SEG 2017 Conference

Porphyry Cu deposits in China

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Porphyry Cu deposits in China presently contain a total resource of ~47 Mt Cu at average grades ranging mostly from 0.2 to 0.7% Cu, accounting for 52% of Cu reserve of China. In term of contained Cu, 11 porphyry deposits are classified as giant (≥2.5 Mt Cu), and 16 are classified as large (≥0.5 Mt Cu) in China. These giant and large deposits are mainly concentrated within seven belts or districts, the Gangdese belt in southern Tibet, the Yulong and Zhongdian belts in eastern Tibet, the Duolong district in central Tibet, the Dexing district and the Middle-Lower Yangtze River Valley belt in eastern China, and the Central Asian Orogen Belt in northern China. Other giant deposit (e.g., Tongkuangyu) occurs within the North China craton. These deposits were formed during five time periods: the Paleoproterozoic (~2, 100 Ma), Ordovician (~480-440 Ma), Carboniferous (~330-310 Ma), late Triassic to the early Cretaceous (~215-105 Ma) and Eocene to Miocene (~40-14 Ma), but mainly during the latter two time periods. Adakite-like (e.g., high Sr/Y ratio) magmas are most favorable for the formation of giant and large porphyry Cu deposits in China, although some large and giant deposits in the Central Asian Orogen belt and the Duolong district are associated with normal calc-alkaline arc-like intrusions having low Sr/Y ratio.

Approximately 55% giant and ~25% large porphyry Cu (-Mo-Au) deposits in China are confirmed to occur in an arc setting, including those at Xiongcun, Pulang, Duobuza, Bolong and Naruo in a continental arc setting, and those in the Central Asian porphyry Cu belt in an island arc setting. The mineralization-related porphyry intrusions in arc setting in China are generally thought to be generated by partial melting of metasomatized mantle wedge, although several of them were possibly generated by partial of subducting oceanic slab. In contrast, ~40% of giant and ~70% of large porphyry Cu (-Mo-Au) deposits in China occur in postcollisional and/or intraplate settings. These deposits are mainly concentrated in the Tibetan plateau. The mineralization-related porphyry intrusions in postcollisional and/or intraplate settings are generally thought to be generated by partial melting of subduction-modified mafic lower crust. Ore-forming metals and sulfur were derived from remelting of sulfide phases that were introduced during precollisional arc magmatism, and the water in the Cu-forming porphyry magmas was concentrated during dehydration reactions in the upper parts of the subducting continental plate and/or degassing of mantle-derived H_2O-rich ultrapotassic-like and/or alkaline mafic magmas.

The telescoping of vertical alteration sequence in the postcollisional and/or intraplate porphyry Cu depoists in China is systematically stronger than that in the island and continental arc porphyry Cu depoists in China. This is probably because postcollisional and/or intraplate porphyry Cu deposits/districts in China either experienced higher rates of synmineralization tectonic uplift, or suffered more complex structural superposition, compared with that in magmatic arcs in China. Hypogene mineralization for ~>50% giant porphyry Cu deposits in

China is characterized by the precipitation of the majority of Cu minerals during sericitic alteration, which was mainly caused by decreasing temperature.