In-Situ Rb-Sr dating by LA-ICP-MS/MS on different matrices

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Résumé

Laser ablation ICP-MS/MS (LA-ICP-MS/MS or LA-ICP-QQQ) has recently emerged as a powerful in-situ tool for Rb-Sr dating of geological processes, including magmatic, metamorphic and hydrothermal events. This technique offers high special resolution up to a few tens of micrometers, allowing direct analysis of the matrices of interest. However, determining and correcting for fractionation and matrix effects remains a key challenge.
To overcome these limitations, our study focuses on characterizing fractionation and matrix effects and their impact on the accuracy and precision of in-situ Rb-Sr dating using LA-ICP-MS/MS. We analyzed various reference materials (RMs; synthetic silicate glass, geological glass, and mineral powder) and natural mineral samples. We also attempted to develop fused mineral glasses from the CRPG phologopite Mica-Mg and biotite Mica-Fe, which are currently used as primary or secondary RMs for 87Rb/86Sr calibration. This aimed to improve homogeneity, control matrix effects, and achieve better precision with more stable ablation signals.
Our results show that fractionation and matrix effects do exist, impacting 87Rb/86Sr ratio calculations, though 87Sr/86Sr ratios are largely unaffected. These matrix effects are mainly linked to differences in major element composition, particularly Si and Al, between the RMs. We established a correlation between the major element compositions of the matrices and the accuracy of the measured 87Rb/86Sr ratio. In addition, we will present preliminary data on the homogeneity and potential of the developed mineral glass RMs. Furthermore, we propose a new approach using a correction factor calculated based on the Al and/or Si content of the dated minerals and RMs, evalulating the potential of fused mineral glasses as primary RMs for in-situ Rb-Sr dating.

Mots-Clés: LA ICP MS/MS, In situ Rb Sr dating, matrix effect, reference materials, glass, powders

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