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# The Pampe gold deposit (Ghana): Constraints on sulfide evolution during gold mineralization

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ABSTRACT

The Ashanti belt, a world-renowned gold producing region in southwest Ghana, has received renewed attention in recent years. Most studies, however, focused on the major deposits situated along the Ashanti shear zone and in the adjacent Tarkwa Basin to the east, neglecting smaller yet important occurrences, such as the Pampe deposit which occurs few kilometers to the west of this shear zone, on the Akropong Trend. Nevertheless, investigating such simpler smaller-scale mineralizing systems is attractive, in that this can help shedding light on the processes that control gold deposition at the regional scale.

At Pampe, gold endowment has been estimated at approximately half a million ounces with an average gold grade of 2.8 g/t. The mineralization is related to two sets of quartz veins; a first set ($V_1$), which has a NE trend and is sub-parallel to the main foliation ($S_1$), and a second set ($V_2$), which crosscuts this foliation. The $V_2$ veins have a NNW–SSE trend with local conjugate geometries indicating that they formed during NNW–SSE shortening, which, regionally, is linked to major orogenic gold deposition. Gold mineralization is systematically associated with sulfides, which occur disseminated in the vein walls and in the surrounding host rocks. The ore sulfide paragenesis consists of 1) a first generation of pyrite, which is associated with $V_1$ veins; 2) a second generation of sulfides, consisting of an intergrowth of arsenopyrite and pyrite that crystallized contemporaneously with the formation of the second vein set; 3) a late phase of pyrite growth which occurs as overgrowths on phase-2 sulfides and formed during the waning stages of $V_2$ emplacement. Invisible (sub-microscopic) gold was detected in all sulfide generations by LA-ICP-MS. The analytical profiles for the Au signal are mimicked by those for Pb, Cu, As, Ag, Te, and Bi. Invisible gold is thus interpreted to have precipitated within sulfides in the form of nanoparticles (colloidal gold alloys). Conversely, visible native gold grains were recognized exclusively in association with arsenopyrite from late $V_2$ veins, either as inclusions or, more commonly, at the boundary with other sulfides, as well as in micro-fractures that crosscut the sulfides. Gold precipitation was likely induced by sulfidation of the wall rock during fluid–rock interaction. The Pampe deposit exemplifies the mineralization processes that took place at larger scale in neighboring world-class deposits such as Obuasi, Bogoso and Prestea.


## 1. Introduction

In southwest Ghana, the Ashanti belt and the sediments in the directly adjacent basins (Kumasi to the west, Tarkwa and Akyem to the east) are host to a gold district that contains a significant number of world-class hydrothermal gold deposits, including the giant Obuasi deposit (owned by AngloGold Ashanti) which, with over 40 million ounces of gold, is the largest gold deposit in the West African Craton (WAC) (Blenkinsop et al., 1994; Oberthür et al., 1997; Allibone et al., 2002a; Fougerouse et al., in press). Other major deposits include Bogoso, Prestea, Damang and Wassa (Fig. 1). The Bogoso, Prestea and Obuasi deposits are spatially associated with the Ashanti and Obuasi Fissures, located on the western flank of the Ashanti belt, while Damang and Wassa occur near the contact between the Birimian and Tarkwaian units on the eastern margin of the belt.

Gold deposits along the Ashanti belt were emplaced during a multiphase deformation history (e.g., Eisenlohr and Hirdes, 1992; Milesi et al., 1992; Allibone et al., 2002a, 2002b; Perrouty et al., 2012, 2015). The main-stage mineralization event occurred during the final episodes of the deformation history, post the deposition and folding of all the major stratigraphic sequences, during NW–SE to NNW–SSE shortening (e.g., Allibone et al., 2002a, 2002b).

Despite recent progress in the knowledge of the gold deposits in the Ashanti belt, practically all of the attention has been focused on the deposits hosted within a stratigraphic sequence known as the Tarkwa

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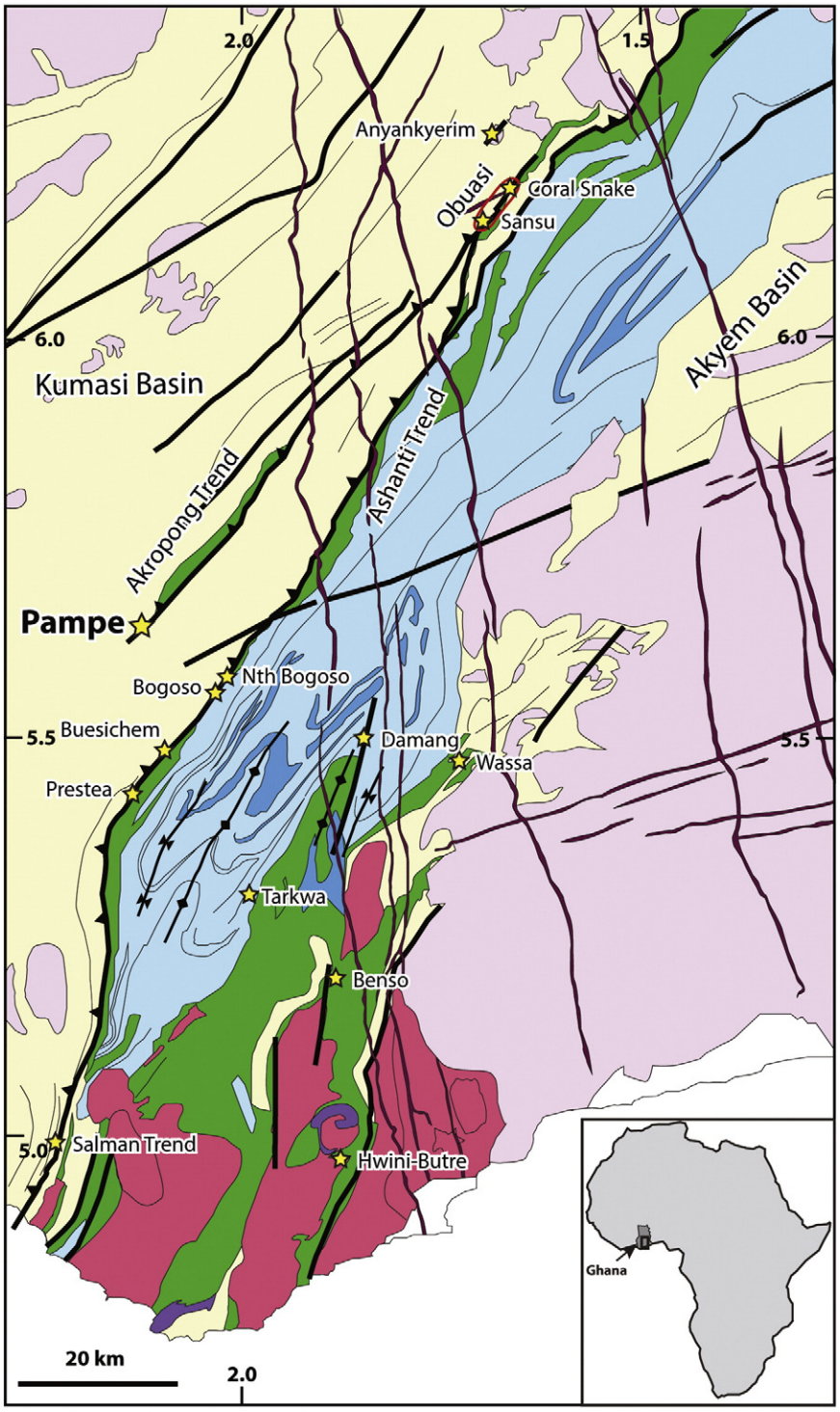


Dolerite dykes

Eburnean intrusive suite (granite, granodiorite, tonalite ca. 2118 to 2088 Ma)

Tarkwa Group (conglomerate, quartzose sandstone, >2089 Ma, < 2132 Ma)

Dolerite sills and dykes (within Tarkwa Group)

Sedimentary and volcano-sedimentary groups (Sedimentary Basins ca. 2155 to 2160 Ma)

Syn-volcanic intrusive rocks (granodirite-tonalite 2145 to 2180 Ma)

Syn-volcanic intrusive rocks (gabbro-pyroxenite 2145 to 2180 Ma)

Volcanic rocks (rhyolite, basalt, volcanoclastic units, ca. 2142 to 2196 Ma)