

## **Formation of LCT Pegmatites in Archean Cratons: Constraints from $^{40}\text{Ar}/^{39}\text{Ar}$ mica, U-Th-Pb monazite and U-Pb tantalite/columbite dating**

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Lithium-Cesium-Tantalum (LCT) pegmatites are typical constituents of Archean crust. Due to the growing Li-market, LCT pegmatites recently became a promising exploration target. The temporal and spatial relationships of the pegmatites to potential source granites, their crystallisation history and geotectonic settings are under debate. For the evaluation of the petrogenesis and emplacement history we compared Meso- and Neo-Archean LCT pegmatites of the Zimbabwe (Bikita), Pilbara (Wodgina) and Yilgarn Cratons (Londonderry, Mount Deans, Cattlin Creek) [1]. White mica and lepidolite are abundant in LCT pegmatites and potentially accessible for  $^{40}\text{Ar}/^{39}\text{Ar}$  dating.

$^{40}\text{Ar}/^{39}\text{Ar}$  cooling ages were determined on 16 lepidolite and white mica samples to elucidate the late hydrothermal stage of pegmatite formation. The  $^{40}\text{Ar}/^{39}\text{Ar}$  ages cover a large spectrum from Neoarchean (~2630 Ma) to Paleoproterozoic (~2316 Ma), and are verified by U/Pb tantalite/columbite ages (~2870 to 2615 Ma, LA-ICP-MS) and by Th-U-Pb electron microprobe monazite ages (~2700 Ma; ~2500 Ma) [1].

Micas from the Yilgarn Craton yield Neoarchean cooling ages indicating a immediate cooling after crystallisation. In contrast, micas from the Zimbabwe (~2625 Ma) and Pilbara Craton (~2870 Ma) exhibit Paleoproterozoic cooling ages that significantly postdate initial crystallisation [1]. This is in good agreement with petrographic data that suggests a post pegmatite hydrothermal overprint.

Overall, our new age data are in good agreement with a previously postulated global major LCT pegmatite events between 2850 to 2800 Ma and 2650 to 2600 Ma [2]. During this event specific geodynamic conditions (i.e. a super-continent assembly) and associated anormal high heat flow from the mantle enabled the global formation of large volumes of LCT pegmatites.

[1] Dittrich, T. et al (2015) Final Report for Rockwood Lithium GmbH (Frankfurt am Main /Germany) 536p.

[2] Tkachev, A. (2011) Geol. Soc., Special Publ. 350: 7-23.