SEG 2017 Conference

Possible Two Contrasting Mineralization Events of the Yata Gold Deposit in the Golden Triangle, SW China: New Constraints from Geochemistry, Isotopes, and Geochronology

Xiaoye Jin,* Jianwei Li, and Albert Hofstra

China University of Geosciences (Wuhan), Wuhan, Hubei province, China, *e-mail, cugjxy@foxmail.com

Large areas of the Dian-Qian-Gui "Golden Triangle" in SW China host numerous sediment-hosted disseminated or vein-type gold deposits, which have been classified as Carlin-type based on their similarity to the gold deposits in Nevada, USA. Numerous studies have provided a detailed geological picture for these deposits since 1970s, yet a comprehensive and widely accepted genetic model still remains elusive. New geochemical, isotopic, and geochronological data from the Yata deposit provide significant insights into genesis of gold mineralization in the area. The Yata deposit occurs in the basinal Triassic terrigenous calcareous turbidities and consists of auriferous veins controlled by a group of EW-oriented folds and faults. Individual orebodies comprise quartz-realgar-stibnite veins and disseminated As-pyrite and arsenopyrite within hydrothermally altered rocks on both side of the veins. Gold occurs mostly as "invisible" gold in the As-pyrite and arsenopyrite.

Calculated $\delta^{18}O_{H2O}$ values for quartz and calcite and measured δD_{H2O} values of fluid inclusions extend between three end members: metamorphic/ magmatic waters (14–15‰), organic water (14–135‰), and meteoric water (–10 to –72‰). Most of the calculated $\delta^{13}C_{CO2}$ values for calcite and measured $\delta^{13}C_{CO2}$ values of fluid inclusions are within the range of their carbonate host rocks (–6 to +3‰), but some extend to lower values (–10 ‰), which may be due to oxidation of organic C or input of magmatic/mantle C (–3 to –7‰). In-situ pyrite S isotope range from 0.78 to 9.95 per mil. Line scan of single grain pyrite shows a distinctive decrease of $\delta^{34}S$ values from pre-ore core to overgrowth Au-bearing rim, toward to 0 per mil, as being observed in Nevada and interpreted as a result of the injection of magmatic S. In-situ Pb isotope analysis suggests all ore-stage Py has relatively homogeneous Pb isotopic composition, compatible with granitic intrusions around the Golden Triangle. Helium extracted from fluid inclusions has R/Ra values between 0.01 (crust) and 1.21 that corresponds to 20% mantle He (R/Ra=8). Ion extracts of fluid inclusions provide additional evidence for mixtures of magmatic fluids and evaporated seawater. Collectively, these results demonstrate the initial fluids and ore-forming materials may have been derived from a concealed magma system at depth.

The illite associated with Au-bearing pyrite yields a well-defined Rb-Sr isochron age of 204.6 ± 5.2 Ma, whereas the realgar-bearing quartz vein has an Rb-Sr isochron age of 148.5 ± 4.1 Ma. Together with the previous published geochronological data, we suggest that the Golden Triangle underwent two independent gold mineralization events in late Triassic and late Jurassic, respectively. In addition, the former is consistent with the closure of the branch of the Paleo-Tethys between the Indochina and the South China plate. Gold may have been precipitated during a period of post-collision lateral transpression. The latter is consistent with the internal lithospheric extension of the South China plate, which may be associated with the subduction of the Paleo-Pacific plate. Gold mineralization may have been induced by slab tearing or subduction swerving during the late Jurassic.