Effect of composition of granitoid melt and temperature on dissolution of tantalite-columbite in the melt: Experimental study

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Experimental study of solubility of a natural crystal tantalite-columbite (10.5 wt.% MnO, 6.6% FeO, 42.9% Ta_2O_5, 37.9% Nb_2O_5, 1.7% TiO_2, 0.4% SnO_2) in model (K_2O-Na_2O-Al_2O_3-SiO_2) melts of alkaline, metaluminous and peraluminous (topaz-containing) granites was carried out in internally heated pressure vessels (IHPV) at T = 650, 750 and 850°C and P = 100 MPa.

It is established that tantalum content in the melts higher than niobium content at all investigated compositions and temperatures, so Nb/Ta ratios in the melt are always less than unity and varies from 0.70 to 0.07 (Fig. 1). The Nb/Ta ratios were reduced with the change in the composition of the melt from alkaline to peraluminous granites. At that there is the overall decrease in the contents of Ta and Nb (up to 1-2 orders of magnitude), but the content of Ta is reduced noticeably weaker compared to Nb. Maybe the decrease in temperature can lead to substantial separation of Ta and Nb specifically in peraluminous granitic melts.

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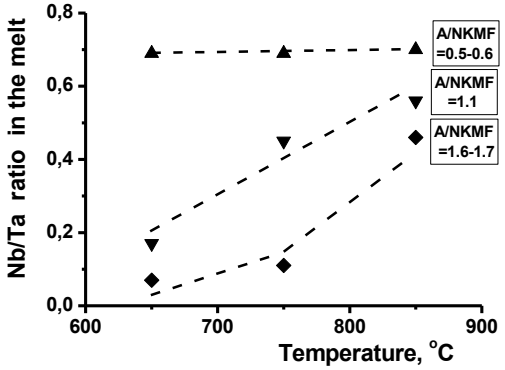

Figure 1: The Nb/Ta ratios in the melt versus temperature. Different symbols and lines characterize three melts compositions: alkaline (Al_2O_3/(Na_2O+K_2O+MnO+FeO) = 0.5-0.6), metaluminous (A/NKMF = 1.1) and peraluminous (A/NKMF = 1.6-1.7).