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Magmatic sulfide deposits: China vs. the world

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Based on magma types, major magmatic sulfide deposits in the world can be classified into four catalogues: (I) meteorite impact melt-related such as Sudbury, (II) komatiite-related such as Yilgam and Raglan, (III) ferropicrite- or tholeiite-related such as Jinchuan and Noril'sk, and (IV) high-Al basalt-related such as Voisey's Bay. These deposits all occur in Precambrian continents and the associated magmatism took place exclusively in intra-plate settings. In contrast, in China some major magmatic sulfide deposits also occur in convergent tectonic settings. This new type of deposits can be further divided into those that formed during active subduction and those that formed post-subduction. The former is represented by the newly-discovered Xiarihamu Ni-Cu ore deposit (age, ~412 Ma), which is among the 10 largest Ni deposits/camps worldwide, in the northern part of the Tibet Plateau, and the latter includes several Permian Ni-Cu ore deposits in the Central Asian Orogenic Belt in northern Xinjiang, NW China. The parental magmas for the deposits in convergent tectonic settings all show arc-like geochemical signatures such as pronounced negative Nb-Ta anomalies. The PGE tenors of the sulfide ores of these deposits are all very low, indicating severely PGE-depleted parental magmas for these deposits. The depletions of PGEs in the parental magmas of these deposits are either due to low-degree melting of the mantle, which leaves PGE-rich sulfide liquid behind, or due to a previous sulfide saturation event during magma ascent. Os-S isotopes of the sulfide ores from these deposits indicate that assimilation of crustal sulfides and/or organic matter from sedimentary rocks played a major role in triggering sulfide saturation in the parental magmas for these deposits. The discovery of the arc basalt-related Xiarihamu deposit in China is encouraging for global Ni exploration in convergent tectonic zones.