6  | 23  | 3.2  |
| 24JX-181-Grt1-14 | Grt-1 | 0.01  | 0.05  | 0.02  | 0.20  | 0.41  | 0.01  | 1.6  | 0.92  | 12  | 4.1  | 17  | 3.6  | 31  | 4.4  |
| 24JX-181-Grt1-15 | Grt-1 | 0.05  | 0.13  | 0.03  | 0.28  | 0.59  | 0.01  | 2.3  | 0.95  | 10  | 3.2  | 12  | 2.5  | 20  | 3.0  |
| 24JX-181-Grt1-16 | Grt-1 | 0.02  | 0.09  | 0.03  | 0.35  | 0.85  | 0.01  | 3.6  | 1.6  | 19  | 6.2  | 25  | 5.2  | 43  | 6.4  |
| 24JX-181-Grt1-17 | Grt-1 | 0.01  | 0.07  | 0.03  | 0.26  | 0.47  | 0.01  | 2.1  | 1.1  | 13  | 4.1  | 16  | 3.2  | 26  | 3.6  |
| 24JX-181-Grt1-18 | Grt-1 | 0.01  | 0.06  | 0.02  | 0.34  | 0.71  | 0.01  | 3.0  | 1.3  | 15  | 5.1  | 21  | 4.7  | 41  | 6.1  |
| 24JX-181-Grt1-19 | Grt-1 | 0.01  | 0.06  | 0.03  | 0.31  | 0.86  | 0.03  | 3.4  | 1.4  | 15  | 4.4  | 17  | 3.4  | 28  | 4.2  |
| 24JX-181-Grt1-20 | Grt-1 | 0.01  | 0.03  | 0.01  | 0.18  | 0.43  | 0.00  | 1.8  | 0.70  | 7.4  | 2.3  | 8.8  | 1.8  | 15  | 2.4  |
| 24JX-168-Grt2-01 | Grt-2 | 159  | 326  | 36  | 126  | 29  | 0.46  | 23  | 3.8  | 21  | 4.0  | 9.9  | 1.6  | 11  | 1.6  |
| 24JX-168-Grt2-02 | Grt-2 | 229  | 463  | 49  | 169  | 38  | 0.80  | 30  | 4.5  | 24  | 4.1  | 9.7  | 1.4  | 9.5  | 1.3  |
| 24JX-168-Grt2-03 | Grt-2 | 24  | 29  | 2.8  | 11  | 6.4  | 0.22  | 11  | 2.9  | 22  | 5.1  | 16  | 2.9  | 22  | 3.4  |
| 24JX-168-Grt2-04 | Grt-2 | 37  | 47  | 4.1  | 13  | 4.2  | 0.24  | 5.7  | 1.4  | 10.0  | 2.3  | 7.0  | 1.3  | 10  | 1.5  |
| 24JX-168-Grt2-05 | Grt-2 | 79  | 161  | 15  | 49  | 12  | 0.29  | 12  | 2.7  | 18  | 4.0  | 12  | 2.1  | 16  | 2.5  |
| 24JX-168-Grt2-06 | Grt-2 | 58  | 90  | 8.3  | 25  | 6.0  | 0.39  | 6.2  | 1.3  | 9.4  | 2.1  | 6.4  | 1.2  | 8.8  | 1.3  |
| 24JX-168-Grt2-07 | Grt-2 | 53  | 89  | 8.4  | 25  | 5.5  | 0.33  | 5.2  | 1.1  | 7.6  | 1.6  | 5.1  | 0.89  | 6.9  | 1.1  |
| 24JX-168-Grt2-08 | Grt-2 | 175  | 330  | 31  | 84  | 12  | 0.44  | 6.9  | 0.87  | 4.2  | 0.66  | 1.6  | 0.21  | 1.4  | 0.17  |
| 24JX-168-Grt2-09 | Grt-2 | 46  | 74  | 7.1  | 22  | 4.7  | 0.33  | 4.2  | 0.85  | 6.0  | 1.3  | 4.1  | 0.71  | 5.5  | 0.82  |
| 24JX-168-Grt2-10 | Grt-2 | 406  | 496  | 45  | 147  | 31  | 2.0  | 22  | 3.4  | 17  | 2.9  | 6.9  | 0.98  | 6.5  | 0.84  |
| 24JX-168-Grt2-11 | Grt-2 | 23  | 35  | 3.5  | 15  | 8.1  | 0.17  | 12  | 2.8  | 21  | 4.7  | 15  | 2.8  | 23  | 3.4  |
| 24JX-168-Grt2-12 | Grt-2 | 12  | 20  | 2.4  | 13  | 9.1  | 0.21  | 13  | 3.1  | 23  | 5.3  | 18  | 3.5  | 29  | 4.8  |
| 24JX-168-Grt2-13 | Grt-2 | 87  | 170  | 17  | 59  | 22  | 0.33  | 26  | 5.0  | 30  | 5.9  | 16  | 2.6  | 20  | 2.9  |
| 24JX-168-Grt2-14 | Grt-2 | 26  | 46  | 4.7  | 18  | 9.1  | 0.16  | 13  | 3.2  | 23  | 5.2  | 16  | 3.1  | 26  | 4.3  |
| 24JX-168-Grt2-15 | Grt-2 | 80  | 116  | 9.4  | 26  | 10.0  | 0.31  | 14  | 3.1  | 21  | 4.8  | 15  | 2.9  | 25  | 4.2  |
| 24JX-168-Grt2-16 | Grt-2 | 8.7  | 14  | 1.8  | 10  | 6.8  | 0.23  | 8.7  | 2.1  | 15  | 3.6  | 12  | 2.3  | 19  | 3.0  |
| 24JX-168-Grt2-17 | Grt-2 | 18  | 26  | 2.4  | 9.5  | 6.9  | 0.15  | 12  | 2.9  | 22  | 5.3  | 18  | 3.5  | 30  | 5.0  |
| 24JX-168-Grt2-18 | Grt-2 | 49  | 68  | 6.2  | 19  | 5.1  | 0.26  | 6.0  | 1.4  | 10  | 2.3  | 6.9  | 1.3  | 10.0  | 1.5  |
| 24JX-168-Grt2-19 | Grt-2 | 35  | 48  | 4.4  | 14  | 3.9  | 0.21  | 4.8  | 1.1  | 8.2  | 1.9  | 5.8  | 1.1  | 8.3  | 1.3  |
| 24JX-168-Grt2-20 | Grt-2 | 118  | 236  | 26  | 98  | 26  | 0.47  | 25  | 4.7  | 29  | 5.9  | 16  | 2.4  | 16  | 2.3  |
| 24JX-181-Grt2-03 | Grt-2 | 170  | 505  | 70  | 328  | 98  | 0.53  | 86  | 14  | 77  | 14  | 34  | 4.5  | 26  | 3.2  |
| 24JX-181-Grt2-04 | Grt-2 | 210  | 576  | 79  | 375  | 124  | 0.67  | 120  | 20  | 110  | 19  | 44  | 5.5  | 30  | 3.5  |
| 24JX-181-Grt2-05 | Grt-2 | 134  | 343  | 42  | 163  | 36  | 0.37  | 23  | 3.4  | 20  | 3.9  | 11  | 1.7  | 11  | 1.6  |
| 24JX-181-Grt2-06 | Grt-2 | 203  | 571  | 77  | 361  | 115  | 0.67  | 111  | 19  | 107  | 20  | 47  | 6.1  | 34  | 3.9  |
| 24JX-181-Grt2-07 | Grt-2 | 266  | 724  | 96  | 434  | 145  | 0.83  | 143  | 24  | 133  | 23  | 51  | 6.3  | 34  | 3.7  |
| 24JX-181-Grt2-08 | Grt-2 | 174  | 479  | 62  | 265  | 63  | 0.51  | 44  | 6.6  | 37  | 7.4  | 20  | 2.9  | 19  | 2.5  |
| 24JX-181-Grt2-09 | Grt-2 | 692  | 1838  | 234  | 946  | 249  | 2.5  | 196  | 31  | 169  | 32  | 77  | 10  | 57  | 6.8  |
| 24JX-181-Grt2-10 | Grt-2 | 1891  | 5476  | 726  | 2994  | 721  | 3.5  | 448  | 53  | 209  | 26  | 45  | 4.8  | 24  | 2.5  |
| 24JX-181-Grt2-11 | Grt-2 | 176  | 490  | 64  | 282  | 81  | 0.56  | 67  | 11  | 60  | 11  | 27  | 3.6  | 21  | 2.6  |
| 24JX-181-Grt2-12 | Grt-2 | 614  | 1598  | 205  | 885  | 294  | 1.7  | 292  | 47  | 248  | 41  | 88  | 11  | 54  | 5.9  |
| 24JX-181-Grt2-13 | Grt-2 | 161  | 443  | 58  | 258  | 71  | 0.55  | 56  | 9.3  | 54  | 10  | 26  | 3.6  | 21  | 2.7  |
| 24JX-181-Grt2-14 | Grt-2 | 407  | 834  | 81  | 258  | 48  | 1.3  | 37  | 6.3  | 36  | 6.6  | 16  | 2.3  | 14  | 1.7  |
| 24JX-181-Grt2-15 | Grt-2 | 136  | 254  | 24  | 73  | 15  | 0.47  | 12  | 2.2  | 13  | 2.4  | 5.8  | 0.86  | 5.3  | 0.69  |
| 24JX-181-Grt2-16 | Grt-2 | 164  | 385  | 48  | 211  | 61  | 0.58  | 51  | 8.3  | 48  | 9.6  | 25  | 3.4  | 20  | 2.6  |
| 24JX-181-Grt2-17 | Grt-2 | 30  | 49  | 4.5  | 13  | 2.5  | 0.13  | 1.5  | 0.25  | 1.6  | 0.36  | 1.0  | 0.21  | 1.6  | 0.25  |
| 24JX-181-Grt2-18 | Grt-2 | 42  | 82  | 8.3  | 27  | 5.6  | 0.16  | 3.8  | 0.64  | 4.1  | 0.84  | 2.6  | 0.45  | 3.4  | 0.52  |
| 24JX-181-Grt2-19 | Grt-2 | 38  | 68  | 6.4  | 20  | 3.7  | 0.20  | 2.5  | 0.38  | 2.3  | 0.50  | 1.6  | 0.29  | 2.3  | 0.36  |
| 24JX-181-Grt2-20 | Grt-2 | 26  | 35  | 2.9  | 8.3  | 1.5  | 0.15  | 0.94  | 0.16  | 1.0  | 0.22  | 0.69  | 0.14  | 1.1  | 0.17  |
| 24JX-181-Grt2-21 | Grt-2 | 252  | 623  | 82  | 380  | 128  | 0.78  | 122  | 19  | 98  | 16  | 34  | 4.1  | 22  | 2.4  |
| 24JX-181-Grt2-22 | Grt-2 | 1407  | 3801  | 471  | 1871  | 463  | 3.1  | 345  | 50  | 240  | 36  | 75  | 9.1  | 49  | 5.5  |
| 24JX-181-Grt2-23 | Grt-2 | 1079  | 2654  | 311  | 1125  | 261  | 3.3  | 199  | 31  | 156  | 25  | 56  | 7.1  | 41  | 4.7  |
| 24JX-181-Grt2-24 | Grt-2 | 57  | 123  | 16  | 68  | 24  | 0.21  | 25  | 4.1  | 21  | 3.5  | 7.6  | 0.91  | 4.9  | 0.60  |
| 24JX-181-Grt2-25 | Grt-2 | 1328  | 3654  | 470  | 1937  | 504  | 2.3  | 374  | 51  | 231  | 32  | 59  | 6.4  | 32  | 3.2  |
| 24JX-181-Grt2-26 | Grt-2 | 1590  | 4445  | 566  | 2297  | 596  | 3.3  | 469  | 69  | 335  | 51  | 105  | 12  | 65  | 7.2  |
| 24JX-181-Grt2-27 | Grt-2 | 1771  | 4929  | 633  | 2609  | 685  | 3.7  | 525  | 75  | 353  | 52  | 104  | 12  | 64  | 7.0  |
| 24JX-181-Grt2-28 | Grt-2 | 34  | 59  | 5.7  | 18  | 3.6  | 0.15  | 2.4  | 0.38  | 2.4  | 0.53  | 1.5  | 0.27  | 2.2  | 0.32  |
| 24JX-181-Grt2-29 | Grt-2 | 37  | 64  | 6.0  | 18  | 3.3  | 0.16  | 2.2  | 0.36  | 2.2  | 0.48  | 1.4  | 0.26  | 2.1  | 0.33  |
| 24JX-181-Grt2-30 | Grt-2 | 211  | 483  | 53  | 195  | 51  | 0.78  | 46  | 8.9  | 55  | 10  | 27  | 4.1  | 25  | 3.0  |
| 24JX-171-Grt3-01 | Grt-3 | 0.26  | 1.8  | 0.43  | 2.6  | 0.83  | 0.08  | 0.69  | 0.10  | 0.54  | 0.11  | 0.30  | 0.04  | 0.25  | 0.04  |
| 24JX-171-Grt3-02 | Grt-3 | 0.37  | 1.9  | 0.43  | 2.6  | 0.82  | 0.11  | 0.74  | 0.11  | 0.64  | 0.13  | 0.34  | 0.05  | 0.32  | 0.04  |
| 24JX-171-Grt3-03 | Grt-3 | 0.31  | 1.9  | 0.46  | 3.1  | 0.81  | 0.10  | 0.73  | 0.10  | 0.57  | 0.12  | 0.31  | 0.04  | 0.26  | 0.04  |
| 24JX-171-Grt3-04 | Grt-3 | 0.55  | 2.9  | 0.58  | 2.7  | 0.54  | 0.09  | 0.42  | 0.06  | 0.36  | 0.07  | 0.17  | 0.02  | 0.14  | 0.02  |
| 24JX-171-Grt3-05 | Grt-3 | 0.69  | 3.2  | 0.50  | 1.7  | 0.28  | 0.06  | 0.20  | 0.03  | 0.14  | 0.03  | 0.07  | 0.01  | 0.07  | 0.01  |
| 24JX-171-Grt3-06 | Grt-3 | 1.0  | 4.2  | 0.58  | 1.8  | 0.26  | 0.05  | 0.22  | 0.03  | 0.25  | 0.04  | 0.10  | 0.01  | 0.11  | 0.02  |
| 24JX-171-Grt3-07 | Grt-3 | 0.59  | 3.0  | 0.59  | 3.1  | 0.89  | 0.10  | 0.92  | 0.14  | 0.86  | 0.18  | 0.52  | 0.07  | 0.47  | 0.06  |
| 24JX-171-Grt3-08 | Grt-3 | 0.57  | 2.9  | 0.60  | 3.5  | 0.98  | 0.11  | 0.94  | 0.13  | 0.83  | 0.18  | 0.48  | 0.06  | 0.42  | 0.06  |
| 24JX-171-Grt3-09 | Grt-3 | 0.48  | 2.5  | 0.59  | 3.6  | 1.1  | 0.12  | 1.0  | 0.15  | 0.89  | 0.18  | 0.49  | 0.07  | 0.44  | 0.07  |
| 24JX-171-Grt3-10 | Grt-3 | 0.96  | 2.0  | 0.49  | 3.0  | 0.74  | 0.09  | 0.51  | 0.06  | 0.30  | 0.05  | 0.12  | 0.02  | 0.10  | 0.01  |
| 24JX-171-Grt3-11 | Grt-3 | 0.42  | 2.2  | 0.55  | 3.1  | 0.83  | 0.10  | 0.54  | 0.08  | 0.45  | 0.09  | 0.23  | 0.03  | 0.21  | 0.03  |
| 24JX-171-Grt3-12 | Grt-3 | 0.28  | 1.8  | 0.44  | 2.7  | 0.77  | 0.11  | 0.55  | 0.08  | 0.39  | 0.09  | 0.22  | 0.03  | 0.18  | 0.03  |
| 24JX-171-Grt3-13 | Grt-3 | 0.20  | 1.4  | 0.36  | 2.3  | 0.79  | 0.09  | 0.70  | 0.10  | 0.56  | 0.11  | 0.29  | 0.04  | 0.24  | 0.03  |
| 24JX-171-Grt3-14 | Grt-3 | 0.33  | 2.1  | 0.53  | 3.3  | 0.94  | 0.10  | 0.70  | 0.08  | 0.52  | 0.09  | 0.23  | 0.03  | 0.19  | 0.02  |
| 24JX-171-Grt3-15 | Grt-3 | 0.97  | 5.6  | 1.3  | 5.9  | 1.2  | 0.15  | 0.84  | 0.13  | 0.75  | 0.17  | 0.49  | 0.06  | 0.42  | 0.06  |
| 24JX-171-Grt3-16 | Grt-3 | 0.85  | 5.5  | 0.95  | 3.9  | 0.70  | 0.11  | 0.51  | 0.08  | 0.47  | 0.11  | 0.32  | 0.05  | 0.26  | 0.04  |
| 24JX-171-Grt3-17 | Grt-3 | 0.89  | 5.4  | 1.2  | 6.4  | 1.4  | 0.16  | 0.99  | 0.15  | 0.92  | 0.19  | 0.53  | 0.08  | 0.50  | 0.07  |
| 24JX-171-Grt3-18 | Grt-3 | 0.38  | 2.8  | 0.69  | 3.9  | 0.63  | 0.10  | 0.37  | 0.05  | 0.28  | 0.06  | 0.14  | 0.02  | 0.13  | 0.02  |
| 24JX-171-Grt3-19 | Grt-3 | 0.29  | 1.9  | 0.48  | 3.0  | 0.83  | 0.09  | 0.67  | 0.10  | 0.56  | 0.12  | 0.30  | 0.04  | 0.28  | 0.03  |
| 24JX-171-Grt3-20 | Grt-3 | 0.31  | 1.9  | 0.50  | 2.8  | 0.86  | 0.09  | 0.73  | 0.11  | 0.65  | 0.15  | 0.36  | 0.05  | 0.32  | 0.05  |
| 24JX-177-Grt3-01 | Grt-3 | 0.60  | 3.4  | 0.59  | 2.2  | 0.33  | 0.06  | 0.24  | 0.03  | 0.17  | 0.04  | 0.09  | 0.01  | 0.09  | 0.01  |
| 24JX-177-Grt3-02 | Grt-3 | 0.45  | 2.9  | 0.54  | 1.8  | 0.15  | 0.03  | 0.11  | 0.01  | 0.07  | 0.02  | 0.03  | 0.00  | 0.07  | 0.00  |
| 24JX-177-Grt3-03 | Grt-3 | 0.48  | 2.8  | 0.46  | 1.4  | 0.14  | 0.03  | 0.06  | 0.01  | 0.05  | 0.01  | 0.03  | 0.00  | 0.03  | 0.00  |
| 24JX-177-Grt3-04 | Grt-3 | 0.67  | 3.5  | 0.58  | 2.1  | 0.25  | 0.06  | 0.12  | 0.01  | 0.08  | 0.02  | 0.04  | 0.01  | 0.04  | 0.01  |
| 24JX-177-Grt3-07 | Grt-3 | 0.26  | 1.6  | 0.43  | 2.1  | 0.42  | 0.09  | 0.14  | 0.01  | 0.05  | 0.01  | 0.01  | 0.00  | 0.01  | 0.00  |
| 24JX-177-Grt3-08 | Grt-3 | 0.55  | 3.5  | 0.77  | 4.0  | 0.82  | 0.07  | 0.42  | 0.05  | 0.25  | 0.04  | 0.11  | 0.01  | 0.10  | 0.01  |
| 24JX-177-Grt3-09 | Grt-3 | 0.29  | 1.4  | 0.33  | 2.1  | 0.51  | 0.05  | 0.28  | 0.04  | 0.18  | 0.03  | 0.08  | 0.01  | 0.06  | 0.01  |
| 24JX-177-Grt3-10 | Grt-3 | 0.72  | 4.1  | 0.59  | 1.9  | 0.22  | 0.03  | 0.18  | 0.03  | 0.17  | 0.04  | 0.09  | 0.02  | 0.12  | 0.01  |
| 24JX-177-Grt3-11 | Grt-3 | 0.85  | 3.2  | 0.50  | 1.9  | 0.24  | 0.07  | 0.16  | 0.03  | 0.15  | 0.03  | 0.07  | 0.01  | 0.05  | 0.01  |
| 24JX-177-Grt3-12 | Grt-3 | 0.77  | 3.6  | 0.52  | 1.7  | 0.23  | 0.10  | 0.18  | 0.03  | 0.14  | 0.03  | 0.07  | 0.01  | 0.06  | 0.01  |
| 24JX-177-Grt3-13 | Grt-3 | 0.93  | 3.5  | 0.48  | 1.6  | 0.26  | 0.03  | 0.21  | 0.03  | 0.16  | 0.03  | 0.06  | 0.01  | 0.05  | 0.01  |
| 24JX-177-Grt3-15 | Grt-3 | 0.64  | 3.2  | 0.55  | 2.4  | 0.45  | 0.05  | 0.32  | 0.05  | 0.28  | 0.06  | 0.17  | 0.02  | 0.14  | 0.02  |
| 24JX-177-Grt3-16 | Grt-3 | 1.2  | 5.9  | 0.87  | 3.3  | 0.53  | 0.05  | 0.40  | 0.05  | 0.34  | 0.06  | 0.18  | 0.02  | 0.15  | 0.03  |
| 24JX-177-Grt3-17 | Grt-3 | 1.1  | 5.1  | 0.83  | 3.4  | 0.58  | 0.06  | 0.47  | 0.07  | 0.38  | 0.08  | 0.21  | 0.04  | 0.21  | 0.03  |
| 24JX-177-Grt3-18 | Grt-3 | 0.96  | 4.6  | 0.73  | 2.9  | 0.49  | 0.06  | 0.39  | 0.06  | 0.34  | 0.07  | 0.18  | 0.03  | 0.16  | 0.02  |
| 24JX-177-Grt3-19 | Grt-3 | 1.2  | 6.3  | 1.1  | 4.2  | 0.80  | 0.07  | 0.55  | 0.08  | 0.41  | 0.10  | 0.24  | 0.04  | 0.24  | 0.03  |
| 24JX-177-Grt3-20 | Grt-3 | 0.49  | 3.2  | 0.64  | 2.7  | 0.24  | 0.05  | 0.12  | 0.01  | 0.06  | 0.01  | 0.03  | 0.00  | 0.03  | 0.00  |

**表2** 石竹山矿床多金属矿化矽卡岩中石榴子石U-Pb定年结果

**Table 2.** LA-ICP-MS U-Pb data of garnet in polymetallic mineralized skarns of the Shizhushan deposit

|  |  |  |  |
| --- | --- | --- | --- |
| **分析点** | **石榴子石类型** | 238U/206Pb | 207Pb/206Pb |
| **Ratio** | **1sigma** | **Ratio** | **1sigma** |
| 24JX-168-Grt2-01 | Grt2 | 24.8468  | 0.5369  | 0.1645  | 0.0052  |
| 24JX-168-Grt2-02 | Grt2 | 22.2467  | 0.3399  | 0.2487  | 0.0090  |
| 24JX-168-Grt2-03 | Grt2 | 21.1129  | 0.3796  | 0.2122  | 0.0065  |
| 24JX-168-Grt2-04 | Grt2 | 22.2537  | 0.9792  | 0.1693  | 0.0152  |
| 24JX-168-Grt2-05 | Grt2 | 21.4287  | 0.3735  | 0.2475  | 0.0073  |
| 24JX-168-Grt2-06 | Grt2 | 5.6935  | 0.7975  | 0.6273  | 0.0252  |
| 24JX-168-Grt2-07 | Grt2 | 5.9499  | 0.5783  | 0.6195  | 0.0223  |
| 24JX-168-Grt2-08 | Grt2 | 20.7579  | 0.6869  | 0.2337  | 0.0146  |
| 24JX-168-Grt2-09 | Grt2 | 12.4299  | 1.2518  | 0.4520  | 0.0231  |
| 24JX-168-Grt2-10 | Grt2 | 19.6204  | 0.3393  | 0.2548  | 0.0121  |
| 24JX-168-Grt2-11 | Grt2 | 6.7030  | 0.3325  | 0.6469  | 0.0196  |
| 24JX-168-Grt2-12 | Grt2 | 10.5104  | 0.3607  | 0.5307  | 0.0157  |
| 24JX-168-Grt2-13 | Grt2 | 16.3049  | 0.5793  | 0.4068  | 0.0159  |
| 24JX-168-Grt2-14 | Grt2 | 23.8243  | 0.4415  | 0.1213  | 0.0044  |
| 24JX-181-Grt2-01 | Grt2 | 21.7814  | 0.3974  | 0.2011  | 0.0080  |
| 24JX-181-Grt2-02 | Grt2 | 20.9315  | 0.3879  | 0.2239  | 0.0066  |
| 24JX-181-Grt2-03 | Grt2 | 20.7230  | 0.3101  | 0.2269  | 0.0054  |
| 24JX-181-Grt2-04 | Grt2 | 22.1860  | 0.3503  | 0.1894  | 0.0067  |
| 24JX-181-Grt2-05 | Grt2 | 22.8489  | 0.3572  | 0.1861  | 0.0066  |
| 24JX-181-Grt2-06 | Grt2 | 20.8245  | 0.7733  | 0.2130  | 0.0137  |
| 24JX-181-Grt2-07 | Grt2 | 25.5223  | 0.2813  | 0.0698  | 0.0007  |
| 24JX-181-Grt2-08 | Grt2 | 21.1639  | 0.5271  | 0.2249  | 0.0105  |
| 24JX-181-Grt2-09 | Grt2 | 25.5687  | 0.2889  | 0.1161  | 0.0013  |
| 24JX-181-Grt2-10 | Grt2 | 22.4475  | 0.2813  | 0.1948  | 0.0035  |
| 24JX-181-Grt2-11 | Grt2 | 21.8405  | 0.2989  | 0.1701  | 0.0026  |
| 24JX-181-Grt2-12 | Grt2 | 12.9793  | 0.6941  | 0.4032  | 0.0238  |
| 24JX-181-Grt2-13 | Grt2 | 22.2153  | 0.2810  | 0.1946  | 0.0029  |
| 24JX-181-Grt2-14 | Grt2 | 9.1864  | 0.3788  | 0.5684  | 0.0127  |
| 24JX-181-Grt2-15 | Grt2 | 14.5419  | 0.1900  | 0.4268  | 0.0053  |
| 24JX-181-Grt2-16 | Grt2 | 11.7258  | 0.1700  | 0.5035  | 0.0090  |
| 24JX-181-Grt2-17 | Grt2 | 6.8286  | 0.1114  | 0.6495  | 0.0108  |
| 24JX-181-Grt2-18 | Grt2 | 22.2885  | 0.2730  | 0.1649  | 0.0023  |
| 24JX-181-Grt2-19 | Grt2 | 23.9701  | 0.6224  | 0.1092  | 0.0129  |
| 24JX-181-Grt2-20 | Grt2 | 24.0016  | 0.4600  | 0.1307  | 0.0088  |
| 24JX-181-Grt2-21 | Grt2 | 15.5158  | 0.3057  | 0.3863  | 0.0055  |
| 24JX-181-Grt2-22 | Grt2 | 26.0614  | 0.3258  | 0.0823  | 0.0022  |
| 24JX-181-Grt2-23 | Grt2 | 25.6700  | 0.2275  | 0.0724  | 0.0007  |
| 24JX-181-Grt2-24 | Grt2 | 27.0940  | 0.2476  | 0.0717  | 0.0006  |
| 24JX-181-Grt2-25 | Grt2 | 11.8399  | 0.1533  | 0.5074  | 0.0063  |
| 24JX-181-Grt2-26 | Grt2 | 11.3317  | 0.1894  | 0.5114  | 0.0080  |
| 24JX-181-Grt2-27 | Grt2 | 22.3815  | 0.2836  | 0.1825  | 0.0022  |
| 24JX-171-Grt3-01 | Grt3 | 2.2192  | 0.2991  | 0.7920  | 0.0285  |
| 24JX-171-Grt3-02 | Grt3 | 6.4244  | 0.3929  | 0.7157  | 0.0206  |
| 24JX-171-Grt3-03 | Grt3 | 1.6338  | 0.2236  | 0.8043  | 0.0137  |
| 24JX-171-Grt3-04 | Grt3 | 15.7242  | 1.0636  | 0.3267  | 0.0188  |
| 24JX-171-Grt3-05 | Grt3 | 1.6688  | 0.1833  | 0.8040  | 0.0094  |
| 24JX-171-Grt3-06 | Grt3 | 1.4733  | 0.1847  | 0.8033  | 0.0097  |
| 24JX-171-Grt3-07 | Grt3 | 2.4644  | 0.2243  | 0.8125  | 0.0119  |
| 24JX-171-Grt3-08 | Grt3 | 0.3424  | 0.0379  | 0.8529  | 0.0090  |
| 24JX-171-Grt3-09 | Grt3 | 6.2220  | 0.7550  | 0.6446  | 0.0264  |
| 24JX-171-Grt3-10 | Grt3 | 0.1168  | 0.0305  | 0.8501  | 0.0096  |
| 24JX-171-Grt3-11 | Grt3 | 0.2697  | 0.0286  | 0.8595  | 0.0091  |
| 24JX-171-Grt3-12 | Grt3 | 1.7495  | 0.1932  | 0.7769  | 0.0100  |
| 24JX-171-Grt3-13 | Grt3 | 9.8096  | 0.4614  | 0.5923  | 0.0164  |
| 24JX-171-Grt3-14 | Grt3 | 8.7907  | 0.5652  | 0.5599  | 0.0166  |
| 24JX-171-Grt3-15 | Grt3 | 0.9296  | 0.1067  | 0.7983  | 0.0113  |
| 24JX-171-Grt3-16 | Grt3 | 0.7767  | 0.0926  | 0.8257  | 0.0145  |
| 24JX-171-Grt3-17 | Grt3 | 1.5121  | 0.1969  | 0.8319  | 0.0126  |
| 24JX-177-Grt3-01 | Grt3 | 4.0359  | 0.4605  | 0.7157  | 0.0149  |
| 24JX-177-Grt3-02 | Grt3 | 2.6954  | 0.1532  | 0.7601  | 0.0112  |
| 24JX-177-Grt3-03 | Grt3 | 0.6311  | 0.0888  | 0.8103  | 0.0113  |
| 24JX-177-Grt3-04 | Grt3 | 0.3817  | 0.0818  | 0.8491  | 0.0161  |
| 24JX-177-Grt3-05 | Grt3 | 15.7760  | 0.8037  | 0.3938  | 0.0166  |
| 24JX-177-Grt3-06 | Grt3 | 9.9573  | 0.6923  | 0.4874  | 0.0200  |
| 24JX-177-Grt3-07 | Grt3 | 12.3134  | 1.0906  | 0.3985  | 0.0208  |
| 24JX-177-Grt3-08 | Grt3 | 27.5682  | 0.4792  | 0.0860  | 0.0291  |
| 24JX-177-Grt3-09 | Grt3 | 0.1327  | 0.0273  | 0.8406  | 0.0104  |
| 24JX-177-Grt3-10 | Grt3 | 0.1575  | 0.0170  | 0.8668  | 0.0258  |
| 24JX-177-Grt3-11 | Grt3 | 9.1690  | 0.5021  | 0.5906  | 0.0281  |
| 24JX-177-Grt3-12 | Grt3 | 9.0313  | 1.2792  | 0.5369  | 0.0382  |
| 24JX-177-Grt3-13 | Grt3 | 26.8428  | 0.5388  | 0.1196  | 0.0441  |
| 24JX-177-Grt3-14 | Grt3 | 13.3191  | 0.9971  | 0.3640  | 0.0228  |
| 24JX-177-Grt3-15 | Grt3 | 9.2926  | 0.5432  | 0.5232  | 0.0257  |