Supplementary Material for

Determining Ba isotopes for barite using Na_2CO_3 exchange reaction and double-spike method on MC-ICP-MS

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10 Table S1 Effect of the organic matters on $\delta^{137/134}Ba$ analyses.

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Sample	Organic matter	$\delta^{137/134}Ba_{NIST}$ /‰	2SD	n
NBS127	untreated	-0.24	0.07	2
		-0.23	0.12	2
GBW07812	untreated	0.23	0.03	2
		0.20	0.08	2
		0.19	0.07	2
		0.25	0.08	2
		0.23	0.10	2
		0.25	0.06	2
GBW07811	untreated	-0.07	0.06	2
		-0.06	0.02	2
		-0.05	0.00	2
		-0.09	0.02	2
GBW07814	untreated	-0.03	0.05	2
		-0.02	0.04	2
		-0.06	0.03	2
		-0.07	0.06	2
GBW07815	untreated	-0.01	0.02	2
		-0.04	0.06	2
		-0.05	0.09	2
		-0.06	0.09	2
GBW07816	untreated	-0.04	0.06	2

	-0.05	0.01	2
	-0.02	0.05	2
	-0.03	0.08	2

13 Table S2 Measurement of $\delta^{137/134}Ba$ of GBW07812 using different chemical processes.

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GBW07812	Conditions	$\delta^{137/134}Ba_{\ SRM\ 3104a}$ (‰)	2SD	n	The fraction of dissolved barium (%)
Dissolve	A=1:5,B>4,C=3	0.22		1	
barite	A=1:5,B>4,C=2	0.27	0.03	2	88
firstly	A=1:5,B>4,C=2	0.23		1	
	A=1:10,B>4,C=3	0.20	0.03	2	
（M=16）	A=1:10,B>4,C=3	0.26	0.05	2	
	A=1:10,B>4,C=3	0.24	0.02	2‡	
	A=1:10,B>4,C=3	0.23	0.01	2	95
	A=1:10,B>4,C=2	0.23	0.01	2	91
	A=1:10,B>4,C=2	0.26		1	
	A=1:10,B>4,C=1	0.20	0.01	2	76
	A=1:10,B>4,C=1	0.20		1	
	A=1:20,B>4,C=1	0.27	0.05	2	80
	A=1:20,B>4,C=1	0.25		1	
	A=1:10,B=2,C=3	0.22	0.01	2	64
	A=1:10,B=4,C=3	0.24	0.01	2	49
	A=1:10,B=8,C=3	0.22		1	
Average		**0.23**	**0.05**	**26**‖	
Dissolve	A=1:10,B=0.3,C=3	0.27	0.01	2	58
impurities	A=1:10,B=1,C=3	0.23	0.05	2	52
firstly	A=1:10,B=2,C=3	0.26	0.04	2	54

	A=1:10,B=3,C=3	0.25	0.05	2	63
（M=9）	A=1:10,B=4.3,C=3	0.20	0.01	2	66
	A=1:10,B=11,C=3	0.23	0.05	2	67
	A=1:10,B=17,C=3	0.27	0.01	2	73
	A=1:10,B=24,C=3	0.27	0.03	4	70
	A=1:10,B=24,C=3	0.27	0.03	4	72
Average		**0.25**	**0.05**	**22**[‖]	

A is the mass ratio of $BaSO_4$:Na_2CO_3.

B is the hours of each exchange reaction.

C is the number of exchange reaction.

[‖] The total number of repeated runs of the same sample, including different digestions.

[ǂ] The same solution measured at different time (March and May 2018).

Fig. S1 Influence of isotope composition of double spike and proportion of double spike in the double spike-sample mixture. The horizontal axis gives the proportion of double spike in the double spike-sample mixture, and the vertical axis gives the proportion of ^{136}Ba in the double spike. The isotope ratio of double spike is calculated using the method in Rudge et al. (2009).

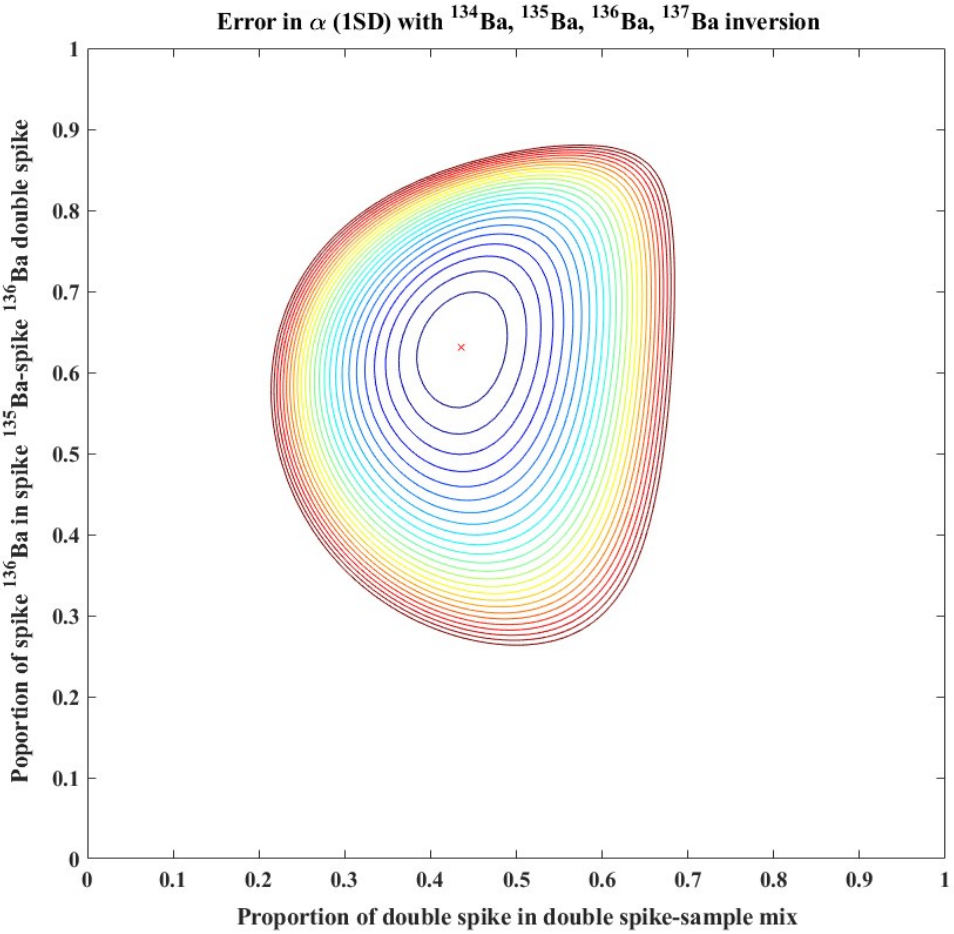

Fig. S2 Effect of the fraction of dissolved barium on $\delta^{137/134}$Ba analyses. Error bars reflect two standard deviations, and the points with only one single measurement do not show error bar. Data are available in Table S2.