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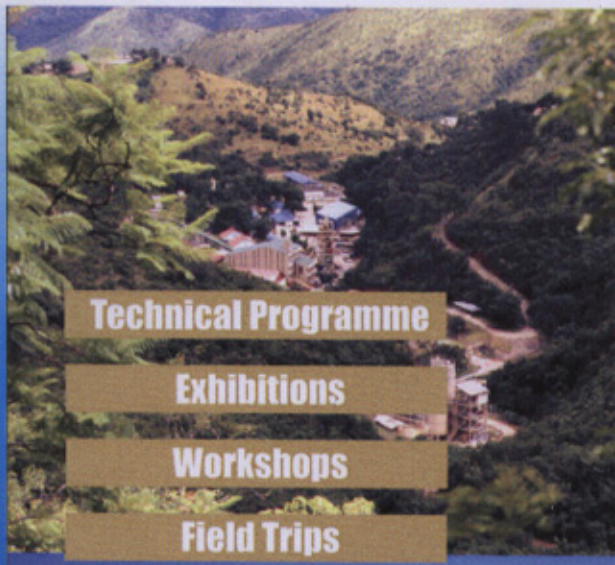

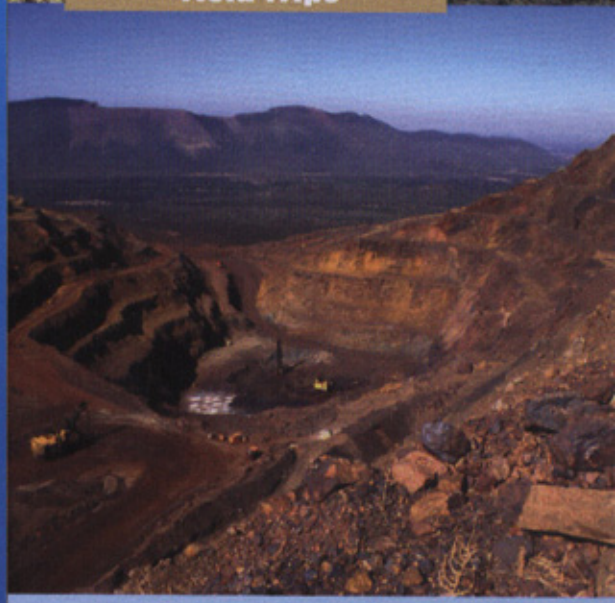

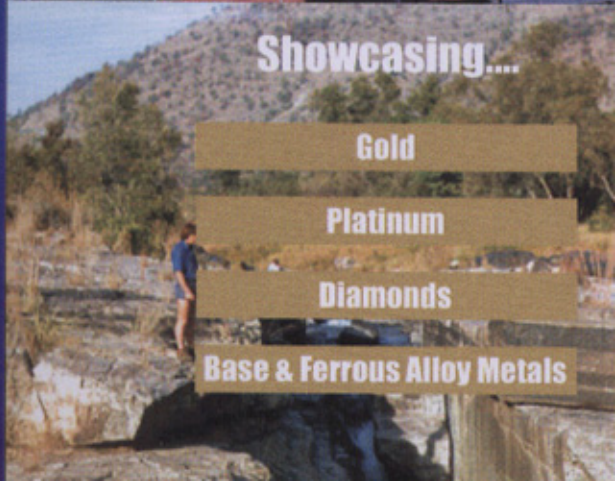

Gongalskiy BI & Krivolutskaya NA

MAGMATIC, HYDROTERMAL AND SEDIMENTERY DEPOSITS OF THE UDOKAN-CHINEY ORE-MAGMATIC SYSTEM IN THE NORTH TRANSBAIKALIA, SIBERIA, RUSSIA

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The North Transbaikal region situated at the southwestern margin of the Aldan Shield incorporates a unique ore district (Fig. 1). Giant ore deposits, such as Udokan (copper, silver), Chinei (iron, titanium, vanadium, copper, and noble metals), and Katugin (rare metal and rare earth elements), are located 30–100 km south of the Novaya Chara station along the Baikal Amur Mainline (Arkhangelskaya et al., 2004). For the first time magmatic, hydrothermal and sedimentary copper ores in the North Transbaikalia are regarded as different parts of common the Udokan-Chiney ore-magmatic system. The Udokan deposit of copper sandstones is situated in the central part of the ore region. It is framed by the croppingouts of the gabbroides of the Chiney, the Mylove, the Luktur massifs, the Main Dyke of Udokan and small bodies with copper (essentially chalcopyrite) of sulfide ores, enriched in noble metals (Gongalsky, Krivolutskaya, 1993). Inside the intermediate zone (between the Udokan sedimentary and the Chiney magmatic deposits), numerous ore manifestations and deposits having signs of the both genetic types are situated. Firstly, the Pravoingamakitsky, the Unkur and the Sakinsky deposits belong to this group. All these deposits have very close chemical (Cu, Ag, and Au) and mineralogical (bornite-chalcocite and chalcopyrite) composition. Sulfide ores located in different heteroabyssal blocks of lithosphere represent parts of a common ore-magmatic system (Gongalsky, Krivolutskaya, 2004). They are a result of fractional crystallization of basic-ultrabasic melts. 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. Hydrothermal fluids play very important role in the origin of copper ores in the Kodaro-Udokan region. Copper precipitated from fluids in submarine conditions in the Udokan deposit. This observation is not in contrast with the sedimantary genesis of the deposit.

The Udokan deposit is located in the same-named overturned syncline, stretched along west-north-west direction. Ore horizon is of 350 m thickness and consists of disseminated and massive bornite-chalcocite bodies shaped in bands and lens among sandstones. All mineralogical types of ores have copper composition with Ag admixture (0.8 ppm). Parallel with the concordant position there are echelon-like small chalcocite-bornite and chalcopyrite lens and veins perpendicular to sedimantary rock stratification (Fig.1a,b). High Au concentrations have been discovered: in intersecting veinlets – up to 0.3 ppm, in subconformable veins – up to 0.1 ppm and in ore-free sandstones – 0.03 ppm.

The most important deposits are connected to the Chiney anorthosite-gabbronorite massif which value confronts with the one of the Udokan deposit. Three groups of rocks take part in its forming. Magmatic breccia with lamprophiric and gabbronorite cement finished are represent the last period of massif formation. They are closely associated with endo- and exocontact sulfide ores (Fig. 2a). The Chiney massif contains copper deposits: the Kontaktovoe, the Skvoznoe, the Rudnoe located inside the contact zone of massif with surrounding terrigenous rocks.

The most part of satellite deposits of the Udokan located in the sedimentary rocks differ from this extra large deposit by essentially chalcopyrite ore composition and high Ag concentrations. The Pravoingamakitsky deposit is one of the examples of hydrothermal type of deposits in the the Udokan-Chiney ore-magmatic system. There were found veins and breccia bodies with thickness up to 3 m and longitude with 5-7 m on the area of 2 km^2. They consist of pyrite-chalcopyrite ores which cement quarts fractions and sandstones. Quartz veins with noble metals and copper were detected in the nearest framing of the Chinei Massif and the Pravoingamakit deposit. Ores are represented by the pyrite–chalcopyrite varieties with typical stringer and breccia structures (Fig. 2c, d). The limp of ore comprises of up to 370 ppm Ag, 1.2 - Au, 0.8 - Pd, 0.2 - Pt ppm. There are many rare minerals in veins likewise millerite $(Ni_{0.98}Fe_{0.03})_{1.01}S_{0..99}$; pentlandite $(Ni_{5.69}Fe_{3.32})_{9.01}S_{7.99}$; hessite $Ag_{1.98}Te_{1.02}$; clausthalite $Pb_{1.00}(Se_{0.78-0.85}S_{0.15-0.22})_{1.0}$ and other Ag, Ni, Pb minerals of sulphosalt group (Gongalsky, et al, 2007).

Conclusions. Sulfide ores located in different heteroabyssal blocks of lithosphere represent parts of a common ore-magmatic system. They are a result of fractional crystallization of basic-ultrabasic melts. 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. Hydrothermal fluids played very important role in the origin of copper ores in the Kodaro-Udokan region. Copper precipitated from fluids in submarine conditions in the Udokan deposit. This observation is not in contrast with the sedimantary genesis of the deposit.

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Figure captions

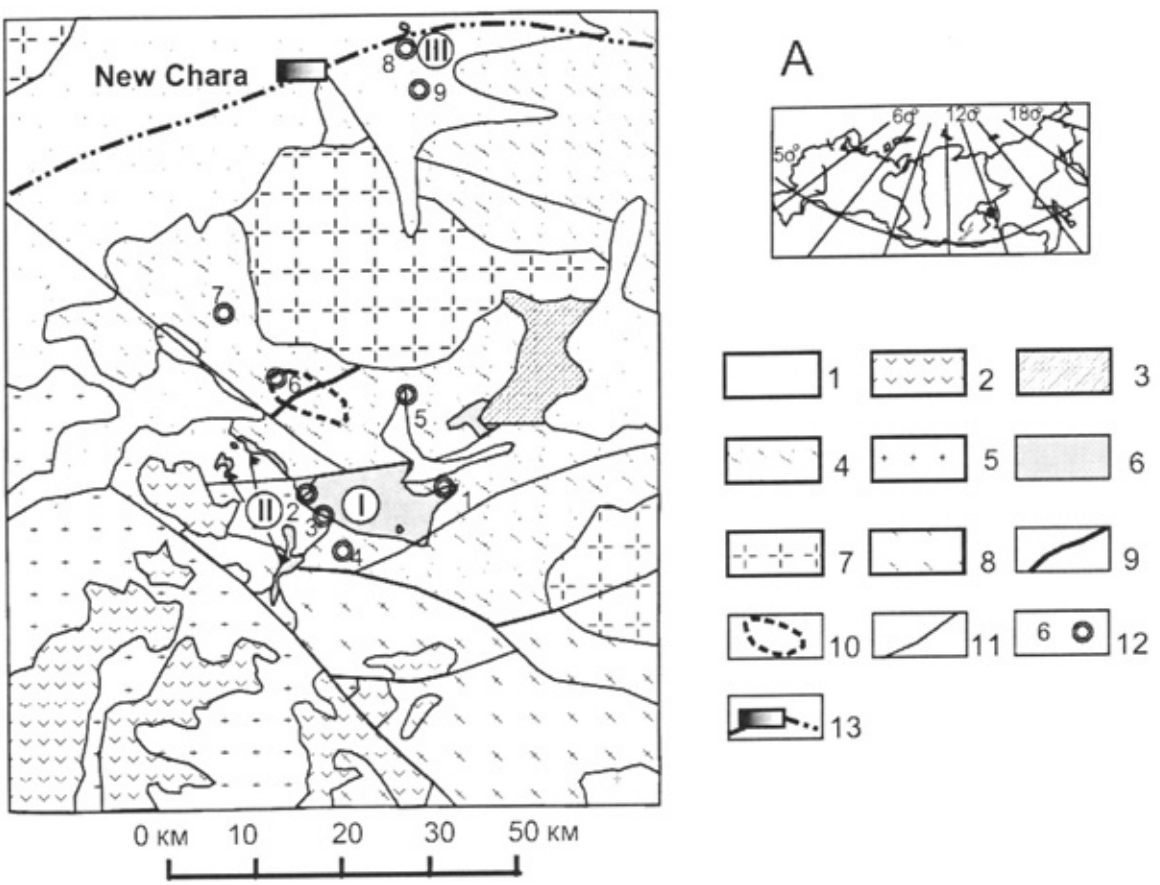

Fig.1. Schematic geological map of the the Kodaro-Udokan region: 1) Quaternary deposits; 2) volcanic rocks (N-Q); 3) sedimentary Vend-Cambrian deposits; 4) Lower Proterozoic carbonate-terrigenous rocks of the Udokan seria; 5) granite, Ingamakitsky complex; 6) gabbro, Chiney complex (massifs: I-Chiney, II –Mylove, III – Luktur); 7) granite, Kodarsky complex; 8) granite, Kuandinsky complex ; 9) Main Dyke of the Udokan deposit; 10) Cu sandstone horizon in the Udokan deposit; 11) faults; 12) deposits: 1- Rudnoe, 2 - Kontaktovoe, 3 - Skvoznoe, 4 - Pravoingamakitskoe, 5 - Sakinskoe, 6 - Udokan, 7 - Klukvennoe, 8 - Luktur, 9 - Unkur; 13) railway station.

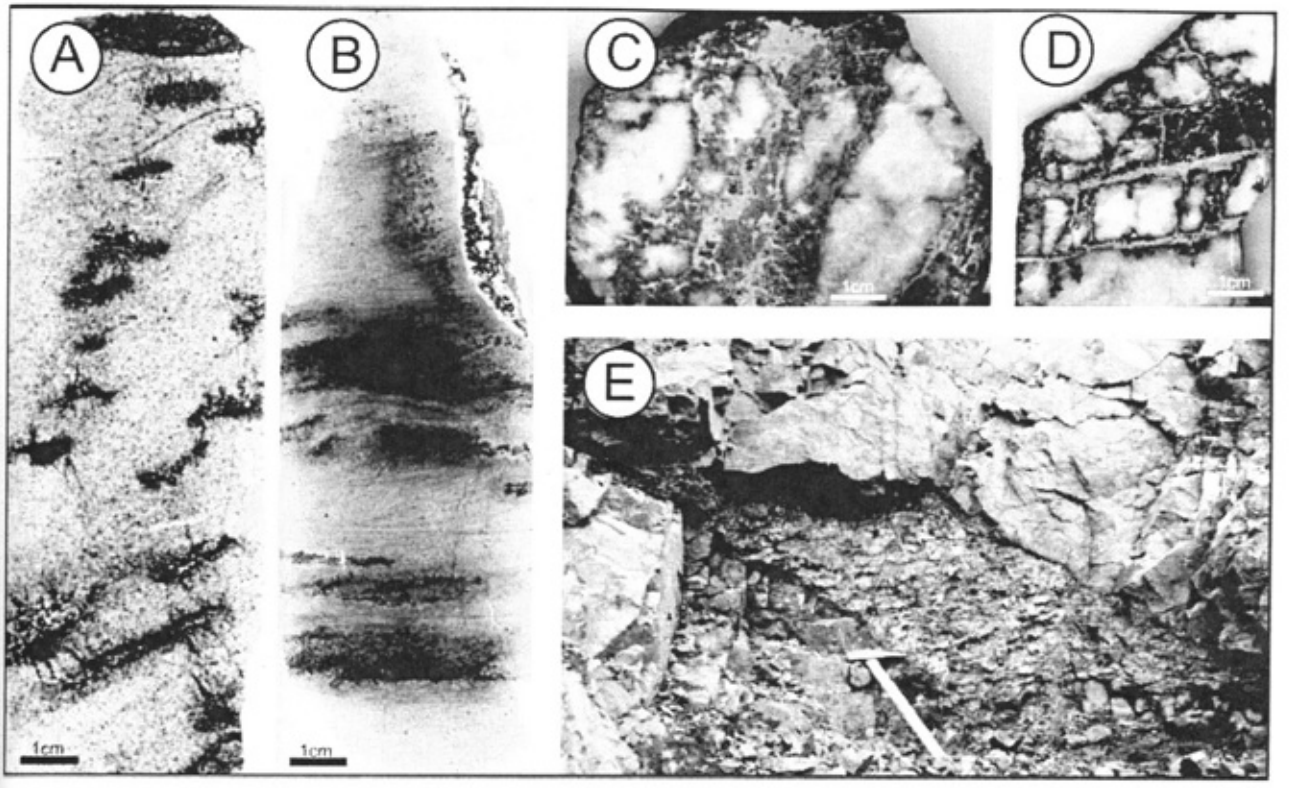

Fig. 2. A, B - Echelon-like position of chalcosine- bornite veinlets in the Udokan deposit 1) territory Zaozerny; 2) territory Zapadny; C, D - quartz – pyrite - chalcopyrite of the Pravoingamakit deposit; E - chalcopyrite lens of the Rudny deposit