

Comparing CRC-MC-ICPMS to QQQ-ICPMS/MS for in situ Rb-Sr applications

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Laser ablation ICP-MS has established itself as a standard technique for elemental and isotopic analysis due to its uncomplicated sample preparation, spatial resolution capability, and excellent analytical precision. However, isobaric interferences often present a significant problem for the precise and accurate determination of isotope systems used in mineral geochemistry and geochronology. Mass spectrometry is now entering a new era with the advent of collision/reaction cell technology (CRC), allowing for specific removal of unwanted isobaric interferences from the analyte of interest within the mass spectrometer itself. In particular, laser ablation triple quadrupole (QQQ)-ICP-MS/MS applied to Rb-Sr geochronology involves the separation of $^{87}\text{Rb}^+$ from $^{87}\text{Sr}^+$ using reactive gaseous agents such as O_2 , N_2O or SF_6 [1-4]. One of the disadvantages of QQQ-ICP-MS/MS is the fundamental limitation on the measured isotope ratio internal precision that can be achieved in peak hopping mode of $\sim 1\text{--}2\%$, mainly caused by ion beam fluctuations and the consecutive nature of data acquisition. In this contribution we will compare the performance of the Agilent 8900 QQQ-ICP-MS/MS to the new Thermo Fisher Scientific Neoma CRC-MC-ICPMS for in situ Rb-Sr geochronometry of mica, K-feldspar and apatite reference materials, and discuss the currently achievable internal precisions of isotope data obtained from materials with various Sr concentrations. Both instruments are installed side-by-side at the John de Laeter Centre (Curtin University, Australia), and the experiments were conducted using identical laser ablation parameters over multiple consecutive sessions. Challenges for the accurate determination of $^{87}\text{Sr}/^{86}\text{Sr}$ and $^{87}\text{Rb}/^{86}\text{Sr}$ are (1) high Rb/Sr in biotite requires efficient removal of residual ^{87}Rb from ^{87}Sr , (2) medium to low Rb/Sr in K-feldspar and apatite lead to smaller time-integrated variations in $^{87}\text{Sr}/^{86}\text{Sr}$ and thus require more precise (sub-permil) determination of $^{87}\text{Sr}/^{86}\text{Sr}$, and (3) removal of additional polyatomic interferences encountered in apatites such as CaPO^+ and REE^{2+} . We provide a comprehensive report on our method development and highlight the remaining analytical challenges with these new platforms.

[1] Cheng et al. (2008) *Anal.Chim.Acta* 627(1), 148-153.

[2] Bolea-Fernandez et al. (2016) *J.Anal.At.Spectrom.* 31, 464-472.

[3] Zack and Hogmalm (2016), *Chem.Geol.* 437, 120-133.

[4] Hogmalm et al. (2017) *J.Anal.At.Spectrom.* 32, 305-313.