Jakub Ryznar

Mineralogy and geochemistry of 3T mineralisation form the Kibara Belt area, Central Africa

ABSTRACT

The doctoral dissertation focuses on mineralogy, geochemistry and deposit-forming processes of 3T mineralization (tin - Sn, tungsten - W, tantalum - Ta) related to the tin-bearing granites of the Bugarura-Kuluti area in eastern Rwanda. The objects of the research are granites, pegmatites, greisens and hydrothermal veins hosting Sn, W and Ta-Nb mineralization, as well as selected heavy minerals such as tourmaline, zircon, monazite, staurolite and Ti oxides. The aim of the work is to investigate the origin, evolution and age of Ta-Nb, Sn and W deposits, as well as to determine the sources and metals zonality. The research presents changes in the mineralogy and chemistry of studied minerals presented on the metallogenic model of the research area. Additional aim of the work is to propose exploration methods adapted to the investigated deposits.

To solve the scientific problem, a wide scope of field work was carried out, including mapping and sampling of mineralized formations. The second part of the research concerned the use of analytical methods, which include: optical microscopy in reflected and transmitted light, chemical analysis of the whole rock (ICP-MS), chemical analysis in the micro area using an electron microprobe (EMPA) and a mass spectrometer with inductive plasma ionization coupled with laser ablation (LA ICP-MS).

The results of field work allowed us to revise and improve the geological map of the area and supplement it with the location of mineralised outcrops. On its basis, the zonality of individual types of deposits was confirmed and their range was determined. A detailed petrographic description and mineralogical analysis were conducted on granites, pegmatites, greisens and hydrothermal veins hosting Sn, W, Ta-Nb mineralisation as well as selected heavy minerals. Differences in the mineralogical and chemical characteristics of minerals from different types of deposits were demonstrated. The chemical zoning of Ta-Nb mineralization with increasing distance from the source has been proved. The directions of fractionation of the magmatic system were presented and the origin of the studied mineralization was determined. The results of field and analytical work allowed for the creation of a metallogenic model of the area and the presentation of deposit-forming processes over time against the background of regional tectonic events. Finally, exploration methods adapted to the nature of the mineralization occurring have been proposed.