Lithium pegmatites of the Kalba-Narym Belt, East Kazakhstan: Geological overview

Gleb Smirnov¹, Reimar Seltmann², and Azam Soltani Dehnavi³

¹Nazarbayev University, Astana, Kazakhstan (gleb.smirnov@nu.edu.kz)
²The Natural History Museum, Earth Sciences Department, London, United Kingdom (r.seltmann@nhm.ac.uk)
³Nazarbayev University, Astana, Kazakhstan (azam.soltani@nu.edu.kz)

The Kalba-Narym Belt is part of the Central Asian Orogenic Belt (CAOB) and formed due to the continental collision between Kazakhstan and Siberian plates in the Late Paleozoic. Several plutons comprising the Kalba-Narym granitic batholith are considered post-orogenic. The commonly accepted theory claims that these intrusive bodies might have been formed due to the far-spreading influence of the Tarim mantle plume (Khromykh et al., 2019). However, the volcanic facies, that are normally associated with plume-related activities are present only sporadically in the Kalba-Narym area, which may imply that the heat source is plume-unrelated and instead linked to mafic underplating and uplift processes of the crust. Amongst the variable intrusive rocks formed in this region, highly-fractionated pegmatites are particularly important but nevertheless remain poorly understood with origin controversially discussed. The mineralized pegmatites are associated with Phase 1 granites of the Kalba complex, with a 40Ar/39Ar age of 297 to 290 Ma (Kotler et al., 2021). The formation of pegmatites, driven either by the differentiation of granitic melts or by anatctic melting processes, was likely supplemented by the inputs of volatiles and rare metals with fluids. The rocks of the best-known pegmatite occurrences located near Asubulak village, such as Yubileynoye and Krasny Kordon deposits, can be categorized as LCT pegmatites, including three main zones based on mineralogical and geochemical assemblages of a) microcline-albite with pollucite and petalite (Ta, Cs, Be, Sn), b) microcline-albite with spodumene (Ta, Nb, Cs, Li, Be, Sn), and c) spodumene-albite (Li, Ta, Nb, Sn) (D’yachkov et al., 2021).

Apart from the mineralized pegmatites, there are known occurrences of barren pegmatites, which creates an opportunity for comparison with the mineralized pegmatites specifically via contrasting geochemical signatures. Aiming at a proper understanding of the pegmatite genesis, mineralization mechanisms and geochemical approach on a bigger regional scale of the Greater Altai may open up unique perspectives for the future exploration of the region. Therefore, this presentation provides an overview and re-evaluation of the detailed geological characteristics of the Kalba-Narym Belt, continuous into Chinese Altai, and the processes involved in rare-metal pegmatite mineralization.

References:
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