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Assessment of Mica-Mg and GL-O nano-powders as reference materials for in-situ Rb-Sr dating by LA-ICP-MS/MS

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The recent advancement of tandem inductively coupled plasma mass spectrometry - with addition of a reaction/collision cell between two quadruples (ICP-MS/MS) - allows the in-situ dating of geological materials via negative b-decay radiometric systems, such as rubidium-strontium (Rb-Sr) using laser ablation (LA). Using a reactive gas such as O_2, N_2O or FS_6 allows on-line (i.e., within instrument) separation of isobaric ions such as ^{87}Rb and ^{87}Sr, as the former is inert with these gases, and the later can react with the above gases to form either $^{87}Sr^{16}O^+$ or $^{87}Sr^{19}F^+$ [1, 2]. However, using the LA system for sampling can introduce effects such as matrix-effects between minerals and down-hole fractionation which require correction for accurate results. Thus, improved calibration strategies are required to correct in-situ Rb-Sr data using suitable reference materials (RMs) that should be matched (mineralogically and chemically) with the samples/minerals of interest. Currently, the lack of mineral-specific and matrix-matched RMs remains the main challenge that limits the in-situ Rb-Sr dating technique to only certain minerals, and thus the development and characterisation of new RMs are necessary to apply this novel technique to wider applications in earth and planetary sciences. In this work, two reference materials have been tested including phlogopite (Mica-Mg) and glauconite (GL-O) for in-situ Rb-Sr dating of micas minerals by the LA-ICP-MS/MS. The samples were analysed as nano-powder pellets by the LA-ICP-MS/MS to constrain their $^{87}Rb/^{86}Sr$ and $^{87}Sr/^{86}Sr$ ratios, and thus Rb-Sr ages. These results were used to better characterise and calibrate Rb-Sr data and isotope variability in the above mineral standards (Mica-Mg and GLO), as well as phlogopite flakes (MDC),glauconite grains (GL-O) and biotite (Mica-Fe); and conclusions are made about the suitability of the above mineral standards for in-situ Rb-Sr dating applications.

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2. Zack, T. and K.J. Hogmalm, *Laser ablation Rb/Sr dating by online chemical separation of Rb and Sr in an oxygen-filled reaction cell.* Chemical Geology, 2016. **437**: p. 120-133.