Geophysical Research Abstracts
Vol. 16, EGU2014-6658, 2014
EGU General Assembly 2014

LCT pegmatites from the Wodgina pegmatite district, Western Australia

Lisa Richter, Thomas Dittrich, Thomas Seifert, and Bernhard Schulz
Department of Mineralogy , TU Bergakademie Freiberg, Germany (Thomas.Dittrich@mineral.tu-freiberg.de)

The lithium-cesium-tantalum (LCT) pegmatites from the Mt. Tinstone and Mt. Cassiterite open pits are located within the Wodgina pegmatite district, about 130 km south of Port Hedland, Western Australia. The albite-spodumene and albite-type pegmatites of the Wodgina pegmatite district are currently mined for tin, tantalum and niobium. The pegmatites are hosted within the Archean East-Pilbara Granite-Greenstone Terrane linked to the fertile Numbana monzogranite that forms part of the Yule Granitoid Complex.
Granitic melt intruded into metasedimentary rocks (∼2.8 Ga) and formed a series of pegmatite sheets, dikes and irregular structures. These pegmatites are characterized by a high melt fractionation that led to the formation of pegmatitic minerals, containing high concentrations of rare elements, such as Ta, Nb, Li, Rb and Cs.
The pegmatites from the Mt. Tinstone sheet open pit, which were investigated within this study, comprises four internal zones consisting of six mineral assemblages, dominated by quartz, albite and white mica, with K-feldspar and spodumene as major or minor constituents.
Distribution patterns of cassiterite and Ta-Nb-Sn-oxide minerals (ixiolite/wodginite, tantalite/columbite and microlite) can be observed within the four different pegmatite zones. The contact zones are enriched in cassiterite, ixiolite and microlite; border zones reveal high concentrations of cassiterite, ixiolite and tantalite; the intermediate units are characterized by a moderate enrichment of the ore minerals; whereby core zones host almost no significant contents of the minerals mentioned above. Distribution of Ta-Nb-Sn-oxides within the zones and Mn/(Mn+Fe) and Ta/(Ta+Nb) ratios are indicators for melt fractionation, and change from the core zones to the outermost contact zones, as well as from north to south.
Electron microprobe analyses on white mica show the existence of fractionation trends from more primitive white mica of the core zones (zinnwaldite) to higher evolved white mica of the border and contact zones (lepidolite and polylithionite). Furthermore, the white micas show a north to south regional fractionation trend.
Trace element variations appear in the bulk rock geochemistry of samples from different locations within the Mt. Tinstone pegmatite sheet. These variations illustrate a fractionation trend from pegmatites enriched in Li, Cs, Rb, Ta and Sn to the north, to less fractionated pegmatites with lower concentrations of these elements in the south.
In summary, the fractionation indicators reveal a trend from north to south. This may indicate a parental granitic intrusion north of the Wodgina pegmatite district and a position of the more evolved pegmatites southwards the Mt. Tinstone open pit.