Assessment of the auxiliary gas flow and torch position influence on measurement of Lu-Hf isotopic composition of zircon by a direct identification of $^{177}HfO/^{177}Hf$ formation rates with MC-ICP-MS

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Lu-Hf systematics has widespread applications in geochemistry. In the past few decades, the use of multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) has improved the precision and accuracy of Lu-Hf analysis. Unfortunately, a major challenge of isobaric and polyatomic spectral interferences still exists in accurate measurement. Oxide ions of elements are one of the most problematic interferences which are abundantly in samples. In this contribution we present a new methodology for Lu-Hf analysis by a direct identification of $^{177}HfO/^{177}Hf$ formation rates with MC-ICP-MS. Specifically, the effects of the auxiliary gas flow and torch position on measurement of Lu-Hf isotopic composition of zircon are explored by identifying $^{177}HfO/^{177}Hf$ formation rates directly.

For solution analysis of Lu-Hf, the achieved relationship between $^{177}HfO/^{177}Hf$ ratios and the auxiliary gas flow is exponential. Moreover, the range from 0.5 l/min to 0.8 l/min used for the auxiliary gas flow is appropriate. If the flow is higher than 0.8 l/min or lower than 0.5 l/min, the obtained ratio will be higher or lower than the recommended value of $^{176}Hf/^{177}Hf$. The $^{177}HfO/^{177}Hf$ ratios were 0.92%, 0.34%, 0.29%, 0.27% and 0.26%, corresponding to -4mm, -2mm, 0mm, 2mm and 4mm of the z position of the torch. If changing z position of the torch, although the $^{176}Hf/^{177}Hf$ isotope ratios showed some slight change, they are within uncertainty equivalent to the recommended value. For laser ablation analysis, when the auxiliary gas flow was tuned from 0.7 l/min to 1.1 l/min, the $^{177}HfO/^{177}Hf$ hardly changed. And the obtained $^{176}Hf/^{177}Hf$ isotope ratio showed slight change, which are consistent with the recommended value.

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