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Role of the Sheeted Veins in the Understanding of the Bonikro Intrusion-Related Gold System, Fettékro Greenstone Belt, Côte d'Ivoire

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The Fettékro greenstone belt is one of the most productive gold belts in Côte d'Ivoire. In its southern part, the intensive exploration has revealed the gold deposits of Dougbafla, Agbahou, Bonikro, and Hiré, thus forming the Oumé-Hiré gold district.

The Bonikro gold deposit presents two main birimian units: the mafic volcanic made of basaltic to andesitic composition in the East and the westerly volcano-sedimentary composed of shales, siltstone, and pyroclastic lavas (basaltic to dacitic). These two units are metamorphosed to the greenschist facies and affected by the north-south Bonikro Shear Zone (BSZ). This major structural event governing the interface between these two units also controls the setting of the Bonikro main intrusive and associated lithologies: granodiorite, pegmatite, acidic lava, and aplite.

Gold is primarily found within the granodiorite and secondarily in the zones where the intrusive and the BSZ are also present. The mineralization, associated with strong hydrothermal activity, is marked by sericitisation, silicification, chloritisation, albitisation, and the presence of three veins generations—sheeted, planar, and transversal.

Among these veins, the sheeted show particular characteristics: (i) they are syngenetic, (ii) they display a low fluid-rock ratio, and (iii) they are scheelite-bearing veins.

The sheeted veins are earlier, thick (1-cm), sub-parallel sets of quartz and feldspar veins. They comprise milky quartz (70 to 80%), albite (5-10%), scheelite (up to 15%), and pyrite (up to 5%). Most of the deposit's visible gold is located in the sheeted veins.

Seventy-two fluids inclusions have been studied in the sheeted (34) and the planar (38) veins by microthermometry at the Université de Lorraine, Nancy, in France. Ten of them have been investigated by the raman spectroscopy method.

The primary fluids associated with the sheeted veins are monophasic (carbonic), whereas the planar veins contain both monophasic and biphasic inclusions. The carbonic fluids are dominated by CO₂-rich CH₄-N₂. The aquo-carbonic contains more N₂ than CH₄, presenting a global composition of H₂O-rich CO₂-N₂ ± NaCl ± CH₄. The homogenization temperatures support that gold has been deposited in these veins from 200° to 290°C in primary fluids. In the secondary fluids, the temperature reaches 300°C and 125 to 250 Mpa.

Elsewhere in the Birimian of West Africa, similar fluids and compositions have been observed. The fluid immiscibility has been invoked to explain the gold deposition process in other deposits; it may have occurred in Bonikro.

