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Udokan-Chiney Ore Magmatic System with Superlarge Concentrations of Copper in Sedimentary and Magmatic Rocks (Eastern Siberia, Russia)

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Copper bearing ores associated with Paleoproterozoic massifs and sedimentary rocks belon to Udokan-Chiney ore magmatic system located in Transbaikalia, Eastern Siberia, Russia. The composition of the rocks from these massif were studied. These ores had being produced during the magmatic and hydrothermal stages. The first type of mineralization is veinlet-disseminated ores in gabbro of the layered intrusions, the second type is quarts veins in the exocontacts of massifs and the third type is the massive and disseminated ores in sandstones. Sulfide ores located in different heteroabyssal blocks of lithosphere represent parts of a common ore-magmatic system. There were consecutively formed the following types: magmatic ores in inner parts of layered intrusions, magmato-hydrothermal ores in exocontacts of massifs, hydrothermal and hydrothermal-sedimentary ones in sandstones.

Despite unfavorable natural mining–geological and technological features of the Udokan copper deposit, its exploitation in the nearest future is inevitable. Therefore, the solution of problems related to enhancement of the efficiency of raw mineral mining in the deposit and ore district has become a crucial issue. This district is characterized by juxtaposition of two large deposits (Udokan and Chiney). Moreover, these deposits are superlarge (giant) objects with respect to resources of major metals (Cu and V). Extraction of associated ore components and elucidation of new types of complex

ores are essential for enhancement of the efficiency of future mining–metallurgical plants in the region. In this respect, assessment of the genesis, abundance, and scale of gold–platinum–copper mineralization, which was first found in the Udokan–Chiney ore district, is very important. Quartz veins with noble metals and copper were detected in the nearest framing of the Chiney Massif and the Pravoingamakit deposit. However, we scrutinized ores of this deposit in 2004–2006 and revealed that its structure is more complicated and differs significantly from that of the standard cupriferous sandstone deposit (Udokan). Orebodies of the Pravoingamakit deposit are hosted in terrigenous–carbonate rocks of the middle section of the Chitkanda subformation of the Lower Proterozoic Udokan Formation. Economic grade mineralization is developed over 4.5 km. The deposit includes orebodies of two types: (1) veins and lenses of milky white massive quartz with stringers and patches of sulfides; (2) echelon of massive sulfide bodies surrounded by dissemination of pyrite and chalcopyrite. Quartz veins (0.3–1 m thick) extend along the strike over a few tens of meters. Sulfide bodies are 3–5 m thick and 300–440 m long. The orebodies are characterized by significant content of Cu (0.47–2.5 wt %). Ores are represented by the pyrite–chalcopyrite varieties with typical stringer and breccia structures. Gold–platinum–copper ores of the Pravoingamakit deposit are different from copper ores of the Udokan deposit and are similar to outer contact ores of the Rudnoe deposit in the Chiney Massif. The Udokan deposit is composed of monometal (copper) ores represented by the major bornite–chalcocite and subordinate chalcopyrite varieties.

As in the Pravoingamakit deposit with quartz veins, outer contact ores of the Chiney Massif occur in sandstones. The Chiney Massif typically encloses millerite-chalcopyrite veins and lenses of massive sulfides with an aureole of pyrrhotite–chalcopyrite dissemination. The subhorizontal ore zone is 3–65 m thick and 1–2 km long. Copper is the major metal, while Pt, Pd, Au, Ag, Ni, and Co are associated components. The ores are mainly characterized by a patchy–disseminated texture. Stringer and breccia-type textures are less common. The outer contact zone includes vein and lenticular bodies at the intersection of differently oriented fractures with anomalously high concentrations of noble metals.

Tectonic displacements and significant erosion of the southern Siberian Craton after the Proterozoic period were responsible for the exhumation of blocks with various components composed of layered massifs of the Chiney Complex. These processes promoted the formation of magmatic deposits of sulfide ores, hydrothermal copper deposits in their framing, and sedimentary copper deposits in the distal zone.

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