COMPOSITIONAL VARIATIONS OF PEGMATITE Nb-Ta MINERAL ASSEMBLAGE FROM THE LIMBACH AREA, MALÉ KARPATY MTS., SLOVAKIA

UHER, P.[1], ŽITŇAN, P.[2] & OZDÍN, D.[2]
[1] Department of Mineral Deposits, Comenius University; Mlynská dolina G, 842 15 Bratislava, Slovakia
E-mail: puher@fns.uniba.sk
[2] Department of Mineralogy and Petrology, Comenius University; Mlynská dolina G, 842 15 Bratislava, Slovakia

A varied association of Nb-Ta oxide minerals was discovered during heavy-mineral prospecting in Limbach brook, NW of Pezinok, SW Slovakia. Besides of common heavy minerals (garnet, staurolite, zircon, apatite, monazite-(Ce), ilmenite, magnetite, gold), members of the columbite–tantalite (Ct) group, ferrotapiolite, Sn-rich ixiolite, Ta-rich rutile and microlite to uranmicrolite were identified together with uraninite and Hf-rich zircon (11-15 wt% HfO_2, 0.11-0.14 Hf apfu). The textural and compositional relations as well as local geological setting indicate a granitic pegmatite origin of the heavy mineral Nb-Ta assemblage. The surrounding rocks are Hercynian leucogranites of the Bratislava Massif (the Staré Mesto body) and Lower Paleozoic micaschists to paragneisses. Numerous pegmatite veins cut both the parental granites as well as the metapelites-metapsammites.

Minerals of the Ct group are the most widespread Nb-Ta phases. Five basic textural and compositional types of Ct minerals could be distinguished:

(Ct1) Large crystals (up to 4 mm) with regular fine to coarse oscillatory zoning, locally unzoned or with diffuse zonality. They belong to ferrocolumbite, rarely ferrotantalite, manganocolumbite and manganotantalite with broad compositional variations: (atomic ratio:) Mn/(Mn + Fe) = 0.17–0.52 and Ta/(Ta + Nb) = 0.19–0.70.

(Ct2) Irregular patchy intergrowths of ferrocolumbite – ferrotantalite with Ta-rich rutile (*ca.* 1 mm in size); Mn/(Mn + Fe) = 0.19–0.27 and Ta/(Ta + Nb) = 0.49–0.57. Ct shows increased Ti and W contents (up to 2.3 wt% TiO_2 and 0.7 wt% WO_3).

(Ct3) Irregular patchy intergrowths of ferrotantalite–manganotantalite with ferrotapiolite (*ca.* 0.6 mm in size); Mn/(Mn + Fe) = 0.34–0.66 and Ta/(Ta + Nb) = 0.65–0.81.

(Ct4) Irregular bended zones of ferrocolumbite (up to 0.3 mm long) with fine oscillatory zoning which replace Ct1. The zoning is caused by Nb-Ta variation with increasing of Ta/Nb ratio; Mn/(Mn + Fe) = 0.16–0.19 and Ta/(Ta + Nb) = 0.16–0.34.

(Ct5) Irregular patchy zones of ferrocolumbite to ferrotantalite (0.2–0.9 mm) along cracks and rims of Ct1; Mn/(Mn + Fe) = 0.43–0.49 and Ta/(Ta + Nb) = 0.24–0.61.

The Ct1 belongs to primary magmatic minerals, whereas Ct2 and Ct3 are probably products of sub-solidus (?) recrystallization of primary phases and textural patterns of Ct4 and Ct5 indicate late- to post-magmatic replacement of Ct1. Compositional evolution of Ct is complex without unambiguous fractionation trend.

Ferrotapiolite forms anhedral intergrowths in Ct3 or inclusions in Ct1, 60 to 100 μm in size; Mn/(Mn + Fe) = 0.05–0.07, Ta/(Ta + Nb) = 0.87–0.93. Rarely, a Sn-rich ixiolite-like phase with Mn/(Mn + Fe) = 0.40 and Ta/(Ta + Nb) = 0.81 and 9.4 wt% SnO_2 occurs as 110 μm irregular inclusion in Ct1. Ta-rich rutile (strüverite) shows relatively uniform compositions with Mn/(Mn + Fe) = 0.01–0.03 and Ta/(Ta + Nb) = 0.80–0.84. Rare microlite to uranmicrolite forms anhedral, 5–15 μm thick overgrowth on uraninite in partly recrystallized part of Ct1; Ta/(Ta + Nb) = 0.82–0.94, U = 16–47 atom % of *A* site.

The above mentioned Nb-Ta association from Limbach area with variable but relatively high Ta/Nb and Mn/Fe ratios indicates a moderate fractionation level, typical for the rare-element class of granitic pegmatites of LCT family, probably beryl-columbite subtype (*sensu* ČERNÝ, 1991). Such pegmatites with beryl, columbite–tantalite, Hf-rich zircon, gahnite and almandine–spessartine are typical of the surrounding Bratislava S-type granitic massif (UHER *et al.*, 1994, UHER & ČERNÝ, 1998).

References

ČERNÝ, P. (1991): Geoscience Canada, 18: 29–41.
UHER, P. & ČERNÝ, P. (1998): Geologica Carpathica, 49: 261–270.
UHER, P., ČERNÝ, P., NOVÁK, M. & SIMAN, P. (1994): Mineralia Slovaca, 26: 157–164.