

Geology, geochemistry and genesis of the Cenozoic Bangbu orogenic gold deposit, southern Tibet, China

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Located along the southern part of the Yarlung Zangbo suture zone in southern Tibet, Bangbu is one of the largest gold deposits in Tibet. Auriferous sulfide-bearing quartz veins are controlled by second- or third-order brittle fractures associated with the regional Qusong-Cuogu-Zhemulang brittle-ductile shear zone. Fluid inclusion studies show that the auriferous quartz contains aqueous inclusions, two-phase and three-phase CO₂-bearing inclusions, and pure gaseous hydrocarbon inclusions. The CO₂-bearing inclusions have salinities of 2.2–9.5%NaCl_{eq}, and homogenization temperatures (Th) of 167–336°C. The δD, δ¹⁸O, and δ¹³C compositions of the Bangbu ore-forming fluids are -105.5 to -44.4‰, 4.7 to 9.0‰ and -5.1 to -2.2‰, respectively, indicating that the ore-forming fluid is mainly of metamorphic origin, with also a mantle-derived contribution. The ³He/⁴He ratio of the ore-forming fluids is 0.174 to 1.010R_a, and ⁴⁰Ar/³⁶Ar ranges from 311.9 to 1724.9. Calculations indicate that the percentage of mantle-derived He in fluid inclusions from Bangbu is 2.7–16.7%. These geochemical features are similar to those of most orogenic gold deposits. Dating by ⁴⁰Ar/³⁹Ar of hydrothermal sericite collected from auriferous quartz veins at Bangbu yielded a plateau age of 44.8±1.0 Ma, with normal and inverse isochronal ages of 43.6±3.2 Ma and 44±3 Ma, respectively. This indicates that the gold mineralization was contemporaneous with the main collisional stage between India and Eurasia along the Yalung Zangbu suture, which resulted in the development of near-vertical lithospheric shear zones. A deep metamorphic fluid was channeled upward along the shear zone, mixing with a mantle fluid. The mixed fluids migrated into the brittle structures along the shear zone and precipitated gold, sulfides, and quartz because of declining temperature and pressure or fluid immiscibility. The Bangbu is a large-scale Cenozoic syn- collisional orogenic gold deposit.