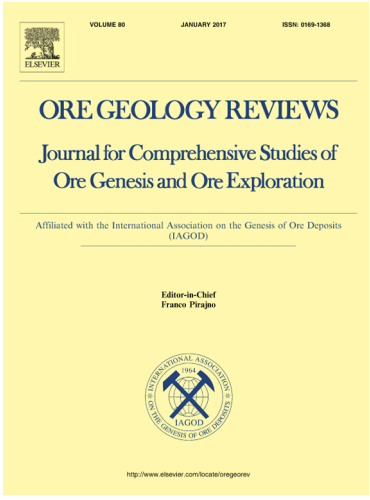

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Mineral chemistry and genesis of the Permian Cihai and Cinan magnetite deposits, Beishan, NW China

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Abstract

Cihai and Cinan are Permian magnetite deposits related to mafic-ultramafic intrusions in the Beishan region, Xinjiang, NW China. The Cihai mafic intrusion is dominantly composed of dolerite, gabbro and fine-grained massive magnetite ore, while gabbro, pyrrhotite + pyrite-bearing clinopyroxenite and magnetite ore comprise the major units in Cinan. Clinopyroxene occurs in both deposits as 0.1 to 2 mm in diameter subhedral to anhedral grains in dolerite, gabbro and clinopyroxenite. High FeO contents (11.7 to 28.9 wt.%), low SiO_2 (43.6 to 54.3wt.%) and Al_2O_3 contents (0.15 to 6.08 wt.%), and low total REE and trace element contents of clinopyroxene in the Cinan clinopyroxenite imply crystallization early, at high pressure. This clinopyroxene is FeO-rich and Si and Ti-poor, consistent with the clinopyroxene component of large-scale Cu-Ni sulfide deposits in the Eastern Tianshan and Panxi ares, as well as Tarim mafic intrusion and basalt, implying the Cinan mafic intrusion and sulfide is related to tectonic activity in the Tarim LIP. The similar mineral chemistry of clinopyroxene, apatite and magnetite in the Cihai and Cinan gabbros (e.g., depleted LREE, negative Zr, Hf, Nb and Ta anomalies in clinopyroxene, lack of Eu anomaly in apatite and similarity of oxygen fugacity as indicated by V in magnetite), indicate similar parental magmatic characteristics. Mineral compositions suggest a crystallization sequence of clinopyroxenite/with a small amount of sulfide – gabbro – magnetite ore in the Cinan deposit, and magnetite ore – gabbro – dolerite in Cihai. The basaltic magma was emplaced at depth, with magnetite segregation (and formation of the Cinan magnetite ores) occurring in relatively

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