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Constraining the tectonic setting of continental crust formation from coupled *in situ* Rb-Sr dating and Pb isotopic analysis of detrital, single K-feldspar grains

DAN BEVAN[1], CHRISTOPHER D. COATH[1], JAMIE LEWIS[1], DANIEL STUBBS[1], JOEL RODNEY[1], JOHANNES SCHWIETERS[2], NICHOLAS LLOYD[3], GRANT CRAIG[2] AND TIM ELLIOTT[1]

[1]University of Bristol

[2]Thermo Fisher Scientific (Bremen) GmbH

[3]Thermo Fisher Scientific

Presenting Author: dan.bevan@bristol.ac.uk

K-feldspars are a major constituent of the Earth's crust and are globally abundant in sediments as preserved detrital grains. Detrital K-feldspars are now viable targets for rapid, single-grain, *in situ* Rb-Sr dating, due to the high precision measurements of $^{87}Sr/^{86}Sr$ attainable using collision cell MC-ICPMS/MS technology [1]. Detrital K-feldspar also preserve the initial Pb isotopic signature of their source rock, due to their low U/Pb ratios. The distinct U/Pb of crust generated in subduction and intraplate environments means initial Pb isotope ratios in detrital K-feldspar, readily measured using *in situ* techniques [2], can be used to infer the tectonic setting of reworked crust [3]. We present analysis of detrital K-feldspar combining these two analytical techniques, using collision cell MC-ICPMS/MS. We use SF_6 and NH_3 reaction gases to chemically resolve Rb and Hg interferences, on Sr and Pb isotopes respectively.

We first demonstrate, using K-feldspar megacrysts from the Shap Granite, and detrital K-feldspar grains from the associated Shap Wells Conglomerate sourced from the same pluton, that source rock Rb-Sr ages, $^{87}Sr/^{86}Sr_i$ and initial Pb isotopic composition can be preserved in detrital K-feldspar grains. We also present coupled Rb-Sr & Pb isotopic analysis of detrital K-feldspar from the Proterozoic Applecross Formation (NW Scotland). The grains analysed display a broad age range, from Neoarchean to Neoproterozoic, providing an initial Pb isotopic archive spanning over 1500 Ma. Relative uncertainties achieved for single grain Rb-Sr ages and $^{87}Sr/^{86}Sr_i$ were as low as 1% and 300 ppm, respectively. We combine the Rb-Sr crystallisation age and initial Pb isotope ratios for each detrital K-feldspar to determine a Pb model age for juvenile crust formation and crustal U/Pb. The model ages calculated for 30 K-feldspar grains span from the Paleoarchean to the Mesoproterozoic, with all of the calculated crustal U/Pb signifying a subduction setting. This temporal record of crustal U/Pb provides a fascinating insight into the tectonic setting of crustal formation during the Archean and the Proterozoic.

[1] Bevan et al. (In submission) *Journal of Analytical Atomic Spectrometry*

[2] Tyrrell et al. (2006) *Journal of Sedimentary Research*, *76*, 324-345

[3] Delavault et al. (2016) *Geology, 44, 819-822*