A new practical isobaric interference correction model for in-situ Hf isotopic analysis using laser ablation-multi-collector-ICP-mass spectrometry of zircons with high Yb/Hf ratios

HAI-OU GU, HE SUN, FANGYUE WANG, CAN GE

School of Resources and Environmental Engineering, Hefei University of Technology, Hefei 230009, Anhui P.R. China

Isobaric interference correction of ^{176}Yb to ^{176}Hf is essential for precise in-situ Hf isotopic measurement of zircons. Though several models have been proposed to do the interference correction and achieved large quantities of good results in the last two decades, the accurate measurement of ^{176}Hf/^{177}Hf ratios for zircons with high Yb/Hf ratios still remains challenging. Especially, a wide range of natural Yb isotopic compositions reported and used in literatures placed a difficulty when setting up this methodology. In this study, solution doping experiments and LA-MC-ICP-MS studies were carried out. Solution doping experiments showed that the mass bias factor of Yb (βYb) and βYb/βHf can be various greatly with the intensity of Yb, therefore are not good options for interference corrections. But (βYb/βHf)c, which is calculated from samples with high Yb/Hf ratios by fixing the calibrated ^{176}Hf/^{177}Hf values to the “true” values, is proven to be a reliable approach for Yb interference correction.

Therefore, a new isobaric correction model using (βYb/βHf)c as the correction parameter can be proposed for in-situ Hf isotopic analysis using LA-MC-ICP-MS methodology for zircons, especially for those with high Yb/Hf ratio. In this model, a determination of “natural” Yb isotopic compositions is not needed anymore. And the model shows no discrimination to Yb/Hf ratios and therefore can be widely used in most laboratories, especially for those newly setup instruments. The lower limitation of ^{180}Hf intensity is ~1V by the new model so that meaningful ^{176}Hf/^{177}Hf ratios and <1.5ε unit internal errors can achieved simultaneously. A ~3-month monitoring for six standard zircons showed the long-term accuracy error is lower than 2ε unit.