

Comparison of Silicon Isotope Analytical Methods: SiF₄ Method versus MC-ICP-MS Method

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The traditional fluorination method and alkali fusion method have been widely used for silicon isotope measurements. The fluorination method is a well established routine method which could provide reliable data using traditional gas source IRMS, and the alkali fusion method is a relatively new method based on MC-ICP-MS, with no fluorinating agent used and a simple protocol. However, the comparison between these two methods were scarce. Here we present silicon isotope data of various samples measured by both methods in order to examine the consistency of the two methods (Table 1).

Table 1 The data comparison of 5 samples

sample	$\delta^{30}\text{Si}(\text{‰})$ (MC-ICP-MS)	$\delta^{30}\text{Si}(\text{‰})$ (SiF ₄)
NBS-28	-0.07±0.10 (n=14)	0.01±0.12 (n=6)
4422	-2.71±0.12 (n=10)	-2.68±0.06 (n=12)
4421	-0.09±0.13 (n=6)	-0.01±0.24 (n=15)
AGV-2	0.03±0.10 (n=11)	0.00±0.14 (n=2)
BHVO-2	0.04±0.14 (n=12)	0.05±0.07 (n=2)

*(n) stand for replicate number

Five samples were analyzed with multiple replicates. The data showed that these two methods yield consistent and comparable results. Compared to SiF₄ method, the advantages of alkali fusion method include to avoid using harmful chemical agent (BrF₅, F₂ and HF), an easier protocol, suitable for analyzing large batch of routine samples, with 1/5 to 1/10 sample size needed. Despite the larger sample amount, the complexity of the operation process, and the use of toxic and relatively less purified fluorinating agents, the traditional SiF₄ method is reliable and could provide a benchmark for silicon isotope determination. For most of the routine samples, either method could be used, but for samples which require extreme accuracy and precision, e.g., the determination of absolute isotope ratio, the traditional SiF₄ method is irreplaceable.