

Characterisation of potential K-feldspar, biotite, and muscovite reference materials for LA–(MC)–ICP–MS/MS Rb–Sr geochronology

CARLOS R CORELLA SANTA CRUZ¹, THOMAS M BELGRANO¹, KERSTIN DROST², DAVID VAN ACKEN¹, MAURICE BRODBECK¹, JULIAN F MENUGE¹, DAVID M. CHEW², DR. PAUL SLEZAK, PHD³, DALTON MCCAFFREY^{4,5}, ANDREW J MARTIN⁴, PROF. J STEPHEN DALY, BA (MOD.), PHD¹ AND FRANK MCDERMOTT¹

¹University College Dublin

²Trinity College Dublin

³Idaho National Laboratory

⁴University of Nevada, Las Vegas

⁵Current address: U.S. Geological Survey, National Minerals Information Center

Project EIRbSr seeks to develop an *in situ* Rb–Sr dating protocol using Thermo Scientific™ Neoma™ MC–ICP–MS/MS at the National Centre for Isotope Geochemistry (NCIG) at University College Dublin. The enhanced analytical precision of this method can only be fully realised using matrix-matched reference materials with commensurately precise Rb–Sr age determinations. Internationally available reference materials are currently relatively limited in mineral variety, and uncertainty on their reference ages still dominates error propagation for samples calibrated by them. Here we update the community on the development of *in situ* Rb–Sr dating in Ireland and on the search for new K-feldspar, biotite, and muscovite reference materials. Promising candidates originating from the *ca.* 1.4 Ga Kingman pegmatite, Cerbat Range, Arizona (Bt, Ms); the Itrongay pegmatite, Madagascar (Kfs); and the Mourne Mountains, N. Ireland (Kfs) have now been identified. Dating by QQQ-ICP-MS/MS at Trinity College Dublin using N₂O reaction gas indicates these materials have Rb–Sr systematics suitable for further isotope dilution characterisation. A notable result of this work so far is that the Itrongay K-feldspar Rb–Sr preliminary age is >100 Myr older than the currently accepted K–Ca and Ar–Ar ages, but consistent with U–Pb ages of apatite inclusions [1,2]. The preliminary biotite age for the Kingman pegmatite (1420 ± 35 Ma) is similar to the recalculated model age for international K-feldspar standard NIST SRM607A (1443 ± 28 Ma; ⁸⁷Sr/⁸⁶Sr_{initial} = 0.71 ± 0.01 [3]), sourced from the same location, but younger than a monazite Th–Pb microprobe age from a satellite quarry at the deposit (1561 ± 37 Ma [4]). Monazite and allanite U–Pb dating are currently underway to resolve the emplacement age of the Kingman pegmatite and better characterise this potential multi-reference-material source.

[1] Nagler and Villa (2000), *Chemical Geology* 169, 5–16.

[2] Popov et al (2020), *Chemical Geology* 556.

[3] Nebel and Mezger (2006), *Chemical Geology* 233, 337–345.

[4] Hanson et al. (2012), *Canadian Mineralogist* 50, 815–824.