Supporting Information for:

One-step chromatographic purification of K, Ca, and Sr from geological samples for high precision stable and radiogenic isotope analysis by MC-ICP-MS

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Introduction

This supporting information provides the detailed description of methodology, figures, and tables to support the results presented in the main text.

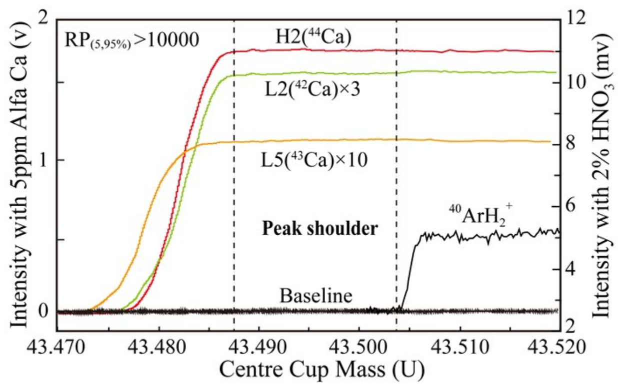

Fig. S1. A peak scan of the Alfa 5 ppm Ca solution left and 2 vol% HNO_3 right under high-resolution model on a Nu Plasma 3.

Table S1. Potential elemental and molecular isobaric interferences affecting K-Ca Isotopic Measurements.[31]

Isotope	Interference (required resolution)
$^{39}K^+$	$^{23}Na^{16}O^+$(1858); $^{38}ArH^+$(5688)
$^{41}K^+$	$^{25}Mg^{16}O^+$(2165); $^{23}Na^{18}O^+$(1511); $^{40}ArH^+$(4888); $^{40}CaH^+$(4768)
$^{42}Ca^+$	$^{84}Kr^{++}$(14627); $^{84}Sr^{++}$(21993); $^{41}KH^+$(3805); $^{30}Si^{12}C^+$(2770); $^{26}Mg^{16}O^+$(2221); $^{40}ArH_2^+$(2161); $^{40}CaH_2^+$(2139); $^{28}Si^{14}N^+$(1962); $^{24}Mg^{18}O^+$(1640); $^{25}Mg^{16}OH^+$(1401); $^{14}N_3^+$(829)
$^{43}Ca^+$	$^{86}Sr^{++}$(10392); $^{86}Kr^{++}$(12404); $^{42}CaH^+$(5596); $^{27}Al^{16}O^+$(2429); $^{31}P^{12}C^+$(2865); $^{26}Mg^{16}OH^+$(1617); $^{14}N_3H^+$ (737)
$^{44}Ca^+$	$^{88}Sr^{++}$(16448); $^{43}CaH^+$(3956); $^{28}Si^{16}O^+$(2687); $^{32}S^{12}C^+$(2650); $^{30}Si^{14}N^+$(2058); $^{26}Mg^{18}O^+$(1673); $^{27}Al^{16}OH^+$(1526); $^{12}C^{16}O_2^+$(1280); $^{14}N_2^{16}O^+$(964)

Table S2. Testing the influences of double charge Sr on Ca isotopic analysis.

Ca/Sr	^{44}Ca(V)	^{88}Sr(mV)	$^{43.5}$Sr(mV)	$\delta^{44/42}$Ca	2SD	N	$\delta^{43/42}$Ca	2SD	N
100000	1.51	2.6	0.1	0.03	0.05	5	0.02	0.06	5
50000	1.51	3.6	0.2	0.07	0.04	5	0.13	0.07	5
20000	1.52	5.1	0.2	0.11	0.05	5	0.38	0.17	5
10000	1.52	11.6	0.2	0.21	0.06	5	0.58	0.18	5
7000	1.51	15.9	0.2	0.44	0.05	5	0.83	0.13	5
5000	1.52	22.1	0.3	0.53	0.07	5	1.05	0.17	5
3000	1.51	35.6	0.2	0.91	0.10	5	1.70	0.15	5
1000	1.51	103.1	0.3	2.89	0.27	5	5.27	0.47	5

Table S3. Ca isotopic composition of geological standards in this study and in the literature.

Sample	Reference	Method [a]	Ca (wt.%)	Ca/Sr after purification	$\delta^{44/42}Ca$	2SD [b]	N [c]
SRM 915b	This study		55.9	162000	0.34	0.05	20
	[1]	SSB, MC-ICP-MS			0.36	0.07	
	[2]	SSB, MC-ICP-MS			0.36	0.05	67
	[3]	SSB, MC-ICP-MS			0.36	0.01	3
	[4]	SSB, MC-ICP-MS			0.38	0.04	2
	[5]	SSB, MC-ICP-MS			0.35	0.02	2
	[6]	SSB, MC-ICP-MS			0.34	0.06	15
	[7]	DS-TIMS [d]			0.36	0.07	41
	[8]	DS-TIMS			0.35	0.05	38
Seawater, Atlantic	This study		0.04	94800	0.89	0.05	10
	[9]	SSB, MC-ICP-MS			0.86	0.08	6
	[3]	SSB, MC-ICP-MS			0.91	0.07	4
AGV-2, Andesite, USGS	This study		3.72	83100	0.34	0.04	12
	[9]	SSB, MC-ICP-MS			0.36	0.05	4
	[2]	SSB, MC-ICP-MS			0.33	0.04	6
	[10]	SSB, MC-ICP-MS			0.38	0.08	3
	[7]	DS-TIMS			0.35	0.04	3
	[11]	DS-TIMS			0.35	0.05	8
	[8]	DS-TIMS			0.38	0.04	9
	[1]	SSB, MC-ICP-MS			0.31	0.05	3
BCR-2, Basalt, USGS	This study		5.09	113500	0.39	0.04	9
	[2]	SSB, MC-ICP-MS			0.38	0.07	30
	[5]	SSB, MC-ICP-MS			0.40	0.02	4
	[4]	SSB, MC-ICP-MS			0.34	0.06	2
	[10]	SSB, MC-ICP-MS			0.42	0.15	3
	[9]	SSB, MC-ICP-MS			0.39	0.07	4
	[3]	SSB, MC-ICP-MS			0.41	0.05	4
	[10]	SSB, MC-ICP-MS			0.42	0.15	3
	[7]	DS-TIMS			0.38	0.06	4
	[11]	DS-TIMS			0.40	0.04	12
	[8]	DS-TIMS			0.39	0.06	24
BHVO-2, Basalt,	This study		8.17	89000	0.38	0.05	9

Hawaiian, USA							
	[2]	SSB, MC-ICP-MS			0.38	0.06	41
	[3]	SSB, MC-ICP-MS			0.41	0.05	5
	[9]	SSB, MC-ICP-MS			0.43	0.08	27
	[4]	SSB, MC-ICP-MS			0.38	0.06	2
	[10]	SSB, MC-ICP-MS			0.42	0.08	10
	[12]	DS-TIMS			0.44	0.05	5
	[7]	DS-TIMS			0.38	0.03	7
	[11]	DS-TIMS			0.39	0.05	16
	[8]	DS-TIMS			0.37	0.05	12
GSP-2, Granodiorite, USGS	This study		1.50	92800	0.35	0.05	12
	[9]	SSB, MC-ICP-MS			0.40	0.10	5
	[2]	SSB, MC-ICP-MS			0.33	0.03	5
	[7]	DS-TIMS			0.32	0.01	3
	[1]	SSB, MC-ICP-MS			0.27	0.02	6
JG-2, Granite, Japan	This study		0.51	108600	0.37	0.04	9
	[11]	DS-TIMS			0.31	0.06	3
RGM-2, Rhyolite, USGS	This study		0.88	98300	0.42	0.05	7
	[11]	DS-TIMS			0.38	0.05	6
	[8]	DS-TIMS			0.39	0.13	3
	[9]	SSB, MC-ICP-MS			0.44	0.04	4
W-2a, diabase, USGS	This study		7.76	113400	0.40	0.07	9
	[11]	DS-TIMS			0.41	0.09	9
	[8]	DS-TIMS			0.34	0.08	3
	[13]	DS-TIMS			0.46	0.24	
DNC-1a, dolerite, USGS	This study		8.22	124600	0.40	0.03	8
	[2]	SSB, MC-ICP-MS			0.41	0.03	4
	[3]	SSB, MC-ICP-MS			0.40	0.05	4
	[4]	SSB, MC-ICP-MS			0.38	0.04	2
	[11]	DS-TIMS			0.41	0.03	5
	[8]	DS-TIMS			0.40	0.04	9

[a] Measurement method include double spike TIMS method (DS-TIMS) and standard-sample standard bracketing MC-ICP-MS method (SSB, MC-ICP-MS);

[b] 2SD, 2 standard deviation;
[c] replicate was measured from independent digestion of the given sample;
[d] All the literature data were converted to the $\delta^{44/42}$Ca from $\delta^{44/40}$Ca by dividing 2.048, if only $\delta^{44/40}$Ca has been reported and the corresponding uncertainty is also divided by 2.0

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