



Artificial geochemical barriers for directed formation of technogenic deposits and environment protection

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Geochemical barriers are a part of the earth's crust wherein the migration of chemical elements slackens abruptly within a short distance, resulting in the elements concentration. Nowadays, it is a burning issue to develop methods for protecting surface and underground water from contamination using geochemical barriers. Secondly, barriers can be used for intra-storage tailings concentration, thus forming technogenic deposits. The aim of our research has been to prove the possibility, and effectiveness, of artificial geochemical barriers for precipitating nickel ions, which is essential for territories affected by mining and processing of sulphide copper-nickel ores, in particular, those of the Kola peninsula. As materials for artificial geochemical barriers we used: thermoactivated copper-nickel ore dressing tailings of the Pechenga ore field; a mixtures of amorphous silica and carbonatite; of serpentine and carbonatite.

The first ever laboratory experiments modeled a long-term interaction of artificial geochemical barriers with sulfate solutions of nickel, copper and iron, there were identified newly formed mineral phases and the mechanism of interaction.

A physical-chemical study of interaction of the sulfate solution with geochemical barriers has been carried out using a Selector software package. For this purpose, a dynamical model was used, representing interactive flow reservoirs.

The above reagents have a good potential for creating artificial geochemical barriers. Thus, the content of nickel precipitated on thermally activated copper-nickel tailings has increased at 10-20 times in comparison with its starting content. The experimentally obtained average values of nickel precipitated on geochemical barriers in the formed technogenic ore are high enough to organize its processing by known pyro- or hydrometallurgical methods. It has been found that geotechnologies can accumulate concentrates containing up to 20% of nickel and 30% of copper.