Is subducted oceanic crust necessary to produce large porphyry-skarn Cu-polymetallic deposits: Case studies from the Middle-Lower Yantgze Metallogenic Belt in South China

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Porphyry-skarn Cu-polymetallic deposits are thought to be genetically linked to a fertile magma with high water and high sulfur contents as well as high oxygen fugacity. Such an ore-bearing magma has been suggested to generate via ridge subduction or by partial melting of subducted oceanic slabs according to studies from many important porphyry deposits worldwide. Here we reported our results from a long-going detailed geological and geochemical investigation on the ore-bearing and barren granitoids in the porphyry and skarn type Cu-polymetallic deposits in the Middle-Lower Yantgze Metallogenic Belt in South China.

Our data show that the ore-bearing granitoids are similar to adakites with high Sr/Y characteristic, which were most likely generated by parting melting of the thickened lower curst together with the underlying enriched lithospheric mantle that have been simultaneously delaminated into the asthenospheric mantle during the Late Mesozoic period. The crust-mantle interaction played an importhant role for the formation of the large Cu-polymetallic ore deposits in this belt. The elemental and Sr-Nd-Hf isotope studies of the granitoids show that the ore-bearing rocks have a higher proportion of mantle-derived material contribution than the barren rocks. It is also suggested that magma fractionation and crystallization process and fluid exsolution placed an important control on the ore genesis. Along with the evolution from early to late magmatic stages, the oxygen fugacity showed an increasing trend for the ore-bearing granitoids, and the volatile and metallogenic metal contents in the magma also show an increasing trend. It is also found that the ore-bearing granitoids generally have lower pressure (<4 kbar) and shallower emplacement depth.

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