A study of melt inclusions from the Zijinshan epithermal-porphyry Au-Cu ore field, Fujian, China

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The world-class Zijinshan Au-Cu deposit is located within a northeast-trending Jurassic-Cretaceous volcanic-granitic suite in western Fujian, southeastern China. It is a high-sulfidation epithermal deposit, with Au mineralization in the upper part and Cu mineralization in the lower part over a vertical range of more than 1000m. Recent discoveries of porphyry-type Cu-Mo deposits adjacent to the Zijinshan deposit have provoked the interest in exploring for porphyry-type orebodies below the epithermal system in Zijinshan. A porphyritic granodiorite intrusion underneath the epithermal mineralization, encountered by deep drilling, has been inferred to be representative of the parent magma that provided the ore-forming metals and fluids. In order to verify this hypothesis, we studied melt inclusions from the intrusion.

A large number of melt inclusions were found in quartz phenocrysts in the granodiorite. The melt inclusions were mostly less than 20 microns in diameter, rounded, composed of glass, crystals, and a vapor phase, and are distributed in isolation, trails, and clusters. The vapor to solid ratios range from 20% to 80% at room temperture. Most melt inclusions homogenized to a melt at temperatures between 800 ºC 860ºC, but many still contained a vapor phase at 860ºC. This is interpreted to indicate that the melt was saturated with fluid at entrapment, and the inclusions that homogenized below 860ºC resulted from homogeneous trapping (just melt), whereas those that could not homogenize represent heterogeneous trapping (melt + fluid).

Some of the relatively large melt inclusions (between 10 and 20 microns) are selected for electron microprobe analysis. The melt inclusions were exposed by careful gradual polishing and analyzed with an CAMECA SX-100 electron microprobe. The lowest SiO_2 content obtained was 63%, which is similar to that of the porphyritic granodiorite; most analytical results, however, show SiO_2 contents from 67% to 82%, suggesting influence of the host quartz due to the small size of the melt inclusions. Ongoing studies aim to determine the Cu and Au contents in the melt inclusions with the LA-ICP-MS method.