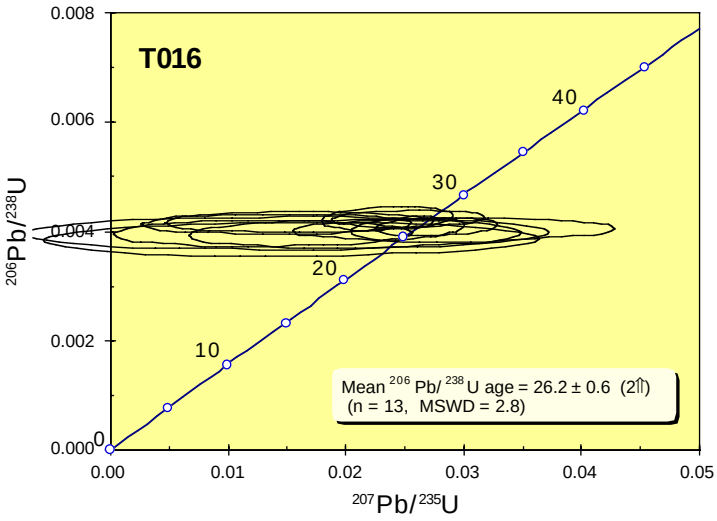
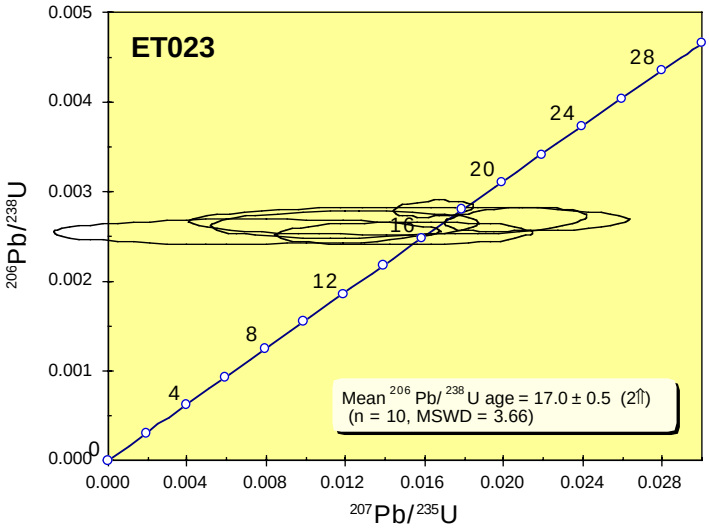
Data Repository item 2003149

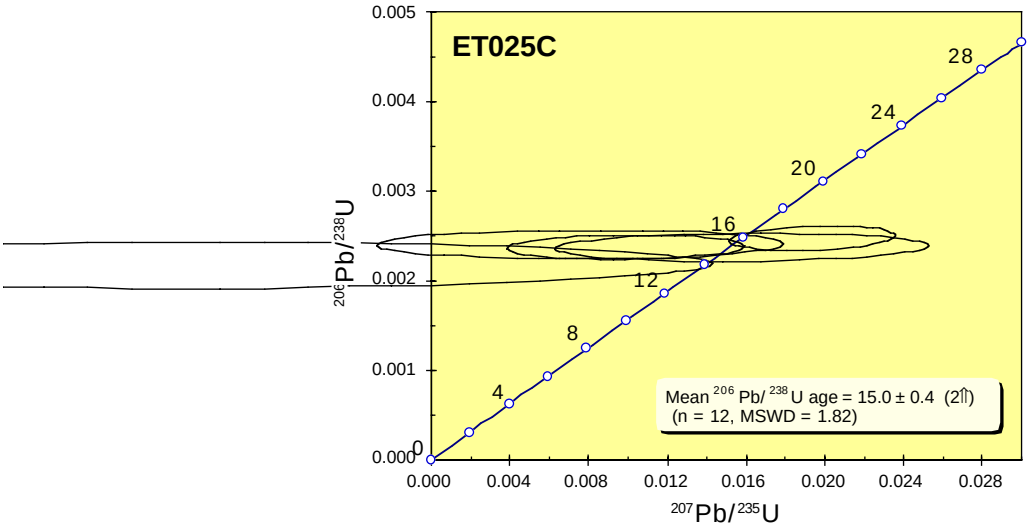
Appendix Table DR1. SHRIMP U-Pb zircon data for adakites from south Tibet

Grain	U (ppm)	Th (ppm)	Th/U	f_{206} (%)	$^{206}Pb^*/^{238}U$ (±1σ)	$^{207}Pb^*/^{235}U$ (±1σ)	$^{206}Pb/^{238}U$ age (Ma ± 1σ)
T016	(29.57°N, 94.58°E)						
5.1	358	20	0.06	6.03	0.00382 ± 0.00001		24.6 ± 0.8
7.1	262	174	0.66	1.14	0.00403 ± 0.00009	0.0291 ± 0.0053	25.9 ± 0.6
8.1	981	823	0.84	0.61	0.00423 ± 0.00006	0.0253 ± 0.0028	27.2 ± 0.4
9.2	575	302	0.53	2.95	0.00417 ± 0.00008	0.0160 ± 0.0046	26.8 ± 0.5
11.1	640	162	0.25	3.38	0.00414 ± 0.00007	0.0141 ± 0.0047	26.6 ± 0.5
13.1	221	73	0.33	5.29	0.00373 ± 0.00010		24.0 ± 0.7
19.1	376	101	0.27	1.36	0.00409 ± 0.00007	0.0277 ± 0.0021	26.3 ± 0.4
20.1	2100	993	0.47	1.16	0.00424 ± 0.00009	0.0235 ± 0.0023	27.3 ± 0.6
21.1	296	95	0.32	2.58	0.00385 ± 0.00013	0.0154 ± 0.0086	24.8 ± 0.8
22.1	1473	450	0.31	0.71	0.00406 ± 0.00009	0.0252 ± 0.0021	26.1 ± 0.6
23.1	384	146	0.38	2.34	0.00395 ± 0.00011	0.0208 ± 0.0058	25.4 ± 0.7
24.1	717	261	0.36	2.92	0.00396 ± 0.00010	0.0130 ± 0.0052	25.5 ± 0.6
29.1	368	162	0.44	3.75	0.00397 ± 0.00012	0.0150 ± 0.0092	25.5 ± 0.8
weighted mean (2σ)							**26.2 ± 0.6**
ET023	(29.61°N, 91.60°E)						
1.1	3540	2876	0.81	0.65	0.00281 ± 0.00004	0.0164 ± 0.0008	18.1 ± 0.3
3.1	456	192	0.42	4.81	0.00257 ± 0.00006		16.6 ± 0.4
4.1	310	115	0.37	-0.60	0.00269 ± 0.00006	0.0206 ± 0.0014	17.3 ± 0.4
5.1	404	204	0.50	1.53	0.00268 ± 0.00006	0.0152 ± 0.0046	17.2 ± 0.4
6.1	371	189	0.51	5.30	0.00259 ± 0.00006		16.6 ± 0.4
7.1	323	130	0.40	2.93	0.00268 ± 0.00008		17.3 ± 0.5
8.1	636	328	0.52	2.30	0.00263 ± 0.00006	0.0119 ± 0.0027	17.0 ± 0.4
10.1	391	166	0.42	3.99	0.00255 ± 0.00006	0.0070 ± 0.0039	16.4 ± 0.4
11.1	396	210	0.53	8.71	0.00249 ± 0.00008		16.0 ± 0.5
11.2	327	118	0.36	1.58	0.00253 ± 0.00005	0.0149 ± 0.0027	16.3 ± 0.3
weighted mean (2σ)							**17.0 ± 0.5**
ET025B	(29.69°N, 91.75°E)						
1.1	892	1116	1.25	5.17	0.00241 ± 0.00007	0.0076 ± 0.0043	15.5 ± 0.4
2.1	437	453	1.04	14.28	0.00217 ± 0.00010	-0.0130 ± 0.0112	14.0 ± 0.7
3.1	439	535	1.22	5.34	0.00234 ± 0.00009		15.1 ± 0.6
4.1	464	837	1.80	10.74	0.00215 ± 0.00009		13.9 ± 0.6
5.1	1073	1005	0.94	0.50	0.00247 ± 0.00006	0.0193 ± 0.0017	15.9 ± 0.4
6.1	458	462	1.01	10.43	0.00215 ± 0.00011		13.8 ± 0.7
7.1	1724	1308	0.76	3.66	0.00237 ± 0.00005	0.0099 ± 0.0025	15.3 ± 0.4
8.1	796	585	0.73	7.25	0.00224 ± 0.00007		14.4 ± 0.4
9.1	321	440	1.37	9.44	0.00225 ± 0.00009		14.5 ± 0.6
10.1	809	943	1.17	2.39	0.00237 ± 0.00006	0.0158 ± 0.0039	15.3 ± 0.4
11.1	398	481	1.21	6.17	0.00235 ± 0.00008		15.1 ± 0.5
12.1	440	389	0.88	6.35	0.00235 ± 0.00009		15.1 ± 0.6
weighted mean (2σ)							**15.0 ± 0.4**

U-Pb zircon dating was conducted using a SHRIMP II ion microprobe newly installed in the Institute of Geology, Chinese Academy of Geological Sciences, Beijing. Zircon grains, together with a zircon U-Pb standard, were cast in an epoxy mount, which was then polished to section the crystals for analysis. Zircons were documented with transmitted and reflected light micrographs and back-scattered electron images, and the mount was vacuum-coated with a 500 nm layer of high-purity gold. Measurements of U, Th, and Pb U-Th-Pb ratios and absolute abundances were determined relative to the TEM standard zircon (206Pb/238U = 0.0668 corresponding to 417 Ma), analyses of which were interspersed with those of unknown grains, using operating and data processing procedures similar to those established in the RSES, Australian National University. The mass resolution used to measure Pb/Pb and Pb/U isotopic ratios was about 5000 during the analyses. Measured compositions were corrected for common Pb using non-radiogenic 204Pb. The results, tabulated and plotted in the concordia diagrams, are given as Appendix I. The uncertainties for individual analyses are reported at 1σ level. Owing to relatively young ages of the samples dated, only the mean dates for pooled 206Pb/238U analyses are used to indicate the magmatic ages, which are quoted with 95% confidence interval (2σ).





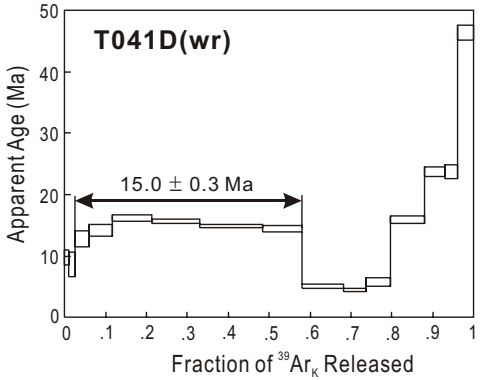


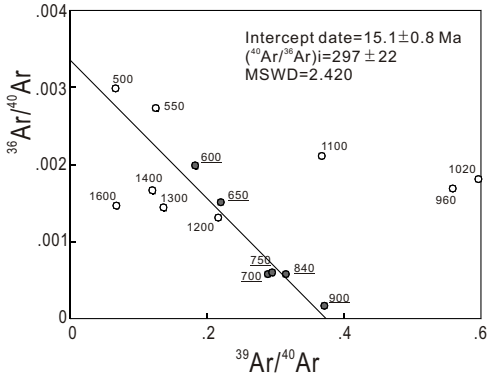
Appendix I. Plots of U-Pb zircon data

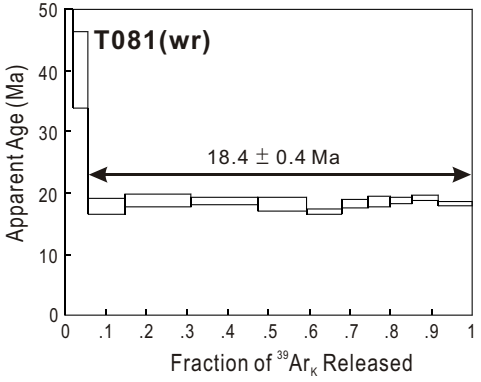
Appendix Table DR2. Summary of $^{40}Ar/^{39}Ar$ dating results of adakites from southern Tibet

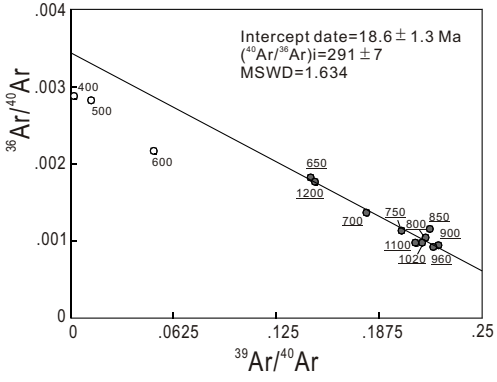
Sample	Phase dated	Plateau date (Myr ± ⇑)	N (steps)	^{39}Ar proportion (%)	Intercept date (Myr ± ⇑)	$(^{40}Ar/^{36}Ar)_i$ (± ⇑)	MSWD
T041D	Whole rock	15.0±0.3	6	55.4	15.1±0.8	297±22	2.420
T081	Whole rock	18.4±0.4	10	94.4	18.6±1.3	291±7	1.634
ET025B	Sanidine	15.2±0.2	19	100	14.8±0.3	306±3	2.125
ET025E	Whole rock	13.2±0.2	7	67.6	12.9±0.3	303±21	1.024
ET026C	Whole rock	16.6±0.2	6	69.3	16.7±0.9	290±28	1.801
ET026D	Sanidine	16.4±0.9	7	74.1	15.7±0.1	307±27	0.498

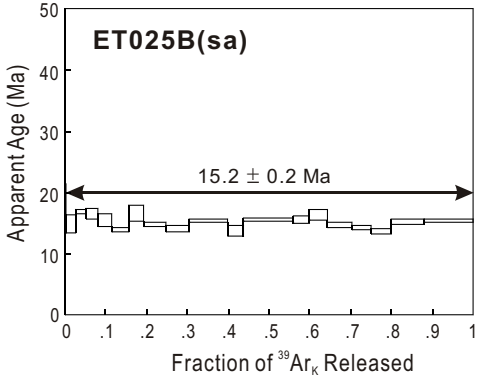
Note: Step-heating $^{40}Ar/^{39}Ar$ age determinations were performed at National Taiwan University using a Varian-MAT GD 120 mass spectrometer coupled with a double-vacuum resistance furnace. Whole rock chips or mineral grains, handpicked and sieved to the range of 140-250 μm, were ultrasonically cleaned in distilled water and dried, and then irradiated in the THOR Reactor at National Tsing-Hua University in Taiwan. To monitor the neutron flux, aliquots of the LP-6 biotite standard (128.4±0.2 Ma), weighted 6-10 mg, were stacked with the samples. More analytical details can be found in Chung et al. (1998). The results, summarized in a table and plotted in age spectra and correlation diagrams, are given in Appendix II.

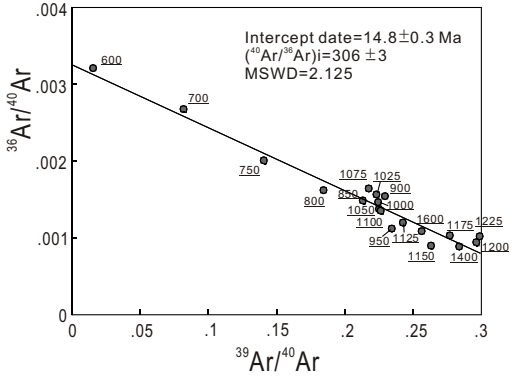


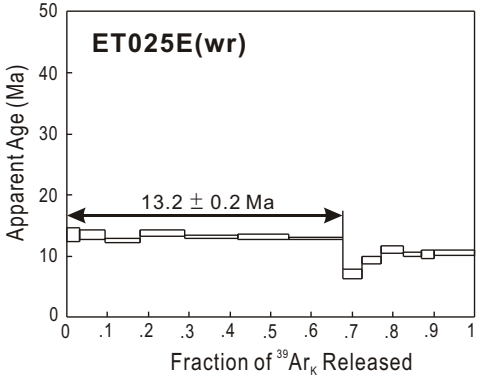


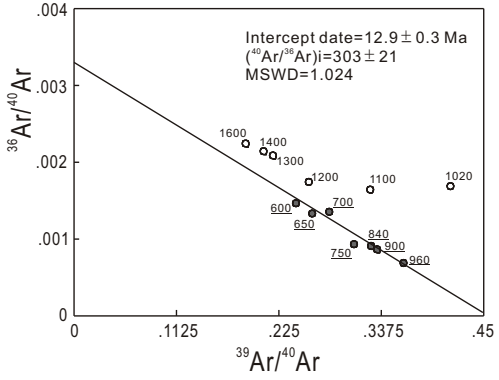


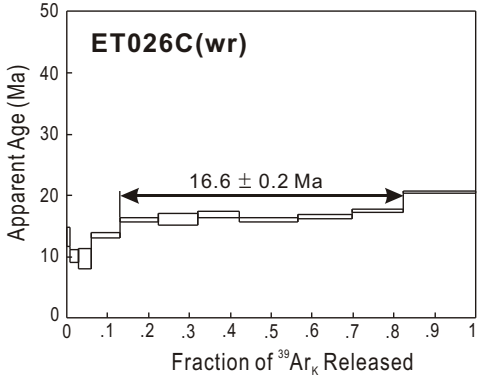


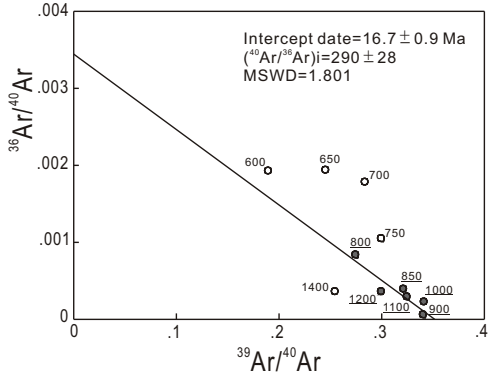


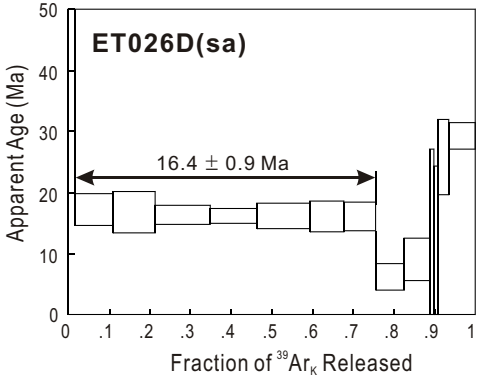


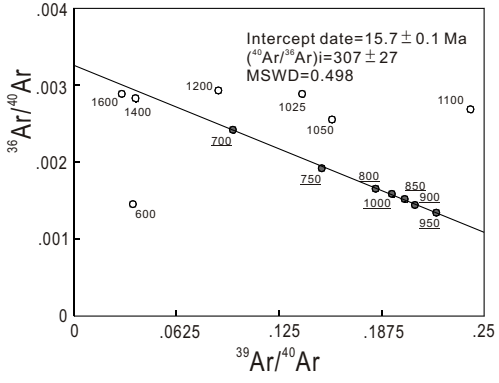












Appendix Ⅱ. Plots of $^{40}Ar/^{39}Ar$ dating results.

Appendix Table DR3. Major and trace element data of representative adakite samples from southern Tibet

sample	T065C	T041D	T081	T016	ET023	ET025B	ET025E	ET026C	ET026D	AGV-1
locality	Majiang	Xigaze	Xigaze	Linzhi	Jiama	Jiama	Jiama	Nanmu	Nanmu	
lithology	dike	dike	dike	plug	plug	plug	dike	plug	dike	USGS-std.
longitude	89.88˚E	88.81˚E	88.85˚E	94.58˚E	91.60˚E	91.75˚E	91.75˚E	90.87˚E	90.87˚E	
latitude	29.74˚N	29.36˚N	29.32˚N	29.57˚N	29.61˚N	26.69˚N	26.69˚N	29.48˚N	29.48˚N	
altitude(m	4605	3866	3706	3976	5121	4645	4645	3816	3816	
age (Ma)	~10-16**	15.0 ± 0.6	18.4 ± 0.8	26.2 ± 0.5	17.0 ± 0.5	15.0 ± 0.4	13.2 ± 0.4	16.6 ± 0.4	16.4 ± 1.8	
method*	Ar-Ar (sa)	Ar-Ar (wr)	Ar-Ar (wr)	U-Pb (zr)	U-Pb (zr)	U-Pb (zr)	Ar-Ar (wr)	Ar-Ar (sa)	Ar-Ar (wr)	
						15.2 ± 0.4 Ar-Ar (sa)				
(wt.%)										
SiO_2	57.47	56.73	60.57	63.48	65.27	67.32	66.76	65.41	63.62	58.26
TiO_2	0.66	0.83	0.62	0.61	0.53	0.45	0.33	0.51	0.55	1.08
Al_2O_3	15.41	17.17	16.18	18.75	16.81	14.43	15.16	16.25	16.32	17.32
Fe_2O_3¶	4.67	5.83	3.97	3.38	3.52	1.14	2.07	3.19	2.75	6.87
MnO	0.05	0.08	0.05	0.04	0.03	0.03	0.06	0.05	0.03	0.10
MgO	2.39	3.31	2.25	1.05	1.53	1.26	0.93	1.29	1.04	1.37
CaO	5.29	5.54	3.68	3.98	3.53	1.85	2.70	3.47	3.40	4.87
Na_2O	3.60	4.11	5.35	4.57	4.19	3.15	3.63	4.25	4.61	3.91
K_2O	2.71	1.72	2.01	1.89	2.95	5.69	3.43	2.78	2.71	2.99
P_2O_5	0.26	0.27	0.18	0.20	0.19	0.05	0.14	0.17	0.21	0.48
Mg#	50.3	52.9	52.8	40.8	49.1	68.6	47.1	44.4	42.8	30.5
(ppm)										(n=13; ±2⇑)
Rb	81.3	30.5	48.2	78.7	85.9	337	159	66.8	61.4	67.3 ± 1.3
Ba	1008	490	689	537	755	748	823	713	1032	1213 ± 25
Th	17.9	3.27	3.68	7.84	8.83	19.2	14.2	7.49	8.86	6.38 ± 0.09
U	4.02	0.64	0.76	0.99	2.52	5.13	5.09	2.65	2.34	1.89 ± 0.04
Nb	4.66	3.80	3.64	3.01	3.67	6.94	4.28	2.93	3.10	13.8 ± 0.2
Ta	0.31	0.23	0.23	0.36	0.30	0.46	0.33	0.18	0.18	0.85 ± 0.02
La	37.6	17.8	13.1	52.9	21.9	26.8	24.4	21.3	21.6	38.6 ± 0.4
Ce	75.8	40.1	28.4	104	45.9	50.8	47.7	43.8	46.7	68.8 ± 0.7
Pb	47.9	16.4	17.1	29.3	12.6	20.5	31.6	18.4	22.8	37.1 ± 0.3
Pr	8.93	5.12	3.47	11.2	5.51	5.43	5.30	5.08	5.64	7.61 ± 0.07
Sr	1121	911	1004	921	1048	360	689	902	1051	658 ± 13
Nd	35.0	21.8	14.4	41.3	22.5	19.6	19.8	19.9	22.4	31.7 ± 0.5
Zr	123	99	101	210	89	129	102	108	85	232 ± 4
Hf	3.22	2.77	2.97	5.07	2.54	3.74	3.42	3.11	2.64	5.03 ± 0.08
Sm	5.79	4.19	2.79	5.68	3.96	3.09	3.22	3.35	3.67	5.81 ± 0.12
Eu	1.58	1.21	0.84	1.26	0.99	0.79	0.87	0.95	1.06	1.73 ± 0.03
Gd	4.36	3.46	2.23	3.44	2.81	2.43	2.43	2.53	2.59	5.09 ± 0.12
Tb	0.45	0.43	0.29	0.27	0.31	0.27	0.27	0.28	0.27	0.704±0.016
Dy	1.95	2.03	1.33	1.02	1.56	1.24	1.25	1.24	1.13	3.55 ± 0.06
Y	9.0	9.5	7.1	5.4	8.2	8.3	6.9	6.4	5.6	19.4 ± 0.3
Ho	0.31	0.35	0.22	0.13	0.27	0.21	0.21	0.20	0.19	0.68 ± 0.01
Er	0.82	0.93	0.59	0.52	0.72	0.60	0.60	0.54	0.52	1.87 ± 0.03
Tm	0.097	0.12	0.073	0.08	0.097	0.083	0.081	0.066	0.060	0.259±0.007
Yb	0.61	0.74	0.46	0.46	0.65	0.56	0.53	0.44	0.38	1.64 ± 0.04
Lu	0.086	0.11	0.063	0.05	0.094	0.086	0.082	0.063	0.052	0.246±0.006

* wr: whole rock; zr: zircon; sa: sanidine.

** Data from Coulon et al. (1986).

¶ total Fe. Mg# =100(Mg/Mg+0.9Fe).

Major and trace elements were determined at National Taiwan University by X-ray fluorescence method using a Rigaku RIX-2000 spectrometer and by inductively coupled plasma-mass spectrometry using an Agilent 7500s quadrupole ICP-MS, respectively. The routine analytical precision and accuracy for most elements measured are estimated to be <5%. To make sure the completion of digestion of the plug-type, coarser-grained samples, fused whole rock glasses made for XRF analyses were used for ICP-MS trace element analyses and these were then checked by duplicate runs of powders digested using high-pressure teflon bombs. Results obtained by both procedures show good consistency, generally with RSD <10 %.