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Fractional crystallization of monosulfide solid solution from sulfide liquids lead to the PGE enrichment in the Jinchuan Ni-Cu sulfide deposit, western China

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Discordant lenses of Pt-Pd enriched zones (ores bearing up to 1.0 ppm of Pt or Pd) have recently been identified in the sulfide-bearing peridotite of the Jinchuan Cu-Ni-PGE (Platinum group element) sulfide deposit, China.

Chalcopyrite, pyrrhotite, and pentlandite occur in both Pt-Pd enriched zones and normal ores, but Cu-bearing minerals such as cubanite and Bi-, Te-, and As-bearing minerals are more abundant in the Pt-Pd enriched zones. Sperrylite is the major Pt-host minerals in the Pt-Pd enriched zones interstitially and occurs mainly as euhedral grains within base-metal sulfides which occur among the cumulates of olivine. PGE-enrichment is found only in sulfide-bearing samples. In orebody # 1 and orebody 24, Rh, Ru, and Ir are positively correlated, but a negative Ir-Pd and Ir-Pt correlation. However in orebody 2 Rh, Ru, Pt, Pd and Ir are positively correlated.

Taken together, the elemental correlations and mineralogical data support a model for the origin of Pt-Pd rich ores in Orebody 1 and Orebody 24 of the Jinchuan deposit are consistent with fractional crystallization of monosulfide solid solution from sulfide liquids on cooling; The origin of Orebody 2 involves variable magma/sulfide liquid mass ratios (R-factors).