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The influence of elemental composition of ore on polymorphic modifications of cubanite

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Using the methods of X-ray and Mössbauer spectroscopy, scanning electron microscopy, there were studied the samples of Norilsk ore types in order to identify compounds containing cubanite. Depending on elemental composition there were singled out two sample series.
Maximum concentration in percentage of selected elements for this series is presented below.
1: Ni (3,47), Cu (22,3), Co (0,05), Fe (38,3), S (34,0), O (1,6), H (0,08);
2: Cu (23,0), Fe (41,7), S (34,0), O (1,1).
The research conducted by using the method of scanning electron microscopy and the X-ray microanalysis showed that iron and sulfur are spread nonuniformly over the scanned area. Sulfur is absent in the inclusions containing Fe and Ni. There are areas, sizes up to 100 microns, strongly enriched by Fe.
The phases, containing Cu Ni, have a complex composition:
1 series: cubanite I (86,5% CuFe2S3), pentlandite (9,37% FeNiS), wroewolfeite (4,09% Cu4(OH)6(SO4)•H_2O).
2 series: cubanite I (36,1% CuFe2S3), cubanite II (54,8% CuFe2S3), chalcopyrite (5,0% CuFeS2), magnetite (2,22% Fe3O4), maghemite (1,64% $Fe2O_3$) and in small quantities pentlandite, galenite.
The magnetic phase has the spectrum composed of two six-linear spectrums. Magnetism of samples due to the minerals of sulfides and oxides groups, which contain a major component of Fe2 + and Fe3 +. Some of the samples of this group have broadened lines, indicating the existence of various positions of the Fe ions in the sublattices.
The magnetization of the sample irreversibly changes with temperature.
The peaks on the spectrum borders show the oxide presence. The isomer shifts of the samples range from 0,3 to 1,394 mm / s, quadrupole splitting ranges from 0,25 to 2,468 mm/s. This indicates that the local electronic structure depends on the genesis of compounds.
The earliest mineral in the samples is petlandite. The later mineral is cubanite, which presents in two different modifications.
Thus, most of the bulk of Cu, Ni is not dissipated in the crystal lattices of the ore, but it is part of the ore sulphides.
The presence of the characteristic structures of the solid solutions decomposition shows a wide temperature range of sulphide crystallization.