

附表 1 北秦岭构造带东段官坡花岗伟晶岩 LA-ICP-MS 锆石 U-Pb 同位素分析结果

Appendix 1 LA-ICP-MS zircon U-Pb isotope analysis results for granitic pegmatites from the Guanpo area, eastern North Qinling tectonic belt

测点	含量($\times 10^{-6}$)		Th/U	同位素比值						年龄(Ma)						谐和度(%)
	Th	U		$^{207}\text{Pb}/^{206}\text{Pb}$	1 σ	$^{207}\text{Pb}/^{235}\text{U}$	1 σ	$^{206}\text{Pb}/^{238}\text{U}$	1 σ	$^{207}\text{Pb}/^{206}\text{Pb}$	1 σ	$^{207}\text{Pb}/^{235}\text{U}$	1 σ	$^{206}\text{Pb}/^{238}\text{U}$	1 σ	
样品 GP002-1(峡河村花岗伟晶岩边部)																
01	127	749	0.17	0.2453	0.0074	15.6538	0.5066	0.4620	0.0068	3155	48	2856	31	2448	30	84
02	24	452	0.05	0.2835	0.0118	24.8570	1.9035	0.6266	0.0387	3382	65	3303	75	3136	153	94
03	498	1309	0.38	0.0505	0.0019	0.2225	0.0082	0.0319	0.0003	217	87	204	7	202	2	99
04	42	384	0.11	0.3048	0.0092	27.4264	0.8180	0.6524	0.0090	3495	47	3399	29	3238	35	95
05	107	171	0.63	0.0980	0.0029	3.5987	0.1261	0.2653	0.0045	1587	56	1549	28	1517	23	97
06	392	3817	0.10	0.0788	0.0023	0.6329	0.0188	0.0582	0.0008	1169	62	498	12	365	5	69
07	151	733	0.21	0.2113	0.0046	9.5621	0.3965	0.3261	0.0097	2916	35	2394	38	1819	47	72
08	911	1395	0.65	0.0562	0.0012	0.5244	0.0112	0.0676	0.0006	461	46	428	7	422	4	98
09	865	6488	0.13	0.0702	0.0016	0.5279	0.0126	0.0547	0.0011	1000	51	430	8	343	7	77
10	745	5449	0.14	0.0609	0.0012	0.3773	0.0127	0.0447	0.0009	635	44	325	9	282	6	85
11	620	5564	0.11	0.0701	0.0017	0.5164	0.0192	0.0532	0.0011	931	55	423	13	334	7	76
12	1608	7994	0.20	0.0622	0.0011	0.3695	0.0098	0.0431	0.0010	683	39	319	7	272	6	83
13	379	2030	0.19	0.1339	0.0019	2.4353	0.0739	0.1316	0.0034	2150	25	1253	22	797	19	55
14	68	539	0.13	0.0682	0.0013	1.4197	0.0290	0.1508	0.0016	876	39	897	12	905	9	99
15	921	5916	0.16	0.0676	0.0018	0.4756	0.0131	0.0511	0.0008	857	55	395	9	321	5	79
16	64	8777	0.01	0.1414	0.0228	0.8608	0.2254	0.0355	0.0025	2256	282	631	123	225	16	5
17	20	361	0.06	0.3017	0.0049	24.9658	0.6175	0.5989	0.0099	3479	26	3307	24	3025	40	91
18	8	285	0.03	0.3110	0.0044	30.7341	0.4948	0.7158	0.0066	3526	21	3511	16	3480	25	99
19	552	1525	0.36	0.0625	0.0016	0.6074	0.0119	0.0708	0.0013	692	54	482	8	441	8	91
20	220	4566	0.05	0.0573	0.0009	0.4574	0.0163	0.0578	0.0019	502	61	382	11	362	12	94
21	61	1666	0.04	0.2336	0.0057	7.7172	0.5680	0.2339	0.0125	3077	39	2199	66	1355	65	52
22	88	472	0.19	0.0705	0.0011	1.3161	0.0235	0.1351	0.0013	944	33	853	10	817	7	95
23	83	299	0.28	0.0888	0.0030	2.6443	0.2416	0.2066	0.0158	1411	66	1313	67	1211	84	91
24	59	200	0.29	0.2573	0.0040	19.8062	0.6793	0.5550	0.0147	3231	25	3082	33	2846	61	92
25	228	667	0.34	0.2835	0.0047	16.3300	0.5157	0.4152	0.0092	3382	26	2896	30	2239	42	74
26	172	425	0.41	0.0691	0.0013	1.4801	0.0281	0.1551	0.0020	902	38	922	12	930	11	99
27	200	483	0.41	0.3116	0.0048	24.3730	0.6182	0.5691	0.0190	3529	25	3283	25	2904	78	87
28	126	325	0.39	0.0973	0.0014	3.6300	0.0525	0.2703	0.0026	1573	26	1556	12	1542	13	99
29	68	3667	0.02	0.0609	0.0012	0.4760	0.0184	0.0573	0.0023	635	43	395	13	359	14	90
30	63	162	0.39	0.3092	0.0075	32.9924	2.2941	0.7622	0.0309	3517	37	3580	69	3652	113	98
样品 GP002-5(峡河村花岗伟晶岩中部)																
01	11	5109	0.002	0.0591	0.0013	0.4696	0.0183	0.0573	0.0012	572	48	391	13	359	7	91
02	27	9014	0.003	0.0661	0.0019	0.4395	0.0239	0.0488	0.0029	811	64	370	17	307	18	81
03	26	7477	0.004	0.0595	0.0035	0.4057	0.0132	0.0486	0.0019	583	128	346	10	306	12	87
04	660	4468	0.148	0.1146	0.0041	1.2018	0.0733	0.0749	0.0025	1873	63	801	34	465	15	46
05	49	9681	0.005	0.0730	0.0018	0.5715	0.0117	0.0572	0.0015	1015	49	459	8	359	9	75
06	24	7126	0.003	0.0579	0.0009	0.4621	0.0099	0.0577	0.0007	528	36	386	7	362	4	93
07	221	26822	0.008	0.0795	0.0047	0.6888	0.0577	0.0622	0.0021	1183	117	532	35	389	13	68
08	10	4486	0.002	0.0706	0.0044	0.6004	0.0546	0.0597	0.0017	946	160	478	35	374	10	75
09	25	6486	0.004	0.0555	0.0007	0.4405	0.0060	0.0575	0.0004	432	-3	371	4	361	3	97
10	230	46290	0.005	0.0619	0.0019	0.4813	0.0161	0.0574	0.0024	672	71	399	11	360	15	89
11	10	3904	0.002	0.0763	0.0018	0.6519	0.0256	0.0616	0.0015	1103	46	510	16	385	9	72
12	13	5572	0.002	0.0587	0.0008	0.4653	0.0120	0.0575	0.0013	567	30	388	8	360	8	92
13	16	4967	0.003	0.0562	0.0007	0.4461	0.0053	0.0576	0.0006	461	28	375	4	361	4	96
14	16	4515	0.004	0.0734	0.0059	0.6396	0.0725	0.0605	0.0017	1026	167	502	45	379	10	71
15	1119	40487	0.028	0.1772	0.0133	1.6776	0.2242	0.0611	0.0062	2628	124	1000	85	382	38	10

续附表 1																
测点	含量($\times 10^{-6}$)		Th/U	同位素比值						年龄(Ma)						谐和度 (%)
	Th	U		$^{207}\text{Pb}/^{206}\text{Pb}$	1 σ	$^{207}\text{Pb}/^{235}\text{U}$	1 σ	$^{206}\text{Pb}/^{238}\text{U}$	1 σ	$^{207}\text{Pb}/^{206}\text{Pb}$	1 σ	$^{207}\text{Pb}/^{235}\text{U}$	1 σ	$^{206}\text{Pb}/^{238}\text{U}$	1 σ	
16	362	13518	0.027	0.1217	0.0060	0.7375	0.0432	0.0441	0.0013	1981	87	561	25	278	8	32
17	6	3024	0.002	0.0746	0.0026	0.7020	0.0388	0.0679	0.0024	1059	70	540	23	423	14	75
18	22	6816	0.003	0.0561	0.0006	0.4430	0.0070	0.0572	0.0005	457	22	372	5	359	3	96
19	13	4931	0.003	0.0665	0.0022	0.5036	0.0130	0.0555	0.0013	820	75	414	9	348	8	82
20	11	4099	0.003	0.1076	0.0034	0.8423	0.0277	0.0570	0.0013	1761	58	620	15	357	8	46
21	35	6256	0.006	0.1199	0.0080	0.8780	0.0757	0.0519	0.0015	1955	119	640	41	326	9	35
22	33	8645	0.004	0.0616	0.0016	0.4887	0.0279	0.0572	0.0025	661	56	404	19	359	16	88
23	23	6602	0.003	0.0568	0.0008	0.4426	0.0180	0.0570	0.0029	483	34	372	13	357	18	95
24	16	5954	0.003	0.0547	0.0006	0.4359	0.0064	0.0578	0.0006	467	26	367	4	362	4	98
25	1883	10266	0.183	0.0869	0.0041	0.5630	0.0353	0.0469	0.0016	1359	91	453	23	296	10	57
26	339	46454	0.007	0.0774	0.0033	0.5435	0.0189	0.0524	0.0023	1132	81	441	12	329	14	70
27	16	4980	0.003	0.0552	0.0010	0.4387	0.0078	0.0578	0.0007	420	41	369	6	362	4	97
28	28	10542	0.003	0.0614	0.0016	0.3897	0.0186	0.0460	0.0018	654	56	334	14	290	11	85
29	25	5374	0.005	0.0942	0.0056	0.7607	0.0487	0.0589	0.0025	1522	113	574	28	369	15	56
30	18	6036	0.003	0.0594	0.0009	0.4722	0.0104	0.0577	0.0009	589	33	393	7	362	5	91
样品 GP002-6(峡河村花岗岩伟晶岩中部)																
01	29	13940	0.002	0.0560	0.0006	0.4499	0.0070	0.0583	0.0007	454	24	377	5	365	4	96
02	363	46122	0.008	0.0558	0.0012	0.3657	0.0128	0.0482	0.0022	456	51	316	10	303	14	95
03	61	2630	0.023	0.1665	0.0113	1.8824	0.1936	0.0776	0.0031	2524	114	1075	68	482	18	23
04	33	4364	0.007	0.0712	0.0040	0.6473	0.0588	0.0637	0.0021	962	116	507	36	398	13	75
05	37	3246	0.011	0.0759	0.0020	0.7000	0.0258	0.0666	0.0013	1094	53	539	15	416	8	74
06	18	5453	0.003	0.0550	0.0006	0.4395	0.0063	0.0580	0.0007	409	24	370	4	364	4	98
07	18	4117	0.004	0.1233	0.0121	1.1186	0.1422	0.0621	0.0018	2006	174	762	68	389	11	35
08	19	6087	0.003	0.0555	0.0006	0.4422	0.0059	0.0577	0.0005	435	26	372	4	362	3	97
09	20	6045	0.003	0.0560	0.0007	0.4480	0.0184	0.0580	0.0023	454	23	376	13	363	14	96
10	17	5868	0.003	0.0645	0.0016	0.4868	0.0131	0.0548	0.0008	767	53	403	9	344	5	84
11	15	7355	0.002	0.0560	0.0007	0.4472	0.0101	0.0579	0.0011	454	25	375	7	363	7	96
12	19	7292	0.003	0.0543	0.0007	0.4294	0.0061	0.0574	0.0005	383	21	363	4	360	3	99
13	101	18799	0.005	0.0782	0.0027	0.6149	0.0332	0.0577	0.0031	1154	69	487	21	362	19	70
14	21	7387	0.003	0.0543	0.0006	0.4292	0.0064	0.0573	0.0005	383	19	363	5	359	3	99
15	41	4013	0.010	0.0682	0.0018	0.6077	0.0333	0.0638	0.0020	876	54	482	21	398	12	80
16	150	4897	0.031	0.0861	0.0032	0.6651	0.0299	0.0557	0.0007	1340	73	518	18	350	4	61
17	23	8069	0.003	0.0625	0.0027	0.4698	0.0302	0.0538	0.0011	700	94	391	21	338	7	85
18	22	6420	0.003	0.0741	0.0031	0.3963	0.0248	0.0385	0.0012	1044	81	339	18	244	8	67
19	39	11513	0.003	0.0591	0.0009	0.2508	0.0111	0.0307	0.0012	569	6	227	9	195	7	84
20	32	4608	0.007	0.0567	0.0007	0.4551	0.0131	0.0581	0.0014	480	26	381	9	364	9	95
21	14	4978	0.003	0.1169	0.0039	0.8483	0.0427	0.0521	0.0010	1910	59	624	23	327	6	37
22	147	27595	0.005	0.0680	0.0025	0.4424	0.0159	0.0483	0.0021	878	76	372	11	304	13	79
23	21	3937	0.005	0.0607	0.0008	0.4804	0.0134	0.0575	0.0015	628	30	398	9	360	9	89
24	62	3659	0.017	0.0756	0.0023	0.6561	0.0360	0.0621	0.0018	1085	62	512	22	389	11	72
25	119	16973	0.007	0.2323	0.0383	6.1779	2.5962	0.1132	0.0266	3068	266	2001	367	691	154	2
26	123	678	0.182	0.0846	0.0041	1.5592	0.0711	0.1349	0.0040	1306	94	954	28	816	23	84
27	88	6431	0.014	0.0743	0.0023	0.5982	0.0252	0.0579	0.0010	1050	68	476	16	363	6	73
28	205	399	0.513	0.1038	0.0013	3.8521	0.0655	0.2691	0.0028	1692	24	1604	14	1536	14	95
29	25	12619	0.002	0.0642	0.0008	0.3511	0.0081	0.0397	0.0009	750	28	306	6	251	6	80
30	20	5691	0.003	0.0543	0.0006	0.4314	0.0058	0.0576	0.0005	383	21	364	4	361	3	99
样品 GP005-1(上河村花岗岩伟晶岩)																
01	1037	9794	0.11	0.0674	0.0015	0.4960	0.0177	0.0531	0.0011	852	45	409	12	334	7	79
02	227	2257	0.10	0.0536	0.0009	0.4763	0.0134	0.0646	0.0017	354	34	396	9	403	10	98
03	423	6909	0.06	0.0616	0.0010	0.4525	0.0124	0.0534	0.0015	661	31	379	9	336	9	87
04	621	1129	0.55	0.0580	0.0009	0.6441	0.0131	0.0805	0.0012	532	33	505	8	499	7	98
05	617	16273	0.04	0.0552	0.0007	0.3992	0.0089	0.0525	0.0012	420	30	341	6	330	7	96
06	195	4735	0.04	0.0653	0.0013	0.5346	0.0265	0.0589	0.0022	783	45	435	18	369	13	83

续附表 1

测点	含量($\times 10^{-6}$)		Th/U	同位素比值						年龄(Ma)						谐和度 (%)
	Th	U		$^{207}\text{Pb}/^{206}\text{Pb}$	1σ	$^{207}\text{Pb}/^{235}\text{U}$	1σ	$^{206}\text{Pb}/^{238}\text{U}$	1σ	$^{207}\text{Pb}/^{206}\text{Pb}$	1σ	$^{207}\text{Pb}/^{235}\text{U}$	1σ	$^{206}\text{Pb}/^{238}\text{U}$	1σ	
07	318	14613	0.02	0.0539	0.0006	0.3988	0.0084	0.0537	0.0010	369	28	341	6	337	6	98
08	270	13239	0.02	0.0538	0.0007	0.5106	0.0531	0.0684	0.0067	365	31	419	36	426	40	98
09	200	7808	0.03	0.0628	0.0010	0.5061	0.0125	0.0585	0.0011	702	-1	416	8	366	7	87
10	1020	24174	0.04	0.0738	0.0086	0.4680	0.0852	0.0428	0.0018	1039	234	390	59	270	11	63
11	871	8106	0.11	0.0731	0.0012	0.3641	0.0084	0.0361	0.0006	1017	33	315	6	229	4	68
12	1207	10500	0.11	0.0739	0.0013	0.5236	0.0094	0.0515	0.0010	1039	32	428	6	324	6	72
13	389	17734	0.02	0.0545	0.0007	0.3997	0.0126	0.0532	0.0016	394	28	341	9	334	10	97
14	514	880	0.58	0.0783	0.0013	1.6798	0.0767	0.1548	0.0057	1155	31	1001	29	928	32	92
15	383	1749	0.22	0.1217	0.0037	1.4084	0.0461	0.0844	0.0021	1983	54	892	19	522	12	47
16	790	10732	0.07	0.0870	0.0024	1.6380	0.2457	0.1388	0.0212	1361	54	985	95	838	120	83
17	273	11436	0.02	0.0568	0.0021	0.4017	0.0171	0.0527	0.0025	483	47	343	12	331	15	96
18	165	735	0.22	0.0864	0.0017	1.4608	0.0439	0.1225	0.0021	1346	39	914	18	745	12	79
19	1247	1231	1.01	0.0611	0.0012	0.6914	0.0145	0.0821	0.0007	643	43	534	9	509	4	95
20	129	240	0.54	0.0888	0.0018	3.0303	0.0680	0.2481	0.0046	1400	39	1415	17	1429	24	99
21	279	4634	0.06	0.0838	0.0014	0.8235	0.0257	0.0713	0.0019	1289	32	610	14	444	11	68
22	1042	7911	0.13	0.0648	0.0013	0.3854	0.0285	0.0428	0.0028	766	44	331	21	270	17	79
23	315	9612	0.03	0.1207	0.0061	0.5997	0.0342	0.0359	0.0007	1969	89	477	22	227	4	29
24	422	1804	0.23	0.1272	0.0041	1.2405	0.0340	0.0710	0.0010	2061	58	819	15	442	6	40
25	406	10290	0.04	0.0764	0.0014	0.3574	0.0103	0.0339	0.0008	1106	5	310	8	215	5	63
26	756	8367	0.09	0.0927	0.0086	0.6975	0.0770	0.0534	0.0022	1483	177	537	46	335	14	53
27	1682	2715	0.62	0.0629	0.0012	0.5318	0.0246	0.0609	0.0021	706	41	433	16	381	13	87
28	1341	3165	0.42	0.0729	0.0018	0.5349	0.0255	0.0529	0.0018	1010	50	435	17	332	11	73
29	4353	14014	0.31	0.1272	0.0055	1.0721	0.0527	0.0612	0.0017	2061	77	740	26	383	10	36
30	293	9260	0.03	0.0687	0.0019	0.4794	0.0131	0.0508	0.0010	900	56	398	9	319	6	78
31	426	526	0.81	0.1021	0.0056	3.1058	0.2391	0.2176	0.0040	1663	101	1434	59	1269	21	87
32	106	5999	0.02	0.0651	0.0023	0.4778	0.0203	0.0531	0.0006	776	75	397	14	334	3	82
33	288	1066	0.27	0.0933	0.0015	2.0685	0.0424	0.1609	0.0024	1494	30	1138	14	962	14	83
34	37	2409	0.02	0.1163	0.0046	1.1312	0.0702	0.0695	0.0020	1902	71	768	33	433	12	44
35	76	5454	0.01	0.0608	0.0011	0.4523	0.0139	0.0538	0.0011	632	39	379	10	338	6	88
36	292	13924	0.02	0.0554	0.0007	0.4083	0.0099	0.0535	0.0012	428	30	348	7	336	7	96
37	120	5661	0.02	0.0865	0.0017	0.6323	0.0168	0.0531	0.0014	1350	39	498	10	334	8	60
38	124	313	0.40	0.0937	0.0015	2.8695	0.0618	0.2219	0.0031	1502	31	1374	16	1292	16	93
39	1042	7648	0.14	0.0597	0.0010	0.3586	0.0109	0.0434	0.0010	594	31	311	8	274	6	87
40	856	4629	0.18	0.0582	0.0010	0.4319	0.0124	0.0538	0.0013	600	35	365	9	338	8	92
41	480	2828	0.17	0.0667	0.0010	0.5386	0.0132	0.0584	0.0011	829	33	437	9	366	7	82
42	77	573	0.13	0.0845	0.0018	1.2419	0.0393	0.1062	0.0023	1306	40	820	18	651	14	76
43	354	5703	0.06	0.0962	0.0086	0.6463	0.0361	0.0526	0.0027	1551	169	506	22	330	17	57
44	14	2413	0.01	0.0540	0.0009	0.5007	0.0120	0.0672	0.0014	372	31	412	8	419	8	98
45	237	476	0.50	0.0690	0.0024	0.7517	0.0247	0.0791	0.0009	898	70	569	14	491	6	85

附表 2 北秦岭构造带东段官坡花岗岩伟晶岩中锆石微量及稀土元素分析结果(×10⁻⁶)

Appendix 2 Zircon trace and REE compositions (×10⁻⁶) for granitic pegmatites from the Guampo area, eastern North Qinling tectonic belt

测点号	Ti	Y	Nb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	REE	Eu/Eu*	Ce/Ce*
样品 GP002-1(峡河村花岗岩伟晶岩边部)																						
01	10.6	1371	2.99	0.376	7.52	0.323	2.71	3.25	1.40	16.6	6.88	90.8	34.9	175	38.2	399	76.3	10038	1.02	855	0.58	5.19
02	4.83	526	3.19	0.545	10.3	0.676	4.64	2.10	17.4	6.32	2.35	31.7	13.8	78.2	19.0	228	45.6	10348	1.12	461	14.6	4.10
03	63.9	1567	8.30	2.85	23.5	1.70	9.40	5.18	0.204	19.7	7.04	97.6	40.2	209	46.2	498	93.4	11835	4.05	1056	0.06	2.57
04	7.06	1357	2.31	0.963	6.82	0.577	5.11	5.60	5.65	25.1	8.74	90.4	26.2	114	24.4	255	49.4	10156	0.728	619	1.46	2.20
05	19.9	1818	2.96	0.010	20.8	0.191	3.31	6.29	1.53	32.7	10.8	128	48.1	224	44.9	450	79.9	9068	1.20	1052	0.33	114
06	33.9	5069	133	5.45	42.5	6.09	44.2	52.3	4.46	152	40.4	376	100	377	73.6	715	121	17991	168	2114	0.15	1.77
07	22.9	2162	8.69	12.2	65.5	6.01	37.1	20.5	28.2	50.2	13.9	142	48.2	231	47.9	498	90.4	12079	6.54	1293	2.69	1.84
08	18.8	1569	9.07	5.23	85.7	5.63	38.3	27.1	7.15	59.3	14.1	136	41.3	174	34.5	343	60.7	11014	1.70	1033	0.55	3.80
09	51.9	5988	170	7.22	53.9	6.58	41.0	37.1	4.28	141	40.2	410	131	575	118	1184	209	16657	85.0	2961	0.18	1.88
10	50.2	3885	181	8.22	38.8	5.45	35.2	36.4	9.45	117	30.9	273	80.0	352	75.8	832	156	16557	147	2054	0.44	1.39
11	24.5	4468	103	20.3	109	12.3	66.3	42.3	9.64	130	34.4	316	88.2	357	73.0	779	138	18181	171	2178	0.40	1.67
12	81.2	4856	243	3.21	39.6	7.53	55.3	63.2	25.5	155	40.8	366	106	473	101	1086	184	15564	136	2710	0.79	1.94
13	91.0	11393	57.7	10.1	79.9	6.81	36.2	27.7	27.1	85.0	37.2	463	143	685	150	1596	252	13657	11.5	3601	1.71	2.32
14	12.1	953	1.50	0.088	1.45	0.102	1.53	4.59	0.281	30.2	8.83	90.9	25.9	104	20.3	185	30.9	12515	0.763	505	0.07	3.68
15	36.4	4038	53.9	8.32	46.7	3.80	18.2	17.6	5.06	70.1	22.5	270	93.8	419	88.9	907	160	14563	65.6	2133	0.44	2.00
16	17.1	6064	22.1	8.40	70.0	14.5	93.3	89.3	13.9	178	56.0	537	141	571	126	1434	218	17876	17.6	3553	0.34	1.53
17	5.19	528	2.77	0.176	2.24	0.137	1.13	1.05	0.803	7.94	2.65	34.2	12.6	65.9	15.6	186	36.5	10360	1.30	367	0.85	3.46
18	6.59	168	1.59	0.116	1.57	0.136	0.715	0.510	1.06	2.18	0.607	10.5	4.01	22.4	4.69	50.8	10.4	11017	0.658	110	3.07	2.99
19	9.59	2741	16.0	0.367	54.1	0.492	4.72	6.90	3.86	43.4	14.8	185	67.2	309	62.7	615	104	9203	2.77	1474	0.68	30.6
20	29.8	2731	18.2	3.43	24.9	4.07	31.3	44.2	1.62	122	31.7	264	56.9	217	52.8	686	122	19853	38.0	1665	0.07	1.60
21	110	4908	32.0	35.1	230	25.4	128	63.2	107	114	30.0	293	86.9	393	81.8	887	166	13738	5.47	2644	3.86	1.86
22	10.4	1712	2.38	0.294	3.04	0.591	5.31	11.2	1.12	50.2	15.6	155	44.0	168	29.4	249	38.1	12232	0.859	772	0.14	1.76
23	13.0	1559	1.92	0.060	15.4	0.078	1.44	3.29	0.734	21.5	8.45	105	40.9	195	39.3	391	70.8	10897	0.939	896	0.27	54.4
24	7.69	1016	2.82	0.538	13.6	0.567	5.57	7.51	5.38	26.7	6.82	81.9	30.5	139	26.6	260	44.8	9368	0.960	651	1.16	5.92
25	12.8	2327	5.58	4.73	31.1	2.89	17.3	14.6	9.50	50.1	15.4	163	53.7	237	46.6	459	84.4	9635	2.27	1190	1.07	2.02
26	7.64	2407	0.840	0.141	2.40	0.274	4.97	12.4	0.484	66.6	19.3	201	63.3	259	46.3	412	69.9	11651	0.458	1160	0.05	2.94
27	205	1991	4.94	1.96	21.1	1.60	10.1	13.5	8.37	51.6	15.4	155	48.5	215	42.3	431	82.5	8458	1.02	1100	0.97	2.86
28	12.9	4320	2.37	0.010	11.6	0.094	2.47	7.32	0.752	50.4	20.4	269	107	526	107	1104	195	11191	1.28	2405	0.12	90.5
29	14.1	2676	14.6	10.5	32.3	3.60	22.0	26.8	2.64	72.5	24.1	233	60.0	254	60.1	720	122	16876	15.2	1646	0.18	1.27
30	7.32	1236	2.61	2.37	13.8	0.901	6.92	5.43	0.907	25.7	8.27	101	36.1	164	31.5	299	50.4	9579	1.63	749	0.23	2.28

续附表 2

测点号	Ti	Y	Nb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	REE	Eu/Eu*	Ce/Ce*
样品 GP002-5(峡河村花岗伟晶岩中部)																						
01	11.2	1832	3.01	2.14	22.8	4.60	27.3	14.5	10.7	25.7	9.78	129	43.7	218	54.0	599	101	16265	3.59	1264	1.69	1.75
02	13.6	2489	9.22	9.41	46.6	7.25	35.8	28.1	7.76	56.4	25.0	258	58.3	234	52.4	528	74.6	30370	17.1	1423	0.60	1.36
03	14.8	2912	3.09	8.66	43.5	5.98	27.9	8.42	4.73	26.6	13.2	196	69.4	340	79.1	849	137	15625	3.88	1811	0.97	1.45
04	31.8	13991	29.0	90.3	76.7	24.2	124	138	13.0	394	167	1533	295	987	206	2044	263	17189	13.1	6360	0.17	0.39
05	4.46	4198	6.06	14.4	73.4	9.04	50.3	40.2	5.92	104	38.9	402	100	428	106	1287	222	15010	7.44	2884	0.28	1.55
06	4.28	3127	4.10	3.69	29.8	2.79	15.8	9.25	17.5	30.0	14.5	211	74.7	359	82.9	874	142	15251	3.64	1869	3.21	2.24
07	17.6	12742	18.5	10.7	57.8	10.5	60.8	94.9	7.14	316	149	1394	268	891	188	1920	243	17716	14.2	5616	0.13	1.32
08	2.49	2253	4.49	2.59	11.5	1.98	8.37	7.06	0.778	18.8	9.76	150	52.4	262	63.0	680	112	14982	4.34	1382	0.21	1.23
09	1.79	2678	3.41	0.058	0.665	0.100	0.395	1.45	0.656	16.7	10.5	165	63.9	314	74.6	800	136	15325	6.00	1587	0.41	2.09
10	5.70	4065	2.92	18.6	73.5	9.90	47.2	47.8	7.41	125	55.2	466	81.4	239	47.1	433	50.9	20297	11.3	1704	0.29	1.30
11	1.13	1677	1.78	0.643	3.11	0.543	2.81	2.89	0.796	11.6	7.42	112	41.5	208	49.6	535	88.3	15413	3.12	1066	0.42	1.27
12	2.78	2002	2.94	3.68	23.6	2.91	13.5	12.0	4.21	39.1	19.3	200	46.2	171	37.0	379	48.2	18284	5.45	1001	0.60	1.73
13	0.692	1946	2.30	0.401	0.859	0.131	1.10	1.57	0.184	11.3	7.58	127	48.2	233	56.4	607	99.4	15536	4.07	1196	0.13	0.90
14	4.44	2829	3.08	6.43	23.3	3.89	19.9	17.2	3.87	46.1	18.9	228	69.0	306	68.8	711	113	15199	3.33	1638	0.42	1.12
15	30.9	2547	9.95	11.4	62.0	8.62	40.3	31.9	6.98	59.4	25.3	253	60.2	249	60.5	684	107	16986	12.7	1662	0.49	1.51
16	13.8	1834	5.25	33.4	203	26.1	121	55.8	54.2	81.8	24.7	198	38.0	121	22.3	199	25.1	35121	22.6	1206	2.45	1.66
17	3.89	1169	8.42	2.26	13.0	1.91	8.79	9.33	0.984	22.7	12.3	127	28.1	115	26.9	295	43.8	21092	8.23	709	0.21	1.51
18	1.41	2259	2.50	0.274	2.09	0.209	0.682	1.05	0.517	13.2	8.50	140	52.1	260	61.7	659	106	15602	4.47	1308	0.43	2.10
19	5.80	2171	2.88	4.39	37.5	5.83	32.9	26.9	4.69	43.8	17.0	187	55.1	242	56.2	584	93.0	15337	2.98	1392	0.42	1.78
20	11.9	2292	14.2	5.96	29.3	4.43	23.8	28.3	1.93	73.0	30.3	257	51.8	187	45.1	557	90.6	18245	8.43	1386	0.13	1.37
21	14.5	9780	25.1	14.8	65.6	11.4	67.6	116	4.35	347	139	1152	208	668	141	1457	190	21787	14.0	4585	0.07	1.22
22	1.22	2680	1.71	1.19	6.12	1.45	11.4	27.5	0.368	91.7	35.7	303	57.1	209	47.7	534	78.8	18090	4.18	1408	0.02	1.12
23	4.91	2715	7.21	8.16	122	15.9	95.6	43.1	18.0	56.8	15.6	185	59.7	288	67.1	721	119	15119	5.68	1819	1.11	2.59
24	1.38	1846	1.99	1.96	13.1	2.15	9.60	4.85	1.99	14.0	8.34	127	44.4	216	50.8	533	88.1	15584	3.31	1116	0.74	1.54
25	3.20	1922	3.57	37.7	80.5	12.2	51.7	28.1	11.4	53.8	22.1	200	42.2	150	31.8	332	42.8	31654	21.1	1098	0.89	0.90
26	16.2	32012	41.4	16.3	88.6	22.0	188	342	5.82	1067	413	3517	675	2212	464	4826	647	14998	12.3	14488	0.03	1.13
27	0.577	1806	2.91	0.320	2.82	0.336	1.49	0.967	0.231	9.64	6.97	115	42.0	211	52.1	579	97.3	16168	4.45	1120	0.23	2.07
28	4.71	3005	5.93	7.39	44.4	5.06	22.2	17.5	5.96	47.1	23.5	270	63.9	242	51.8	507	68.9	18644	10.2	1379	0.64	1.75
29	7.23	2744	2.84	12.1	35.4	5.80	28.8	22.8	4.51	61.5	25.8	259	58.1	212	49.6	548	77.0	21520	13.1	1402	0.37	1.02
30	1.35	2089	3.85	21.9	69.4	5.55	21.7	7.72	4.48	20.2	10.3	145	52.6	260	64.3	701	119	15772	5.89	1505	1.10	1.51

续附表 2

测点号	Ti	Y	Nb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	REE	Eu/Eu*	Ce/Ce*
样品 GP002-6(峡河村花岗岩伟晶岩中部)																						
01	1.56	4254	4.75	0.011	0.228	0.011	0.190	1.88	0.056	24.5	17.8	289	101	507	129	1493	251	16670	9.88	2817	0.03	4.96
02	9.49	9004	6.10	62.0	232	35.6	198	125	6.49	277	93.9	920	214	897	216	2623	437	14837	10.7	6341	0.11	1.19
03	21.5	4191	15.2	34.0	106	16.4	85.8	74.8	7.54	177	57.2	493	106	362	68.2	654	101	15581	3.27	2347	0.20	1.09
04	4.06	1958	3.18	374	538	91.8	337	94.8	3.46	90.6	20.6	184	49.7	209	47.5	480	78.5	15742	3.31	2602	0.11	0.70
05	28.2	3945	12.3	31.1	85.4	12.8	73.9	66.4	5.25	161	51.3	441	97.0	339	70.7	737	120	19025	10.7	2294	0.15	1.03
06	3.16	1864	2.51	1.59	3.42	0.489	1.82	1.95	0.113	10.8	7.37	119	45.3	223	52.7	554	93.5	15583	4.15	1116	0.08	0.93
07	11.3	3219	12.5	19.6	69.4	10.4	56.1	46.6	7.21	99.2	33.4	304	74.0	282	58.1	582	91.4	17822	5.25	1734	0.32	1.17
08	1.07	2286	2.66	0.112	0.442	0.037	0.427	0.779	0.031	12.1	8.56	143	55.4	272	64.9	676	114	15430	4.84	1350	0.03	1.65
09	8.23	2558	2.73	6.79	19.5	1.66	6.70	7.18	1.84	27.2	13.9	180	58.8	275	64.6	683	108	15670	4.54	1456	0.40	1.40
10	6.49	2700	3.43	5.52	26.9	4.03	18.0	12.2	2.62	32.6	15.2	194	62.8	299	67.9	717	111	15215	4.24	1570	0.40	1.37
11	0.954	2944	2.53	0.118	0.460	0.061	0.468	1.52	0.104	16.1	11.5	190	70.0	343	86.3	981	158	16784	3.41	1860	0.06	1.30
12	0.656	2086	2.25	0.004	0.108	0.003	0.063	0.903	0.032	10.6	7.58	132	50.2	252	62.9	712	122	16417	4.34	1352	0.03	7.05
13	36.7	8078	9.26	15.0	102	13.4	74.6	87.0	10.6	226	92.8	848	179	652	147	1598	228	16938	11.0	4279	0.23	1.75
14	0.563	2074	2.03	0.032	0.302	0.013	0.151	0.651	0.068	11.0	7.54	127	50.0	252	63.0	685	119	16564	4.32	1318	0.08	3.60
15	4.93	5289	4.68	14.1	41.9	6.80	47.4	68.5	3.66	220	71.9	594	131	431	84.9	821	130	16115	5.84	2668	0.09	1.03
16	50.4	8173	36.5	74.8	155	31.6	161	155	18.2	391	127	1106	219	687	126	1171	170	17819	9.35	4597	0.23	0.77
17	3.05	2288	2.83	8.66	17.8	1.82	8.99	4.27	1.09	20.6	11.1	163	57.1	276	69.4	763	125	15430	5.02	1529	0.36	1.08
18	96.6	14700	13.3	52.7	251	42.0	197	101	23.0	227	110	1329	363	1479	316	3302	429	15331	10.8	8228	0.46	1.29
19	10.4	4619	8.19	60.8	123	14.1	61.7	23.5	3.88	47.3	19.2	270	93.2	462	126	1461	210	23257	25.9	2978	0.36	1.02
20	4.51	2523	5.96	5.70	24.2	2.41	11.6	8.43	3.23	29.4	14.6	191	60.4	270	62.2	637	105	16186	5.58	1427	0.63	1.57
21	15.0	2426	11.8	34.6	118	16.5	82.9	39.9	6.56	65.8	17.9	179	49.3	239	76.8	1112	208	26335	98.3	2250	0.39	1.19
22	27.2	6555	2.59	12.9	69.4	11.3	61.3	75.4	5.17	232	90.9	763	140	451	99.2	1067	149	18352	12.4	3230	0.12	1.39
23	2.97	2373	2.32	5.75	33.1	2.23	11.0	9.39	2.40	35.8	15.9	198	60.1	254	54.5	555	87.4	17232	4.29	1326	0.40	2.22
24	49.6	3637	14.6	24.3	66.0	11.5	60.0	54.2	5.44	129	44.7	390	93.2	335	66.7	644	97.5	15904	3.34	2024	0.20	0.95
25	14.6	14818	25.3	13.6	68.1	11.1	78.1	150	9.01	466	183	1621	343	1174	258	2652	382	17421	14.1	7414	0.10	1.34
26	37.5	1480	1.48	4.78	9.72	4.46	20.5	14.4	2.42	40.5	12.3	120	37.9	161	32.0	298	50.8	12791	0.895	810	0.31	0.51
27	97.2	6984	31.5	57.5	187	24.9	133	129	11.0	296	97.4	804	179	610	115	1038	151	15671	5.51	3838	0.17	1.19
28	41.7	733	3.06	1.08	40.3	0.583	5.91	6.87	1.29	24.0	6.47	65.0	22.6	96.3	18.8	179	31.9	9928	1.37	501	0.31	12.2
29	109	5706	8.23	102	250	30.6	144	60.5	6.12	112	38.2	437	128	560	141	1640	260	17049	4.48	3914	0.23	1.08
30	1.65	2159	2.83	0.216	0.247	0.021	0.276	1.13	0.035	11.4	8.14	134	50.5	254	61.1	638	107	15972	4.79	1268	0.03	0.88
样品 GP005-1(上河村花岗岩伟晶岩)																						
01	108	4983	77.1	46.8	157	32.8	192	135	17.9	211	51.1	455	120	566	142	1703	317	19934	37.1	4151	0.32	0.97
02	3.92	1075	8.70	2.05	7.04	1.49	10.6	8.54	0.762	17.8	5.38	66.2	26.1	153	45.2	598	122	22584	16.4	1066	0.19	0.97
03	26.9	3369	46.8	16.5	61.5	11.9	66.0	46.4	5.92	90.1	23.6	240	74.3	379	103	1328	257	20605	37.8	2704	0.28	1.06
04	18.4	2486	4.22	6.58	41.6	4.79	38.9	35.8	5.54	94.7	22.1	211	63.8	261	49.9	464	79.6	10228	1.36	1381	0.29	1.78
05	12.0	6390	29.5	48.9	153	24.9	125	69.3	10.6	124	36.2	410	151	784	196	2298	447	17729	48.5	4884	0.35	1.06
06	15.9	1990	16.6	9.86	32.5	6.23	36.6	28.4	3.93	53.1	14.1	142	46.3	234	61.9	777	147	19989	31.7	1595	0.31	1.00

续附表 2

测点号	Ti	Y	Nb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	REE	Eu/Eu*	Ce/Ce*
07	1.44	4759	23.3	0.680	3.17	0.461	1.82	2.86	0.225	28.7	15.5	249	108	651	183	2348	459	19641	46.1	4055	0.08	1.36
08	1.08	4168	21.1	0.566	2.03	0.259	1.65	2.22	0.131	26.3	13.3	219	96.1	570	162	2113	405	19428	42.1	3614	0.05	1.28
09	16.5	2647	12.0	26.3	134	15.9	86.3	28.2	11.2	47.4	13.0	159	62.6	351	93.7	1158	219	20810	23.2	2409	0.94	1.58
10	29.5	6910	42.2	23.1	104	14.8	86.9	58.3	7.40	117	36.6	439	168	884	230	2840	518	16832	73.4	5530	0.27	1.36
11	353	5738	59.8	50.8	239	37.2	219	142	18.1	253	56.7	480	130	581	139	1683	319	16596	46.1	4353	0.29	1.33
12	30.4	5190	58.5	46.1	131	30.0	170	118	21.2	185	47.6	436	122	599	160	2099	388	23017	50.3	4558	0.44	0.85
13	1.19	5509	24.2	1.59	5.44	0.784	3.65	4.09	0.437	33.7	18.6	300	128	752	212	2755	525	20214	50.3	4744	0.11	1.17
14	15.1	1474	8.38	1.41	48.9	0.932	6.25	7.08	0.793	21.3	7.55	98.9	38.4	188	43.3	472	86.7	12023	4.08	1023	0.20	10.3
15	36.5	2289	28.9	17.8	85.0	11.6	66.7	52.2	8.53	98.3	26.8	234	62.9	254	51.5	526	92.9	14258	5.34	1589	0.36	1.42
16	63.0	4996	48.0	73.3	241	32.5	163	73.6	45.5	128	29.4	302	108	622	172	2309	478	16246	55.4	4780	1.43	1.19
17	1.34	3779	21.3	0.216	1.10	0.016	0.366	1.83	0.020	19.2	11.2	195	89.3	534	143	1758	340	20201	36.3	3097	0.01	4.50
18	10.7	1700	7.00	20.7	24.8	5.98	27.9	14.0	2.31	33.3	10.3	123	43.8	196	38.1	375	64.4	13606	2.30	981	0.33	0.54
19	9.60	3359	5.81	8.59	48.3	4.29	41.7	44.8	10.2	139	31.5	290	87.4	339	62.8	583	99.5	9500	1.53	1793	0.40	1.91
20	5.63	1446	2.22	0.554	22.8	0.221	2.07	3.21	0.241	20.6	7.31	98.7	38.4	191	40.5	424	77.6	11837	1.38	928	0.09	15.7
21	2.75	2883	10.2	21.9	92.6	13.9	90.4	53.6	12.2	108	30.6	266	73.0	331	82.5	998	175	20883	62.2	2351	0.49	1.28
22	64.5	5112	59.3	43.9	154	28.5	166	108	12.7	187	47.3	416	118	552	132	1613	286	21548	38.9	3870	0.27	1.05
23	37.0	6970	13.5	57.9	265	32.6	181	93.3	43.8	178	45.7	473	156	789	195	2346	429	16597	19.0	5289	1.04	1.47
24	14.0	2897	10.8	19.8	75.4	12.2	69.9	50.1	12.0	107	30.0	271	73.7	301	60.8	605	98.2	11831	2.87	1788	0.50	1.17
25	51.1	6760	49.2	32.6	195	27.4	164	118	16.1	215	55.7	522	156	739	177	2057	380	16127	48.7	4861	0.31	1.57
26	1362	5879	101	55.2	231	41.0	271	152	21.9	258	64.9	528	144	628	157	1876	344	19909	53.3	4778	0.34	1.17
27	41.4	1993	45.9	30.6	94.4	22.5	116	82.3	8.32	120	27.7	213	54.9	241	60.6	769	143	22040	21.9	1987	0.26	0.86
28	63.0	5743	101	126	395	82.3	456	345	33.4	527	117	810	154	500	96.8	1007	157	23170	69.8	4812	0.24	0.93
29	26.9	24900	44.5	203	234	72.1	432	368	31.1	1002	263	2338	599	2237	410	3901	627	17278	48.1	12722	0.16	0.47
30	5.82	3819	15.5	13.8	31.2	8.35	43.8	28.6	5.71	58.3	19.2	241	89.9	472	124	1503	271	15843	26.7	2912	0.43	0.70
31	15.1	1799	7.12	57.8	37.2	4.37	17.0	9.62	1.32	32.9	10.8	127	47.1	217	44.4	431	76.7	10589	2.78	1115	0.23	0.56
32	8.15	3949	9.94	13.1	75.9	11.4	60.2	38.5	21.7	99.9	26.8	275	84.8	408	100	1268	239	20866	23.1	2725	1.07	1.50
33	20.1	1481	5.37	2.81	32.6	1.24	7.36	5.91	1.33	20.7	7.94	105	39.6	199	43.9	467	88.5	13324	3.74	1026	0.37	4.19
34	4.12	966	5.54	3.13	14.7	2.38	13.6	7.75	2.67	18.3	5.65	69.3	23.6	136	38.4	528	104	21376	31.2	968	0.68	1.30
35	3.81	1702	13.5	2.87	9.40	1.41	7.96	4.82	1.05	18.3	7.31	100	41.4	267	89.6	1355	309	21751	40.9	2216	0.34	1.12
36	1.80	4983	32.9	2.10	9.41	1.11	6.54	7.00	0.605	35.6	19.0	290	111	635	185	2446	473	23337	87.9	4224	0.12	1.49
37	94.8	2717	85.6	9.73	33.1	4.25	22.9	15.4	3.17	41.4	14.5	178	63.5	359	99.9	1287	252	22100	98.0	2386	0.38	1.24
38	84.3	1464	3.55	0.066	11.0	0.112	1.32	2.81	0.388	20.4	7.68	100	40.2	189	39.7	403	73.8	11286	2.10	891	0.16	30.7
39	23.5	4132	20.5	1023	2017	212	872	239	23.9	271	53.3	392	97.3	411	93.5	1063	188	22101	41.9	6961	0.29	1.04
40	23.3	6485	31.4	24.7	96.9	18.4	109	91.6	7.71	217	61.1	545	148	632	144	1521	267	23019	43.8	3886	0.17	1.09
40	18.3	2133	33.9	11.8	41.4	9.02	50.8	36.1	4.43	67.5	18.7	175	48.8	227	55.1	647	121	23086	47.2	1515	0.27	0.97
42	37.3	1020	2.73	3.49	16.4	2.07	6.93	4.95	0.930	18.0	5.54	74.7	28.5	134	29.9	324	60.9	12355	2.37	711	0.30	1.47
43	28.4	3961	40.0	16.0	93.2	16.6	96.1	66.6	10.5	113	30.2	299	90.3	455	123	1545	304	21337	32.4	3261	0.37	1.38
44	0.577	706	4.32	0.160	0.781	0.090	0.816	0.600	0.046	4.55	2.84	43.6	17.8	99.7	27.7	356	70.3	24509	52.7	625	0.09	1.57
45	8.37	891	4.58	2.11	10.3	1.49	11.6	11.8	1.80	31.0	7.86	80.5	26.1	111	23.0	233	44.6	9479	1.23	597	0.29	1.40

注:δEu=Eu_N/(Sm_N+Gd_N)^{1/2};δCe=Ce_N/(La_N+Pr_N)^{1/2}。

附表 3 北秦岭构造带东段官坡花岗岩伟晶岩主量元素(%)和微量元素分析结果($\times 10^{-6}$)
Appendix 3 Major (%) and trace element ($\times 10^{-6}$) compositions for granitic pegmatites from the Guanpo area, eastern North Qinling tectonic belt

样品号	GP002/1	GP002/2	GP002/3	GP002/4	GP002/5	GP002/6	GP002/7	GP002/8	GP002/9	GP002/10	GP002/11	GP005/1	GP005/2	GP005/3	GP005/4	GP005/5	GP005/6	GP005/7
岩性	峡河村花岗岩伟晶岩边部			峡河村花岗岩伟晶岩中部			峡河村花岗岩伟晶岩中部			峡河村花岗岩伟晶岩中部			峡河村花岗岩伟晶岩中部			上河村花岗岩伟晶岩		
SiO ₂	73.8	73.7	72.8	73.5	70.5	73.9	74.5	73.6	77.3	71.3	73.6	79.6	74.3	70.2	70.5	71.3	76.5	74.8
TiO ₂	0.037	0.039	0.039	0.038	0.012	0.036	0.017	0.011	0.011	0.009	0.012	0.010	0.010	0.011	0.006	0.004	0.004	0.012
Al ₂ O ₃	15.2	15.2	15.9	15.4	15.8	15.7	15.4	16.2	13.9	16.6	14.7	12.7	16.0	16.6	16.6	16.0	13.0	15.6
TFeO	0.585	0.553	0.579	0.567	2.91	0.412	0.196	0.137	0.261	0.146	2.32	0.137	0.154	0.181	0.168	0.151	0.141	0.147
Fe ₂ O ₃	0.195	0.191	0.242	0.228	0.490	0.161	0.134	0.047	0.208	0.078	0.369	0.068	0.086	0.118	0.103	0.084	0.073	0.079
FeO	0.412	0.383	0.364	0.364	2.47	0.268	0.077	0.096	0.077	0.077	1.99	0.077	0.077	0.077	0.077	0.077	0.077	0.077
MnO	0.065	0.058	0.062	0.057	0.531	0.014	0.011	0.008	0.033	0.008	0.405	0.008	0.014	0.007	0.012	0.007	0.007	0.010
MgO	0.090	0.065	0.072	0.053	0.173	0.072	0.046	0.043	0.040	0.053	0.134	0.019	0.069	0.036	0.013	0.030	0.019	0.002
CaO	0.955	0.890	0.956	0.959	0.408	1.95	1.09	1.88	1.28	1.51	0.478	1.66	2.07	0.222	0.232	0.197	0.175	2.03
Na ₂ O	3.73	3.81	3.85	3.82	2.21	5.66	4.48	5.73	4.75	5.16	2.60	5.07	6.50	2.25	2.48	2.21	1.79	6.35
K ₂ O	5.15	5.16	5.33	5.20	6.83	1.94	3.83	2.04	1.92	4.80	5.13	0.433	0.588	10.0	9.61	9.64	8.07	0.801
P ₂ O ₅	0.016	0.014	0.005	0.008	0.165	0.077	0.069	0.067	0.059	0.080	0.113	0.023	0.031	0.034	0.026	0.027	0.028	0.031
LOI	0.398	0.410	0.389	0.409	0.358	0.214	0.320	0.213	0.417	0.277	0.459	0.277	0.225	0.345	0.249	0.348	0.188	0.258
Total	99.99	99.99	99.99	99.99	100.02	100.00	99.99	99.99	100.00	99.98	100.02	99.98	99.99	99.90	99.90	99.89	99.90	99.99
Li	22.9	28.3	22.4	25.8	24.3	17.5	10.7	5.81	23.5	6.28	29.4	2.65	3.50	2.53	1.60	1.65	1.31	3.82
Be	1.40	1.39	1.33	1.27	1.22	3.49	3.94	3.48	1.79	2.75	1.08	2.73	3.33	0.483	0.506	0.462	0.381	3.27
Sc	4.08	5.04	5.56	3.40	5.06	5.87	5.36	15.9	4.46	6.46	8.20	11.5	11.2	3.18	3.91	2.78	3.34	8.47
V	1.87	1.80	1.85	1.79	1.09	0.902	0.789	0.858	0.702	0.588	0.747	0.673	0.570	1.06	1.00	0.562	0.409	0.515
Cr	5.70	4.34	6.42	4.24	4.57	4.67	4.57	3.84	4.46	4.82	3.28	3.47	4.24	3.50	4.06	3.93	4.23	3.76
Co	1.15	1.59	1.46	0.702	1.44	1.30	0.684	0.497	2.59	1.13	1.15	0.853	1.59	1.56	1.43	1.19	0.588	0.640
Ni	1.14	0.733	1.64	0.804	0.612	1.47	1.03	1.13	3.96	1.11	0.693	1.87	1.60	0.621	0.567	0.339	0.521	1.60
Cu	4.34	4.34	4.63	4.81	1.05	1.33	1.09	0.895	0.934	1.18	0.648	0.854	1.33	1.49	1.28	0.825	0.793	0.915
Zn	5.86	4.78	5.26	35.7	9.20	6.94	4.73	3.03	1.72	2.27	4.67	0.968	1.50	2.76	1.90	1.63	2.62	2.97
Ga	18.8	19.0	19.1	18.2	13.3	13.1	11.8	11.1	11.7	11.7	11.9	11.8	14.2	7.23	7.19	7.22	5.68	13.9
Rb	122	119	125	124	205	54.9	136	51.3	49.1	146	152	7.24	7.88	432	409	420	251	8.94
Sr	62.3	59.8	64.7	68.6	31.9	40.9	32.3	38.2	34.4	53.4	29.3	103	64.4	88.7	94.7	104	90.6	75.6
Y	10.8	10.8	10.0	11.9	23.7	3.74	7.67	0.529	2.59	0.484	17.1	81.8	1.74	0.886	0.990	1.35	0.306	4.07
Nb	14.3	13.5	13.4	14.6	1.03	1.78	1.26	0.210	0.105	0.187	0.773	0.205	0.572	1.49	0.723	0.644	0.451	0.779
Mo	0.235	0.257	0.260	0.202	0.109	0.107	0.106	0.086	0.054	0.099	0.069	0.051	0.038	0.045	0.040	0.045	0.034	0.034
Cs	2.28	2.24	2.30	2.17	5.41	5.22	13.5	4.20	2.00	7.15	4.16	0.843	0.986	13.2	12.5	11.8	9.54	1.40
Ba	184	123	150	150	131	100	124	99.9	63.7	179	110	73.9	79.7	728	770	779	670	92.5
La	2.99	3.05	2.96	3.67	4.83	2.37	2.85	2.11	2.95	1.51	1.92	18.6	4.38	1.31	1.73	2.60	1.14	4.96
Ce	4.61	5.89	6.26	7.67	9.21	4.15	4.70	3.51	5.40	2.82	3.63	39.8	5.63	1.23	1.53	3.17	0.735	8.26
Pr	0.743	0.807	0.762	0.926	1.17	0.416	0.603	0.336	0.665	0.242	0.442	4.63	0.854	0.127	0.164	0.390	0.077	0.965
Nd	2.99	3.06	2.94	3.78	4.14	1.31	1.95	0.950	2.17	0.764	1.51	16.6	2.90	0.366	0.549	1.28	0.210	3.41

续附表 3

样品号	GP002/1	GP002/2	GP002/3	GP002/4	GP002/5	GP002/6	GP002/7	GP002/8	GP002/9	GP002/10	GP002/11	GP005/1	GP005/2	GP005/3	GP005/4	GP005/5	GP005/6	GP005/7
岩性	峡河村花岗伟晶岩边部			峡河村花岗伟晶岩中部			峡河村花岗伟晶岩			上河村花岗伟晶岩								
Sm	1.10	1.16	1.08	1.28	1.13	0.323	0.572	0.255	0.597	0.186	0.447	4.47	0.619	0.103	0.103	0.379	0.042	0.733
Eu	0.341	0.281	0.341	0.353	0.293	0.278	0.270	0.254	0.210	0.336	0.248	0.442	0.326	0.760	0.888	0.964	0.802	0.367
Gd	0.946	1.12	0.974	1.14	1.03	0.346	0.541	0.206	0.461	0.121	0.511	4.45	0.481	0.094	0.121	0.278	0.060	0.615
Tb	0.271	0.269	0.243	0.319	0.407	0.094	0.159	0.031	0.084	0.021	0.260	1.25	0.065	0.019	0.021	0.040	0.008	0.105
Dy	2.02	1.89	1.80	2.27	4.07	0.669	1.24	0.133	0.458	0.109	2.65	10.7	0.314	0.128	0.133	0.233	0.044	0.591
Ho	0.375	0.371	0.349	0.422	0.895	0.118	0.241	0.021	0.092	0.017	0.576	2.47	0.053	0.024	0.023	0.040	0.008	0.121
Er	1.14	1.04	0.981	1.11	2.96	0.413	0.729	0.144	0.304	0.122	1.99	8.01	0.250	0.085	0.101	0.149	0.029	0.449
Tm	0.174	0.163	0.161	0.158	0.584	0.052	0.099	0.018	0.053	0.018	0.422	1.40	0.022	0.013	0.019	0.025	0.006	0.062
Yb	1.11	1.13	1.10	1.06	4.50	0.299	0.615	0.036	0.465	0.031	3.37	9.54	0.156	0.107	0.171	0.157	0.035	0.466
Lu	0.160	0.167	0.148	0.155	0.690	0.043	0.082	0.004	0.069	0.003	0.521	1.42	0.021	0.014	0.021	0.026	0.006	0.063
Hf	2.87	3.02	3.08	2.81	1.17	0.081	0.154	0.056	1.73	0.050	1.71	1.03	0.078	0.263	0.217	0.160	0.095	0.095
Ta	1.43	1.48	1.34	1.42	0.692	0.265	0.394	0.126	0.050	0.085	0.470	0.244	0.677	0.598	0.261	0.245	0.768	0.848
W	0.666	0.450	0.377	0.362	0.510	0.470	1.27	0.292	0.199	0.290	0.417	0.176	0.185	0.260	0.168	0.178	0.172	0.167
Re	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Tl	0.696	0.704	0.681	0.673	1.17	0.416	0.787	0.380	0.320	0.810	0.798	0.106	0.109	1.61	1.62	1.65	1.36	0.137
Pb	48.7	47.6	48.4	48.5	41.9	20.3	27.0	16.4	14.6	38.7	30.8	20.2	19.6	67.6	67.9	73.0	61.3	21.0
Bi	0.209	0.342	0.085	0.290	1.95	0.081	0.051	0.096	0.076	0.091	1.74	0.557	0.155	2.21	3.11	2.03	4.08	0.168
Th	5.77	5.66	5.68	7.60	3.03	0.565	1.00	0.364	1.23	0.226	0.900	17.9	1.03	0.442	0.522	1.46	0.336	1.86
U	7.31	6.81	6.72	10.2	4.09	0.400	0.690	0.135	1.14	0.075	1.94	5.05	0.244	0.181	0.161	0.201	0.197	0.329
Zr	49.6	53.7	54.0	51.7	21.8	1.91	3.26	1.55	45.2	1.33	37.0	22.2	1.76	5.97	4.04	3.16	2.44	2.74
Nb/Ta	10.0	9.10	10.1	10.3	1.49	6.70	3.21	1.67	2.10	2.20	1.64	0.840	0.845	2.49	2.77	2.63	0.587	0.919
Zr/Hf	17.3	17.8	17.5	18.4	18.7	23.6	21.2	27.7	26.1	26.5	21.6	21.5	22.6	22.7	18.6	19.7	25.7	28.9
Mg [#]	21.5	17.3	18.2	14.3	9.60	23.7	29.5	35.9	21.5	39.3	9.34	19.6	44.4	26.3	12.4	26.2	19.3	2.71
A/CNK	1.13	1.13	1.15	1.13	1.35	1.05	1.14	1.08	1.14	1.01	1.37	1.07	1.06	1.11	1.12	1.11	1.08	1.04
δEu	1.02	0.753	1.02	0.893	0.831	2.54	1.48	3.39	1.22	6.85	1.59	0.303	1.83	23.6	24.3	9.08	48.8	1.67

注: $Mg^{\#} = 100 \times [Mg^{2+} / (Mg^{2+} + Fe^{2+})]$; $\delta Eu = Eu_N / (Sm_N \times Gd_N)^{1/2}$ 。

附表 4 北秦岭构造带东段官坡花岗伟晶岩锆石 Lu-Hf 同位素组成

Appendix 4 Zircon Lu-Hf isotopic compositions for granitic pegmatites from the Guanpo area, eastern North Qinling tectonic belt

测点号	<i>t</i> (Ma)	¹⁷⁶ Yb/ ¹⁷⁷ Hf	2σ	¹⁷⁶ Lu/ ¹⁷⁷ Hf	2σ	¹⁷⁶ Hf/ ¹⁷⁷ Hf	2σ	ε _{Hf} (0)	ε _{Hf} (<i>t</i>)	<i>t</i> _{DM1} (Ma)	<i>t</i> _{DM2} (Ma)	<i>f</i> _{Lu/Hf}
样品 GP002-5(峡河村花岗伟晶岩)												
1	359	0.060227	0.000225	0.001305	0.000004	0.282276	0.000013	−17.5	−9.9	1388	1670	−0.96
9	361	0.070763	0.000078	0.001517	0.000001	0.282277	0.000016	−17.5	−9.9	1394	1669	−0.95
10	360	0.052187	0.000377	0.000784	0.000005	0.282304	0.000015	−16.6	−8.8	1331	1614	−0.98
12	360	0.045829	0.000547	0.000785	0.000009	0.282327	0.000013	−15.7	−8.0	1298	1571	−0.98
13	361	0.053291	0.000210	0.001127	0.000004	0.282225	0.000014	−19.4	−11.7	1454	1760	−0.97
18	359	0.069362	0.000133	0.001501	0.000001	0.282263	0.000014	−18.0	−10.5	1414	1696	−0.95
23	357	0.058518	0.000143	0.001284	0.000001	0.282269	0.000014	−17.8	−10.2	1397	1682	−0.96
24	362	0.061140	0.000042	0.001256	0.000001	0.282247	0.000013	−18.6	−10.9	1427	1720	−0.96
27	362	0.039902	0.000090	0.000857	0.000001	0.282294	0.000012	−16.9	−9.2	1347	1633	−0.97
样品 GP002-6(峡河村花岗伟晶岩)												
1	365	0.096128	0.000097	0.002029	0.000004	0.282246	0.000013	−18.6	−11.2	1458	1732	−0.94
6	364	0.090292	0.000640	0.001900	0.000013	0.282276	0.000016	−17.6	−10.0	1411	1676	−0.94
8	362	0.064767	0.000122	0.001410	0.000003	0.282258	0.000012	−18.2	−10.6	1417	1702	−0.96
9	363	0.057054	0.000113	0.001216	0.000002	0.282265	0.000013	−17.9	−10.3	1400	1687	−0.96
11	363	0.088710	0.000584	0.001876	0.000014	0.282288	0.000014	−17.1	−9.6	1393	1654	−0.94
12	360	0.052736	0.000194	0.001144	0.000003	0.282282	0.000013	−17.3	−9.7	1374	1657	−0.97
14	359	0.054921	0.000155	0.001190	0.000002	0.282273	0.000014	−17.7	−10.0	1388	1673	−0.96
20	364	0.072735	0.000972	0.001356	0.000017	0.282381	0.000013	−13.8	−6.2	1242	1481	−0.96
30	361	0.059094	0.000368	0.001246	0.000007	0.282294	0.000013	−16.9	−9.2	1361	1636	−0.96
样品 GP005-1(上河村花岗伟晶岩)												
5	330	0.083742	0.000510	0.002091	0.000010	0.282440	0.000018	−11.7	−4.9	1181	1391	−0.94
7	337	0.160548	0.000266	0.004187	0.000016	0.282561	0.000014	−7.5	−1.0	1069	1197	−0.87
13	334	0.142783	0.000554	0.003690	0.000013	0.282562	0.000014	−7.4	−0.9	1052	1189	−0.89
17	331	0.172978	0.000162	0.004334	0.000002	0.282557	0.000017	−7.6	−1.3	1079	1206	−0.87
36	336	0.088286	0.000609	0.002182	0.000014	0.282606	0.000012	−5.9	1.0	944	1092	−0.93
40	338	0.045084	0.000106	0.001045	0.000001	0.282599	0.000012	−6.1	1.1	926	1092	−0.97

注: $\epsilon_{\text{Hf}}(0) = 10000 \times [({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{s}} / ({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{CHUR},0} - 1]$; $f_{\text{Lu/Hf}} = ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{s}} / ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{CHUR}} - 1$; $\epsilon_{\text{Hf}}(t) = 10000 \times \{ [({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{s}} - ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{s}} \times (e^{\lambda t} - 1)] / [({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{CHUR},0} - ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{CHUR}} \times (e^{\lambda t} - 1)] - 1 \}$; t_{DM1} 为一阶段 Hf 模式年龄, 计算公式为 $t_{\text{DM1}} = 1/\lambda \times \ln \{ (1 + [({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{s}} - ({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{DM}}] / [({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{s}} - ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{DM}}]) \}$; t_{DM2} 为二阶段 Hf 模式年龄, 计算公式为 $t_{\text{DM2}} = t_{\text{DM1}} - (t_{\text{DM1}} - t) \times [(f_{\text{CC}} - f_{\text{s}}) / (f_{\text{CC}} - f_{\text{DM}})]$, 其中, $\lambda = 1.867 \times 10^{-11} \text{ a}^{-1}$ (Söderlund et al., 2004); $({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{s}}$ 和 $({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{s}}$ 为样品测量值; $({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{CHUR}} = 0.0332$, $({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{CHUR},0} = 0.282772$ (Blichert-Toft et al., 1997); $({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{DM}} = 0.0384$, $({}^{176}\text{Hf}/{}^{177}\text{Hf})_{\text{DM}} = 0.28325$ (Griffin et al., 2000); $({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{mean crust}} = 0.015$; $f_{\text{CC}} = [({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{mean crust}} / ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{CHUR}}] - 1$; $f_{\text{s}} = f_{\text{Lu/Hf}}$; $f_{\text{DM}} = [({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{DM}} / ({}^{176}\text{Lu}/{}^{177}\text{Hf})_{\text{CHUR}}] - 1$; t 为锆石结晶年龄。