The Geology and Paragenesis of the Akyem Orogenic Gold Deposit, Ghana

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Akyem is hosted in the Birimian metasedimentary and meta-volcaniclastic rocks of the northeastern Ashanti greenstone belt, Ghana. The Ashanti belt hosts the largest orogenic gold deposit in West Africa, the Obuasi deposit. Most world-class gold deposits are situated in the central and southern parts of the Ashanti belt. As such, these areas have been the focus of numerous studies and most exploration activities, neglecting other prospective areas. Consequently, the northern part of the Ashanti belt is relatively underexplored and has the potential to shed light on the regional geological and tectonic processes that control gold deposition and may host additional gold resources.

Our recent sampling campaign, petrographic analysis and Pb—Pb age dating have revealed that mineralization at Akyem occurred during the Eburnean D2 regional deformation, ca. 2,142—2109 Ma. We identified two sets of quartz – carbonate veins with a mutual cross-cutting relationship, associated with mineralization: crack-seal veins (V2) and extension veins (V3) which overprint V1 boudinaged quartz-carbonate veins. Hydrothermal alteration associated with mineralization is typically rock-buffered, with a mineral assemblage of quartz – pyrite – albite ± white mica and a carbonate alteration overprint of mainly siderite and ankerite. We identified pyrite as the main ore mineral, occurring as disseminations in the host rock or along vein walls. Backscatter SEM imaging revealed two generations of pyrite: (1) earlier fine-grained and anhedral pyrite, and (2) later coarse-grained and euhedral pyrite. Gold occurs as visible native gold and as inclusions in the lattice of both generation of pyrites. We interpret that gold precipitation likely resulted from sulfidation of the wall rock during a low arsenic fluid-rock interaction. This is evident in the lack of arsenopyrite at Akyem relative to nearby gold deposits in the Ashanti belt such as Obuasi, Takwa, Iduampriem and Bogoso/Prestea.