Tectonics, magma generation, and gold endowment: A study of the mineralization styles in the Sadiola gold camp, Mali, West Africa*

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The ca. 10 Moz Sadiola gold camp is located in the Kédougou-Kénieba Inlier, a window of deformed Paleoproterozoic volcano-sedimentary rocks along the Mali-Senegal border. Mineralization is associated with a period of transcurrent tectonics coeval with prolonged (ca. 2090 to 2060 Ma) magmatism during the late stages of the Eburnean orogeny. The diversity in ore parageneses, nature, and chemistry of wall-rock alteration recognized over the camp points toward two distinct styles of mineralization typified by the Sadiola Hill and Alamoutala gold deposits.

Gold lodes at Sadiola Hill are associated with disseminated sulfides hosted by second-order shear zone and fault arrays. Wall-rock alteration is potassic in character, with a dominant mineral assemblage consisting of biotite-calcite. The metal associations of the ore typically comprise Fe-As-Au-Sb and minor to traces W-Mo-Ag-Bi-Cu-Zn-Pb-bearing mineral species. Detailed paragenetic study reveals a protracted ore development comprising an early As-rich sulfide stage (I) followed by an Au-Sb stage (II) and a late Sb stage (III). LA-ICPMS results on stage I arsenopyrite crystals indicate the presence of invisible gold (≤ 40 ppm) and up to 1% of structure-bound antimony. The mineralization continuum is interpreted to have formed within a temperature range comprised between 260°C and 410°C on the basis of ore mineral assemblage stability fields and temperature estimates derived from arsenopyrite geothermometry.

Gold lodes at Alamoutala o