

An improved method for the determination of high precision stable Zr isotope ratios of geological reference materials using a PFA inert sample introduction system

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Abstract

Zirconium is a high-field strength element, which plays a central role in geochemistry as one of the most refractory, lithophile and incompatible elements. The main host minerals of Zr, zircon and baddeleyite, are common accessory phases in a wide range of igneous and metamorphic rocks, and are highly resistant to alteration as evidenced by >4Ga terrestrial zircons. Stable Zr isotopic measurements have been recently developed and Zr isotopes have been demonstrated to be a sensitive tracer of magmatic processes on Earth. However, there are currently very limited data for geological reference materials including natural zircon standards. Furthermore, the current method is limited by high instrumental background in the absence of HF in the acid, and prolonged sample washouts between measurements. In order to decrease the washing time and improve the Zr background we developed a new mass spectrometry method using a commercially available inert sample introduction system. In addition, the chemical purification technique, used to isolate Zr from sample matrices, has been altered to improve the separation of Zr from key matrix elements, such as Mo. Using this new method, we report the Zr stable isotopic composition of basalt BHVO-2, diabase W-2a, granodiorite GSP-2, syenite STM-2, manganese nodule Nod-A-1, cody shale SCo-1 and four natural zircon reference materials (Penglai, 91500, GJ-1 and Mud Tank).

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