



Chineisky Layered Intrusion with unique V and PGE-Cu ores (Siberia, Russia)

Bronislav Gongalskiy (1) and Nadezda Krivolutskaya (2)

(1) IGEM RAS, Laboratory of Geology Ore Deposits, Moscow, Russian Federation (kgrt-61@ya.ru), (2) GEOKHI RAS

South of the Siberian platform is an extraordinary metallogenic province. Many giant deposits of different genetic types are concentrated here: Udokan (Cu), Chiney (Ti-Fe-V, Pd-Cu), Katugin (Ta, Nb), Sulumat (Fe) etc. It is considered this massif is the largest component of the Proterozoic volcanic-plutonic system of the Kodar-Udokan district.

Chineisky massif located among Cu-rich sedimentary rocks is represented by interlayering horizons of gabronorite and titanomagnetite gabbro in its lower zone and gabbro and anorthosite in the upper zone. The intrusive rocks were proved to be genetically interrelated and show certain similar geochemical features: they have elevated TiO_2 concentrations and have similar trace element patterns and $(La/Sm)N$ and $(Gd/Yb)N$ ratios (1.5–2.3 and 1.87–2.06, respectively). The Chineisky massif is thought to have been formed by the successive emplacement of genetically similar basic magmas, which produced four rock groups with fine and coarse layering and cyclicity of variable rank (micro-rhythms, rhythms, units, and series). The results of cluster analysis indicate that the rocks can be classified into 13 petrochemical types. The phase and chemical characteristics of the parental melts of these compositions were simulated with the use of the COMAGMAT-3.5 computer model, which was also applied to evaluate the composition of the most primitive initial magma of the whole Chineisky massif. Our results indicate that the primitive magma was heterogeneous (olivine + plagioclase titanomagnetite + melt) at a temperature of approximately 1130 C. The initial melt had a ferrobasaltic composition and was close to saturation with magnetite at $\sim NNO$ 0.5.

The basic and ultrabasic rocks of the Luktur pluton are supposed to be the Mg-rich fraction of the parental melt. Gravimetric and magnetic geophysical data show that ultrabasic and basic rocks occur at shallow depths at the Chiney pluton and around it. These facts show the existence of huge magmatic system in Late Proterozoic.

There are two types of commercial mineralization in the Chiney massif: Fe-Ti-V and Cu with precious metals. Nowadays the Chiney massif comprises the largest V resources in Russia. The iron ores are concentrated in the central part of the intrusion and are represented by two varieties: disseminated and massive (the early-magmatic type); veins and irregular bodies (the late-magmatic type). Sulfide minerals occur as accessory disseminations in all rocks of the massif, but their higher concentrations are distributed locally. The copper commercial mineralization is confined to the contact zone of gabbroids with the host rocks, so endo-and exocontact ores are determined. The disseminated mineralization predominates sharply. Vein bodies are distributed in the limited region and localized at a small distance from the bottom of the intrusion.

The main ore mineral is chalcopyrite, that is very unusual for Cu-Ni deposits ($Cu/Ni=10-100$, $Pd/Pt=3$ in ores). The major minerals are pyrrhotite and pentlandite. Many rare minerals of noble metals (Ag, Au, PGE) were found too. In general, the minerals consist of compounds of Pd with Bi, Te, Sb, Sn, As, and Ni; compounds of Pt with As, S, and Fe; a compound of Rh with As-S, as well hessite (Ag_2Te) and Au-Ag-(Hg) alloys. It was found froodite; sobolevskite; kotulskite; sudburyite; stibiopalladinite; mertieite II; isomertieite; paolovite; michenerite; arsenopalladinite; merenskiite; majakite et ctr.

References

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