Structure properties of Norilsk ore type with content of cubanite

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Experimental Results

There was studied the elemental and phase composition of ore samples using the methods of X-ray microscopy and Mössbauer microscopy. It was done for the purpose of revealing the distribution of ions Fe, Ni, Cu, Co, S. The sample magnetism is caused by the presence of the minerals of sulphide and oxide groups, containing Fe^{2+} and Fe^{3+} as the main components. The elemental composition of the studied samples changes from one sample to another (table 1).

Element	Fe	Ni	Cu	S	Co	O	H
Maximum content, %	38,3	3,47	22,3	34,0	0,05	1,6	0,08

Table 1. Elemental composition of the samples

The samples have a complex and varied composition, having a wide range of the values of residual magnetization ($40 < I_n \leq 70$A/m). They also stability to demagnetizing factors.

Phases have a complex composition: cubanite 1 ($CuFe_2S_3$ – 86,5%), pentlandite ($FeNiS_2$ – 9,37%), wroewolfeite ($Cu_4(OH)_6(SO_4)\cdot H_2O$ – 4,09%).

However, there are some sections having the size of (20 – 40) μm which are highly enriched with Fe. Some inclusions, having rectangular and rhomboid forms (2 – 5) μm contain Ni with increased content of Fe. The concentration of Ni has maximum in inclusions, which contain Cu.

The presence of native elements and the intermetallic compounds shows a reducing mode of ore formation processes.

As an additional damaging factor there was used the heating of the samples. The replacement of magnetic ions of Fe with Co ions with nearest values of spin magnetic moment changes the magnetic stability of the samples and Curie temperature (table 2).

t°C	20	100	200	240	250	300	400
$(I/I)_h$	1	0,78	0,62	0,82	0,71	0,39	0,24

Table 2. Relative magnetization $(I/I)_h$ at different temperature

As it was shown by the studies, the presence of the impurity ions leads to changing thermomagnetic properties at t > 250°C at the expense of high ion Co and S mobility.

Magnetization changes irreversibly with the change of temperature. The presence of the step-type thermomagnetic curves indicates the presence of a mechanical mixture, consisting of two and more ferromagnetic phases. It is proved by the discrepancy of Curie temperature (600°C) in the cycle «heating - cooling».

Conclusion

So, the presence of the character structures of the solid solutions decay shows a wide temperature range of sulphide crystallization.