

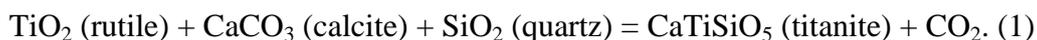
The Geology, Geochemistry, and Comparison of Two Distinct Gold Deposits in West Junggar, Xinjiang, China: Implication for Mechanism of Gold Precipitation

Huichao Zhang* and Yongfeng Zhu

Peking University, Department of Earth and Space Sciences, Beijing, China

*Corresponding author: e-mail, zhanghch@pku.edu.cn

West Junggar, located in the eastern part of the Balkash-Junggar tectonic province, is a major component of the core of the Central Asian metallogenic region. It is a highly endowed metallogenic province with >100 tonnes Au, >0.7 Mt Cu, >0.3 Mt Mo, and >2.3 Mt chromite, as well as significant amounts of Be and U. West Junggar hosts a number of metallic ore deposits, including the gold district in Hatu-Baobei volcanic-sedimentary basin, the Baogutu porphyry copper-gold deposit, and the Sartohay chromite deposit. The Huilvshan and Mandongshan gold deposits, located in the northeastern part of Hatu-baobei basin, are hosted by lower Carboniferous basalt, tuff, and quartz-siderite rock. The orebodies mainly consist of quartz-sulfide veins and altered host rocks with disseminated sulfide minerals. In the Huilvshan gold deposit, pyrite is the major gold-bearing sulfide, while arsenopyrite is the exclusive gold-bearing sulfide in the Mandongshan gold deposit. Rutile and titanite are the Ti-bearing minerals occurring in Huilvshan and Mandongshan, respectively. In addition, Laser Raman spectroscopic analyses of fluid inclusions indicate that CO₂ and CH₄ are the main form of carbon in the Huilvshan and Mandongshan gold deposits, respectively. Based on arsenopyrite geothermometer and microthermometric measurement of fluid inclusions, the ore-forming temperature of Mandongshan gold deposit is higher than that of Huilvshan. We suggest that the ore-forming fluids of the two gold deposits are significantly different on the basis of the different mineral assemblages, fluid compositions, and ore-forming temperatures. A thermodynamic calculation (equation 1) and experimental results showed that low CO₂ content facilitates the formation of titanite in the quartz-calcite system, which is consistent with the result of Raman spectroscopic analyses (CH₄-rich fluid inclusion in Mandongshan gold deposit). The related equation is written as follows:



Geochemistry of trace elements in two gold deposits suggests that ore-forming elements (e.g., Au) may be released from the basalt into the fluid during hydrothermal alteration. Phase-equilibrium calculation of the As-Cu-Fe-S-O system was carried out using the SUPCRT92 software package, with an upgraded version of the database. The calculated results suggest that the decrease of f_{O_2} and f_{S_2} , triggered by fluid-rock interactions, and crystallization of sulfide minerals were major factors that controlled gold precipitation. Two adjacent gold deposits (about 4 km away) hosted by similar wall rocks, however, have distinct mineral assemblages, fluid compositions, and ore-forming temperatures, which suggests that the fluid source of gold deposits in west Junggar is complex.