

Experimental determination of thermal stability areas and structural features of terms of an isomorphous series of Co and Ni selenites

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Secondary minerals of selenium (Se) were chosen as study subjects. Co and Ni selenites are known to form a continuous isomorphous series naturally. Whereas the thermal analysis of synthetic Co and Ni selenites analogs detected a significant difference in their behavior upon heating, of special interest is the study of intermediate terms of the isomorphous series $(\text{Ni}_x\text{Co}_{1-x})\text{SeO}_3 \cdot 2\text{H}_2\text{O}$ ($x = 0.12, 0.27, 0.42, 0.55, 0.62, 0.74$ and 0.80). According to the earlier research [1], the dehydration process for all terms of the series takes place in 2 stages, with the increase in Ni concentration the water loss temperature increases both in the first and second stages, and, in addition, the nature of dehydration changes. Therefore it was decided to do additional research in kinetic parameters using thermal analysis. The research was done on synchronous thermal analyzer STA 449 F3 Jupiter. The results were processed in the program NETZSCH Proteus Thermal analysis v. 5.2.1. The kinetic properties were studied by us for the first time.

The decoded structure of the extreme terms of the series showed presence in the crystal lattice of four types of hydrogen bonds. As the composition of a series of solid solutions in the area 0.3-0.4 Co and 0.7-0.6 Ni changes, intensity drops drastically and all absorption bands widen in CoNiSeO_3 . This may be related to reduced ordering upon moving away from the extreme terms of the isomorphous series.

The obtained data on crystallization fields and the areas of stability of Co и Ni selenites can be used to forecast mobilization (and immobilization) of toxic elements in oxidation zones of sulfide ores and concentration plant dumps.

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[1] Charykova M.V., Fokina E.L., Krivovichev V.G., Yakovenko O.S. and etc. (2015) *Geology of Ore Deposits*. **57**, 570–578.