

Supplementary Table S1. Major element (wt%), REE element ($\times 10^{-6}$), and trace element ($\times 10^{-6}$) compositions of magmatic rocks.

Sample No.	MJ-22	MJ-23	MJ26	LWZ-02	LWZ-03	LWZ-04	LWZ-05	LWZ-13
SiO ₂	82.62	81.16	81.31	70.79	65.30	68.87	66.22	65.50
Al ₂ O ₃	11.20	12.39	12.60	14.63	16.24	13.42	16.40	14.72
Fe ₂ O ₃	0.57	0.61	0.25	0.44	0.28	0.41	0.42	2.60
FeO	0.13	0.06	0.16	1.61	2.71	1.87	2.27	0.31
MnO	0.01	0.01	0.01	0.06	0.08	0.12	0.08	0.10
TiO ₂	0.01	0.01	0.01	0.22	0.32	0.23	0.34	0.26
CaO	0.12	0.06	0.05	2.82	3.42	3.76	3.00	4.69
MgO	0.55	0.40	0.10	0.49	0.82	0.92	0.77	1.35
Na ₂ O	0.08	0.08	0.08	0.29	0.33	0.24	0.34	0.20
K ₂ O	2.54	2.84	3.25	3.24	3.24	3.04	3.27	3.92
P ₂ O ₅	0.07	0.06	0.06	0.12	0.14	0.11	0.15	0.15
LOI	1.94	2.07	1.90	5.12	6.96	6.83	6.52	6.02
Total	99.84	99.76	99.77	99.83	99.82	99.81	99.76	99.83
DI	88.8	88.4	89.9	74.7	67.5	70.2	69.8	65.6
A/CNK	3.61	3.74	3.37	1.61	1.58	1.28	1.72	1.12
La	2.08	5.29	8.88	32.47	35.27	26.84	39.01	24.53
Ce	4.64	11.99	17.71	69.95	67.07	57.28	70.76	57.07
Pr	0.58	1.29	1.95	6.31	7.64	5.26	7.84	5.43
Nd	2.49	5.37	7.51	21.92	28.12	18.34	27.55	20.26
Sm	1.08	2.10	2.36	3.93	5.19	3.47	5.23	4.10
Eu	0.23	0.35	0.33	0.92	1.22	0.87	1.13	1.08
Gd	1.63	2.39	2.43	3.16	4.28	3.26	4.51	4.27
Tb	0.36	0.46	0.44	0.49	0.73	0.59	0.77	0.81
Dy	2.10	2.56	2.21	2.67	4.12	3.27	4.31	4.64
Ho	0.36	0.40	0.34	0.51	0.83	0.60	0.86	0.89
Er	0.88	0.98	0.80	1.38	2.35	1.59	2.39	2.42
Tm	0.13	0.14	0.11	0.22	0.37	0.25	0.38	0.38
Yb	0.78	0.82	0.64	1.49	2.41	1.63	2.43	2.53
Lu	0.10	0.12	0.08	0.22	0.36	0.24	0.37	0.36
Y	10.59	12.76	10.82	15.09	23.58	17.93	24.53	25.44
ΣREE	17.44	34.26	45.79	146	160	123	168	129
LREE	11.10	26.39	38.75	136	145	112	152	112
HREE	6.35	7.87	7.05	10.1	15.4	11.4	16.0	16.3
LREE/HREE	1.75	3.35	5.50	13.4	9.36	9.80	9.47	6.90
(La/Yb) _N	1.79	4.34	9.36	14.71	9.85	11.10	10.84	6.53
Eu/Eu*	0.52	0.48	0.42	0.77	0.77	0.78	0.70	0.78
Ce/Ce*	1.00	1.07	0.98	1.11	0.94	1.09	0.92	1.14
Ba	94.70	80.50	112.60	15.32	16.68	13.89	16.04	14.24
Ga	12.46	14.40	15.08	375.7	464.8	362.1	426.3	482.9
Hf	1.96	2.27	2.45	4.47	5.54	4.55	5.98	5.36

Nb	10.80	13.06	14.24	11.09	7.83	10.64	9.13	10.26
Rb	183.16	217.23	214.83	162.9	158.9	174.1	152.2	193.9
Sr	6.70	6.30	32.40	128.0	108.5	121.4	139.2	127.1
Ta	1.69	1.96	2.02	1.13	0.57	1.34	0.72	0.98
Th	7.29	8.38	11.65	13.38	14.99	11.48	14.52	12.31
U	3.35	3.54	4.35	4.44	3.13	3.52	2.87	2.44
Zr	35.00	40.90	44.60	135.1	168.1	127.1	176.2	158.1

MJ-22, MJ-23 and MJ-26 are samples of the rhyolites. LWZ-02, LWZ-03, LWZ-04, LWZ-05 and LWZ-13 are samples of the granite porphyries. Differentiation index (DI) = Qz (quartz) + Or (orthoclase) + Ab (albite) + Ne (nepheline) + Lc (leucite) + Kp (kalsilite) [55]. The formula of A/CNK is from Shand [85].