

Rb-Sr dating using LA-CRC-MC-ICP-MS/MS

**TU-HAN LUU¹, DANIEL PETERS², YVAN GÉRARD²,
HYWYN CRAWSHAW² AND FRÉDÉRIC MOYNIER¹**

¹Université Paris Cité, Institut de Physique du Globe de Paris,
CNRS UMR 7154

²Nu Instruments Ltd

The ⁸⁷Rb-⁸⁷Sr dating system is widely used in geo- and cosmochemistry. Its long half-life (~ 49 Gyr) allows for dating the crystallization age of objects nearly as old as the solar system, but also much younger igneous rocks. However, the precision of an age derived from an isochron diagram depends on several factors, such as the spread on the Rb/Sr ratios, but also the precision on the Rb/Sr and ⁸⁷Sr/⁸⁶Sr determinations.

In situ isotopic measurements by LA-MC-ICP-MS are challenging: isotopic and elemental fractionation induced by the laser, combined with the presence of molecular interferences (e.g., Fe/Zn/Ga oxides, Ca dimers and Ca argides in the mass region 84-88), often limit the precision on the Rb-Sr age determination. Moreover, the ⁸⁷Rb-⁸⁷Sr radiochronometer is characterized by a beta decay producing a daughter nuclide (⁸⁷Sr) that isobarically interferes with the parent nuclide (⁸⁷Rb) during isotopic analyses. However, these interferences can be avoided by MS/MS analysis, allowing for mass filtering around the masses of interest and mass shifting using the collision/reaction cell (CRC) of an instrument [1].

In this study, we present the first Rb-Sr data using laser ablation (ESI NWR 193 nm laser ablation system) coupled with a Nu Instrument Sapphire XD Dual Path MC-ICP-MS/MS. In particular, we present data that demonstrates the stepwise validation of the Rb-SrF technique on Sapphire XD using the various analytical modes to ensure accuracy and the absence of any analytical artifacts. Before laser ablation analysis, rigorous doping experiments with Rb, Y, Zr, Pd and Cd in solution mode were performed to investigate the effect CRC-based oxide formation (e.g., YO⁺ and ZrO⁺) and evaluate different measures to suppress or minimise said oxides for absolute isotope ratio precision. Ultimately, the instrument was coupled to the laser ablation system.

Data obtained on NIST 610, 612 and 614 standards and three basaltic glasses (BCR-2G, BHVO-2G and BIR-1G) will be presented at the time of the conference, together with ⁸⁷Rb-⁸⁷Sr data for the Erg Chech 002 meteorite.

[1] D. Bevan, C.D. Coath, J. Lewis, J. Schwieters, N. Lloyd, G. Craig, H. Wehrs, T. Elliott, *JAS*, **2021**, 36, 917–931.