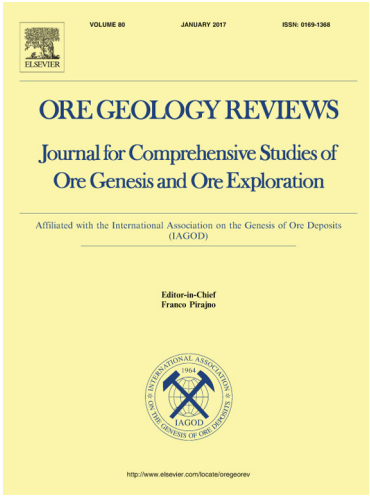

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Precious metals assemblages at the Mikheevskoe porphyry copper deposit (South Urals, Russia) as proxies of epithermal overprinting

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Abstract

Mineral assemblages and formation conditions of precious metals (Au, Ag, PGE) in ores of the Mikheevskoe porphyry copper deposit (South Urals) are the subject of our study. Three mineralization types can be distinguished: (1) Gold-silver-telluride mineralization overlapping porphyry-style bornite-chalcopyrite ores includes native gold (fineness 863-873), electrum (fineness 593-672), galena, hessite, coloradoite, and, more rarely, petzite, stützite, Au-Ag ditellurides, native tellurium, tellurobismuthite, tetradymite–kawazulite, altaite, and extremely rare melonite $NiTe_2$, merenskyite $PdTe_2$, and sopcheite $Ag_4Pd_3Te_4$; (2) Gold-arsenopyrite-base-metal mineralization within quartz-tetrahedrite-sphalerite veinlets cutting porphyry-style mineralization; (3) Gold-telluride mineralization with argillic alteration and mineralogically similar to that of type (1) but distinct because of the presence of Au-Ag, Ag, and Pb selenides. Textural relationships supported by fluid inclusions data and chlorite geothermometry provide evidence that occurrence of precious metals minerals at the Mikheevskoe deposit is mostly linked to epithermal overprint of the porphyry mineralization and was deposited at ca. 300 to 200^{o}C from moderately saline fluids (ca. 5 to 10 wt.%-eq.NaCl). It is suggested that the observed variability in Au and Ag minerals results from small fluctuations of S_2 and/or Te_2 fugacity.