

NEW MINERAL PHASES OF NIOBIUM IN CARBONATITES OF THE KOLA ALKALINE PROVINCE (RUSSIA)

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In carbonatites of the Kola alkaline province more than 20 minerals and phases of Nb are established. The main minerals are pyrochlore, its U-, Th-, Ba-, the Sr-containing varieties, zirconolite, perovskite, lueshite. Vigezzite, niobo-aeshynite-(Ce), loparite-(Ce), uranpyrochlore, bariopyrochlore and phases close to bariozirconolite and thoriopyrochlore appear at high-temperature changes in carbonatites. The water oxides of variable composition having the formula $A_2B_2O_6 \cdot nH_2O$ (A = Ba, ??, Na, Sr and B = Nb, Ti) are formed at low-temperature hydrothermal transformations. Franconite, ternovite, hochelagaite and other phases having the general formula: $A_2-xB_4O_{11} \cdot nH_2O$ (A = Na, ??, Mg, Ba, Sr and B = Nb, Ti, Ta, Fe) are also widely distributed. Niobosilicates: belkovite, nenadkevichite, vuoriyarvite, labuntsovite, korobitsynite and a phase of unknown species occur in this association. The revealed phases and the minerals open new directions of evolution of Nb in carbonatites. The species-forming role of Nb in the carbonatite process increases successively, the activity of Ba is increased in parallel. Water-free oxides of Nb, prevailing on magmatic and metasomatic stages are replaced by water oxides and silicates on the late hydrothermal stage. The simple structures of minerals of a frame type are replaced by complicated with layered, chain structural motifs admitting a wide development of zeolite-like properties. This study was supported by the RFBR (project 98-05-64365 and 99-05-65524).