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Geochemistry and genesis of magmatic Ni-Cu-(PGE) and PGE-(Cu)-(Ni) deposits in China

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China contains a variety of Ni-Cu-PGE and PGE-(Cu)-(Ni) deposits, including the world's largest single Ni-Cu-(PGE) deposit (Jinchuan) and the largest Ni-Cu-(PGE) deposit in an arc setting (Xiarihamu). Unlike other magmatic sulfide deposits, many of which are Archean or Proterozoic, many Chinese deposits are younger (Neoproterozoic to late Triassic). Based on mineralization age, tectonic setting, and spatial distribution, most Ni-Cu-PGE deposits in China occur in 3 metallogenic provinces: 1) Neoproterozoic belts related to the breakup of the Rodinian supercontinent (e.g., Jinchuan, Zhouan); 2) the Permian to Triassic Central Asian Orogenic Belt (CAOB) (e.g., Kalatongke, Huangshandong, Hongqiling), and 3) the ~260Ma Emeishan large igneous province (ELIP) (e.g., Jinbaoshan, Zhubu, Baimazhai). Mineral chemical, whole-rock lithogeochemical, oregeochemical, and isotopic data for 18 typical deposits have been used to aid in the assessment of their genesis and metallogeny. Deposits in the ELIP appear to have been derived from magmas that experienced higher degrees of crustal contamination and/or were derived by partial melting of more enriched sources than in the other metallogenic provinces; deposits in the orogenic belts appear to be hosted by rocks derived from magmas generated from a metasomatized, but probably originally depleted mantle source; and deposits related to the breakup of Rodinia exhibit transitional geochemical characteristics. Olivine compositions (up to 4500 ppm Ni at Fo_{84}), relatively high Ni-Cu-(Co) and relatively low PGE tenors, and high γOs isotopes suggest that many deposits (e.g., Zhouan, Huangshannan, Heishan, Xiarihamu) were derived by melting of pyroxenitic mantle, most likely produced by the interaction of recycled oceanic crust with depleted mantle peridotite. The deposits can be subdivided into three compositional groups: 1) Ni-Cu-PGE deposits (Pobei, Yangliuping, Piaohechuan, Zhouan, Heishan, and Zhubu) have relatively flat mantle-normalized chalcophile element patterns and are more-or-less equally enriched in Ni, Cu, and PGE, similar to most Ni-Cu-PGE deposits worldwide (e.g., Kambalda, Raglan, Sudbury, Noril'sk). 2) Ni-Cu-(PGE) deposits (Hongqiling, Huangshandong, Huangshannan, Huangshanxi, Jingbulake, Kalatongke, Limahe, Tianyu, Xiarihamu, Baimazhai, and Jinchuan) are enriched in Ni-Cu-Co relative to PGE, similar to Pechenga and Voisey's Bay. 3) PGE-(Cu)-(Ni) deposits (e.g., Jinbaoshan) are enriched in Pd-Pt-Rh-Ir relative to and Cu-Ni-Co, similar to other PGE deposits worldwide (e.g., Bushveld, Great Dyke, and Stillwater).Variable PGE tenors that correlate inversely with δ^{34}S and γO values suggest that most deposits formed at relatively low (10-1000) magma:sulfide ratios (R factors). Most deposits exhibit geochemical variations indicating that the sulfide melts experienced variable degrees of MSS fractionation/accumulation. Compared to Archean and Proterozoic magmatic Ni-Cu-PGE deposits elsewhere in the world, which appear to have formed primarily in rifted continental and rifted continental margin settings and to have been derived primarily from peridotitic mantle, many of the Phanerozoic Ni-Cu-PGE deposits in China appear to have formed more in convergent settings and exhibit evidence of having had variable amounts of pyroxenitic mantle in their sources.