The influence of the elemental composition on the cubanite mineralization

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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 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°C	20	200	240	300	400	500	560
I/I_0	1 0,67	0.61 0.40	0.84 0.15	0.38 0.12	0.14 0.08	0.06 0.03	0.02 0.02

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

The samples have a complex and diverse composition of a wide range of values having the remanent magnetization and its resistance to various demagnetizing factors.

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 minerals of sulphide and oxide groups, containing Fe^{2+} and Fe^{3+} as the main components.

Phases containing Cu, Fe, S have complex composition: cubanite I (36,1% $CuFe_2S_3$), cubanite II (54,8% $CuFe_2S_3$), chalcopyrite (5,0% $CuFeS_2$), magnetite (2,22% Fe_3O_4), magnetite (1,64% Fe_2O_3). The position of the absorption lines in the magnetically ordered areas indicates the presence of $CuFeS_2$. Some of the samples of this group have broadened lines, indicating the existence of various positions of the Fe ions in the sublattices. Intergrowths of chalcopyrite (CuFeS2) are characterized by the isomer shift of 0,058 mm/s and the absence of quadrupole splitting.

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

Long-term effects of CO_2-charged brine on caprock integrity and existing heterogeneities within the Entrada Sandstone, Green River, Utah

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Natural CO_2 has been escaping through geysers related to fault zones at Green River, Utah for at least 400 ka [1]. A scientific drilling project in 2012 to sample the CO_2 system, showed that the uppermost formation, the Entrada Sandstone, contained zones with high CO_2 pressures, despite this unit being exposed at surface. Core revealed that The Entrada sandstone comprised bleached sandstone layers interbedded with variably bleached and carbonated thin siltstone layers which have acted as aquitards.

Results from mineralogical, petrological, and geochemical analysis of the CO_2-reservoir rocks and sealing siltstone layers from the Entrada Sandstone core are presented together with a reactive transport model of the mineralogical changes. We determine the length scales and mechanisms of CO_2 penetration of the sealing siltstone caprocks, and especially the significance of carbonate precipitation on its sealing properties.

[1] Burnside *et al*. (2013). Geology. **41**, 471–474.

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