

U-Pb and Lu-Hf isotope systematics of Nb-Ta mineralization

L. MARKO^{1*}, A. GERDES², F. MELCHER² AND
M. VAN LICHTERVELDE³

¹Goethe-University Frankfurt, 60438 Frankfurt, Germany,
(*correspondence: lmarko@stud.uni-frankfurt.de)

²Montanuniversität Leoben, 8700 Leoben, Austria

³Universite de Toulouse, 31400 Toulouse, France

Rare element pegmatites are supposed to be the product of igneous fractionation of diverse felsic magmas. In many cases, a genetic relation between granite plutons and bodies of pegmatite is assumed on the basis of spatial proximity. If the “parental” granite is not exposed, the origin of a given pegmatite is unknown. The combination of high-spatial resolution Sm-Nd and Lu-Hf isotope systematics with U-Pb geochronology could be used to characterize the origin and source of the parental magma. We studied columbite group (CGM) minerals from the Tanco pegmatite (LCT) in southeastern Manitoba (Canada) and from different pegmatite fields of Kibaran age from Central Africa. LA-SF-ICP-MS U-Pb ages of CGM from the Tanco pegmatites show quasi concordant ages between 2.67 – 2.50 Ga as well as strongly discordant analyses with ²⁰⁶Pb/²³⁸U ages of 0.35 to 1.6 Ga. The association of the pegmatite to their “parent” magmas is still unknown. U-Pb ages of CGM samples from the Kibaran pegmatites vary between ~975 and ~930 Ma and are interpreted to be associated to the G4-Granite which formed at 986 ±10 Ma[1]. The U-Pb system shows a clear age variation for the Tanco and Kibaran CGM as well as some discordant ages. Sm-Nd and Lu-Hf isotopes of specific domains in CGM were analysed by isotope dilution technique using a Neptune MC-ICP-MS after dissolution in acid and subsequent separation of the isotope fraction by ion exchange chromatography. Samples of 0.5 to 50 mg were collected from thick section guided by BSE images using a microdrill and Resolution Excimer Laser, respectively. Nd and Sm concentration vary from 0.1 to 107 ppm with Sm/Nd of 0.1 to 0.9; Hf concentration vary from 8 to 740 ppm with Lu/Hf of 0.001 to 0.21. The CGM of the Tanco pegmatite fall in an positiv εHf(t) range of 0.4 to 2.2. The εHf(t) data from Kibaran pegmatites show considerable variation from -2.9 to -23.9 between different localities, within single pegmatites and even grains. This variation correlates with textural heterogeneity and is probably caused by a hydrothermal alteration process. But the big spread in the εHf(t) data from the CGM and the discordant ages are pointing to a more complex history. The association to the “parent” rock and the following processes will be discussed.

[1] Tack et al. (2010) *Prec. Res.* **180** (1-2)pp. 63–84.