Geology and Geochemistry of the Namicupo Gold Prospect, Mozambique Belt, Northeastern Mozambique: Insights from Ore Mineralogy, Fluid inclusions and Stable Isotopes

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The Namicupo gold prospect, hosted by the Mozambique Belt, northeastern Mozambique, occurs as quartz veins parallel to the foliation of metasedimentary rocks. This study discusses the ore mineralogy, fluid inclusion, and stable isotope characteristics of the unreported Namicupo gold mineralization. Based on petrographic observations, the ore in the Namicupo prospect is divided into two stages. The first stage is represented by native gold associated with pyrite and chalcopyrite. The second stage is interpreted as supergene mineralization, characterized by electrum intergrown with barite and oxyhydroxides, which replaced primary sulfides. Primary quartz from the mineralized veins hosts three types of fluid inclusions that coexist in the same crystal. Type A inclusions consist of three phases (aqueous liquid, CO_2 liquid, and vapor), with melting and homogenization temperatures of CO_2 varying from -54.8 to -51.2 ^oC and +26.7 to +30.5 ^oC, respectively, and salinity of 1.0 – 7.8 wt.% NaCl eq. Type B inclusions are single-phase CO_2 liquid at room temperature, with melting temperature between -54.8 and -53.9 ^oC; the homogenization temperature of inclusions exhibiting vapor nucleation during cooling ranges from +12.9 to +29.3 ^oC. Type C two-phase (liquid and vapor) aqueous inclusions show variable degrees of vapor filling, with homogenization temperature between 209 and 337 ^oC, and salinity of 4.0 – 10.8 wt.% NaCl eq. The oxygen isotopic ratio ($\delta^{18}O_{SMOW}$) of water calculated from that of primary quartz, and sulfur isotopic ratio ($\delta^{34}S_{CDT}$) of primary sulfides vary from -2.6 to +0.9 ‰ and -3.5 to +0.9 ‰, respectively. The primary mineralization at the Namicupo prospect is classified as an orogenic-type gold deposit affected by supergene alteration under a moderately oxidizing environment. Primary gold mineralization was caused by an aqueous-carbonic metamorphic fluid at approximate temperature and pressure conditions, estimated from intersecting isochores of aqueous and carbonic inclusions, of 320 ^oC and 170 MPa.