

## **Origin of Ni-Cu sulfide-bearing mafic-ultramafic intrusions in convergent margin settings**

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Economically important Ni-Cu sulfide-bearing mafic-ultramafic intrusions in the central Asian orogenic belt (CAOB) in China are ideal to examine the origin of Ni-Cu sulfide mineralization in convergent margin settings. We chose the Ni-Cu sulfide-bearing, mafic-ultramafic intrusions with the ages ranging from early Permian to the late Triassic in the CAOB and carried out a systematic study on the nature of mantle source, oxygen fugacity of mantle-derived mafic-ultramafic magmas, sulfide saturation mechanism of magmas and metallogenic differences to understand the magmatic processes of Ni-Cu sulfide-bearing mafic-ultramafic intrusions. We found Ni-Cu sulfide-bearing mafic-ultramafic intrusions were emplaced in a short-lived metallogenic epoch, consistent with the stage of syn-collisional extension in a regional scale, which cannot be simply considered as a post-collisional setting as usually thought. This may lead to rapid ascent and emplacement of magmas at a shallower crustal level, preventing significant Ni loss from the magmas at depths. The trace element compositions of the olivine from representative sulfide-bearing and barren intrusions show that the involvement of pyroxenite component during partial melting of the mantle sources is important to produce Ni-rich mafic magmas, however, the degree of involvement of pyroxenite components may be related to the pressure of partial melting of the mantle. The calculated magma oxygen fugacity of representative sulfide-bearing mafic-ultramafic intrusions and integrated S-C isotopic compositions of sulfide ores show that their parental magmas are highly oxidized that are capable of containing enough S to form medium- to small-scale Ni-Cu sulfide deposits. Sulfide saturation of such oxidized magmas was likely triggered by the addition of external-derived crustal organic carbon materials. The oxidized magmas were likely derived from metasomatized mantle source and were therefore highly hydrated, and such hydrated magmas can lead to special ore textures such as globular, net-work and breccia ores. We conclude that the Ni-Cu sulfide deposits in convergent margin settings were likely formed from metasomatized mantle-derived oxidized mafic magmas and were emplaced into the lower crust in a very short period against a long history of region-scale collision, and they have different formation mechanism from those in within-plate, mantle plume-related mafic magmatism.