Geochemical and Mineralogical Factors for Geometallurgy of Complex Cu-Platinum Ores of Viksha Deposit (Karelia, Russia)

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Viksha Cu-PGE deposit is located in the western part of the Onega syncline in North West of Russia. It is localized in Koykarsky gabbro-dolerite 250-300 m thick sill with outcrop area of 100 km^2 hosted by Jatulian carbonate terrigenouse sequence. Two ore layers inriched in magmatic Ti-magnetite (20-40%) intrastratify with granophyre. Sulfide ore mineralization occurs mainly in the upper layer.

Amphibole, epidote, chlorite, tourmaline and sericite alteration of primary mafic rocks were observed. Five main ore mineralization stages were identified: 1) magmatic Ti-Mgt and ilmenite; 2) alteration of Ti-Mgt; 3) medium temperature sulfide mineralization with noble metals (NM): Mgt, chalchopyrite,pyrite, pyrrhotite, bornite, cobaltite, thiospinels, galena, clausthalite; 4) low temperature: chalcocite,covellite, rutile, titanite, hematite and 5) supergene hydrohematite.

NM (Pt, Au, Pd, Ag) grades connected to the upper Cu bearing reef and parts of the low Ti-magnetite reef. NM form their own minerals (arsenopalladinite, native gold, sperrylite, kotulskite, palladoarsenide, palarstannide, braggite, cooperite, atokite, hessite, naumannite, etc.) and occur in dissolved form in sulfides (bornite, cobaltite) and Ti-magnetite. NM minerals were found in association with Cu sulfides, thiospinel, chlorite, epidote and actinilite.

Factor analysis of all geochemical and mineralogical data defined three meaningful factors: 1) mafic/felsic magmatic segregation: (+Ti,Fe,Ni,Pd,Pt,Zn,Mn,As,Mo,Co,Au,Cu,Mgt, Ilm,Ap,CuSulf/-Si,Sr,Na,Mg,P,Ca,Ep,Hem,Qu); 2) Ti-magnetite/sulfide ore types: (+Ni,Mg,Fe,Ti,Tit,Chl,Kfs,Mgt/-Cu,Si,Al,Na,Au,Cu,Cl,As,Mo,Co,S,Cr,P,Pt,Cp2,Pl,Bn,Ser); 3) metasomatic (+Cl,Cu,K,Amf,Cp,CuSulf,Turm/-NM,Na,Al, Hem,Tit,Chl,Py,Qu,Ksp,Ser).

The following mineralogical ore types: Cu-NM (free-milling), low sulfide NM (free milling) and NM-Ti-magnetite (refractory) ores were proposed for metallurgical variability study. Chemical criteria ore types discrimination were suggested and geometallurgical mapping was planned based on the research conclusions.