Development of reference materials for in-situ Rb-Sr isotopic dating by laser ablation ICP-MS/MS and its application to W-Sn deposits in the French Massif Central

YUJIN JEGAL1, CATHERINE ZIMMERMANN2, CHANTAL PEIFFERT3, LAURIE REISBERG2, ETIENNE DELOULE2 AND JULIEN MERCADIER4

1Université de Lorraine, GeoRessources, CRPG, CNRS
2Université de Lorraine, CNRS, CRPG
3Université de Lorraine, CNRS, CREGU, GeoRessources
4Université de Lorraine - CNRS - CREGU - GeoRessources

Presenting Author: yujin.jegal@univ-lorraine.fr

Rb-Sr dating techniques have been widely used as a geochronological tool to date and constrain the cooling history of geological events. However, in-situ dating using the \(^{87}\text{Rb}-^{87}\text{Sr}\) beta decay system is severely limited by the isobaric overlap of \(^{87}\text{Rb}\) on \(^{87}\text{Sr}\). Recent developments in in-situ Rb-Sr isotopic techniques by laser ablation inductively coupled plasma mass spectrometry equipped with a collision/reaction cell (LA-ICP-MS/MS) can resolve this problem, if appropriate reaction cell gases are used (O\(_2\), N\(_2\)O and SF\(_6\)) [1, 2, 3]. In-situ Rb-Sr dating of minerals by LA-ICP-MS/MS requires calibration with well-certified matrix-matched reference materials with precisely known Rb/Sr ratios and Sr isotopic compositions. However, such well-characterized reference materials for in-situ Rb-Sr dating, in particular Rb-rich minerals such as micas, are currently limited.

In this study, we first establish and characterize reference materials suitable for in-situ Rb-Sr geochronology of high-Rb minerals (i.e., micas and feldspars). Four CRPG geostandards, phlogopite Mica-Mg, biotite Mica-Fe, glauconite GL-O and potash feldspar FK-N, were selected as potential mineral standards based on their broad compositional range, covering the compositional variation of micas and feldspars from granitic rocks. We will present the measured \(^{87}\text{Sr}/^{86}\text{Sr}\) and \(^{87}\text{Rb}/^{86}\text{Sr}\) values of the standards obtained by the isotope dilution method using multi-collector inductively coupled plasma mass spectrometry (MC-ICPMS) and thermal ionization mass spectrometry (TIMS) for Rb and Sr isotope measurements, respectively. Our second goal is to examine the selected Rb-Sr standards using an Agilent 8900 ICP-MS/MS coupled with a LA system and to use them as reference materials for dating of unknown samples. Towards this goal, the in-situ Rb-Sr isochron ages of micas from W ± Sn deposits in the French Massif Central will be compared against their already known U-Pb ages [4].

Acknowledgments
This work was supported by a Labex Ressources 21 grant with the reference ANR-10-LABX-21-RESSOURCES21.

References