The role of the elemental composition on the phase formation in ores of the Norilsk type

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Using the methods of X-ray and Mössbauer spectroscopy, scanning electron microscopy, there were studied the samples of ores of the Norilsk type in order to identify compounds containing Cu and Ni. Depending on elemental composition there were singled out sample series.

The concentration of selected elements varied from sample to sample and reached maximum values in percent age: for Cu – 23,0; Fe – 41,7; S – 34,0; O – 1,1. The relative magnetization (I/I_0) of the samples at different temperatures are shown in Table 1.

t	20	200	240	300	400	500	560
I/I_0	1,00 0,70	0,59 0,38	0,90 0,21	0,44 0,18	0,20 0,14	0,10 0,05	0,01 0,01

Table 1: The temperature dependence of the relative magnetization, for I/I_0 line 1 - heating, line 2 – cooling

Magnetization changes irreversibly with the change of temperature. This fact, as well as the discrepancy of Curie temperature in the cycle «heating - cooling», indicates the presence of a mechanical mixture, consisting of two and more ferromagnetic phases.

The magnetic phase has the spectrum composed of two six-linear spectrums. The peaks on the spectrum borders show the iron oxide presence. The sample magnetism is caused by the presence of the cubanite.

Phases containing Cu, Ni have complex composition: cubanite 1 (24,3% $CuFe_2S_3$), cubanite 2 (42,5% Cu333.3 Fe666.7S), nickel sulfide (24,8%). In addition, the samples contain silicon dioxide (8,34%).

The position of the absorption lines in the magnetically ordered areas indicates the presence of cubanite. Some of the samples of this group have broadened lines, indicating the existence of various positions of the Fe ions in the sublattices.

Thus, the presence of the characteristic structures of the solid solutions decomposition shows a wide temperature range of sulphide crystallization.