

Constraints of the concentration of the platinum-group elements in Pobei Ni-Cu Sulfide Deposit, Xinjiang Province

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Pobei Cu-Ni sulfide deposit hosted in mafic-ultramafic intrusion is located in the Beishan rift valley belts, Northern Talimu plate, Xinjiang Province, NW China. The sulfide ores are mainly disseminated. The disseminated sulfide ores are characterized by variable but generally high Cu, Ni and PGE concentrations: 70225-102951 ppm Cu, 108691-307454 ppm Ni, 175-1637 ppb Pt, 214-593 ppb Pd, 23.2-80.6 ppb Ir, 59-216 ppb Ru, and 12-52 ppb Rh in 100% sulfides.

All of rocks and ores Pd/Ir ratios (4.34 to 27.75) in Pobei Cu-Ni deposit are less than 100 [1], indicating that the effects of late hydrothermal fluids are weak. The positive correlations between Ir and Pd indicate that sulfide didn't experience fractionation. Pobei deposit has very higher Cu/Pd ratios ($90-1626 \times 10^3$) than primitive mantle ($Cu/Pd=7.5 \times 10^3$), which suggest that the sulfide ores formed from the silicate magmas had already experienced prior-sulfide [2].

Assuming a partition coefficient between sulfide liquid and silicate melt for Pd, Pt and Ir of 20000 and for Cu of 1000, for Ni of 500 [3, 4], the primary magma of the Pobei intrusion comes from the primitive mantle. Our calculations indicate that the basaltic magma of melting degree 25% had contained 120 ppm Cu, 490 ppm Ni, 9.4 ppb Pt, 16 ppb Pd, and 0.48 ppb Ir, then 0.02% sulfide removal would result in PGE-depletion in the residual magma with 98 ppm Cu, 443 ppm Ni, 0.172 ppb Pt, 0.293 ppb Pd, and 0.009 ppb Ir, then sulfur come to saturation again and sulfide segregate from the PGE-depleted magma under silicate/sulfide liquid ratios (R-factor) ranging from 500 to 5000.

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Spectral and electrochemical evidence for kinetically separate cytochrome compartments in *Geobacter* biofilms

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This work seeks to unite recent reports of the redox potential and putative locations of multiheme c-type cytochromes expressed by *Geobacter* with new electrochemical and spectral data collected during transfer of electrons to electrodes. Spectral monitoring of biofilms revealed that early 40% of *G. sulfurreducens* cytochromes were oxidized at lower potentials (-0.4 V to -0.2 V, the range of extracellular cytochromes OmcS and OmcZ) [1-4], yet sustained electron transfer does not occur at these potentials [5,6]. A second oxidation event was centered at the midpoint potential of the periplasmic cytochrome PpcA (-0.15 V [7]).

The fact that extracellular cytochromes have lower potentials than periplasmic cytochromes is the opposite of how electron transfer chains are typically designed. A hypothesis is that this guarantees the outer surface is in equilibrium with insoluble acceptors, to serve as a sink for the periplasm. If self-exchange and cytochrome-metal transfer rates are rapid, such schemes are possible.

A prediction from this hypothesis is that the periplasmic pool would be slower to respond to changes in electrode potential, as electrons must first travel through extracellular cytochromes. This behavior was observed in scan rate analysis: spectral changes at low potential (-0.4 to -0.2 V) responded immediately to potential steps, while the -0.15 V pool lagged behind. A second prediction is that the redox status of periplasmic cytochromes would kinetically 'gate' electron flow to the exterior, consistent with the -0.15 V midpoint potential observed during catalytic cyclic voltammetry [8]. Further work using mutants lacking key cytochromes are being used to test this model.

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