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Nature of gold mineralization at Abu Khalag, central Bayuda Desert, Sudan

Altigani, M.A.H.¹, Abdel Rahman, E. M.¹, El Zien, S. M.¹, and Hammond, N.Q.²

¹Department of Economic Geology, Faculty of Petroleum and minerals, Al Neelain University, P.O. Box. 12702, Khartoum-Sudan (m.alnagashi@gmail.com).

²School of Physical and Mineral Sciences, University of Limpopo, Polokwane, Limpopo, South Africa.

The Abu Khalag region is located in the central Bayuda Desert about 400 km north of Khartoum, Sudan. It is considered as a part of the Arabian-Nubian Shield. The lithologies in this region are Late Proterozoic gneisses, folded supracrustal metavolcaniclastics, juvenile ophiolitic island-arc rocks, and turbidite assemblages. Relatively younger granitic intrusions and felsic ring dikes have been emplaced along fractures and major fault systems.

Detailed studies of the geology and associated wall-rock alteration suggest that gold mineralization is shear-related, mesozonal, and characterized by greenschist facies mineral assemblages. The mineralization is characterized by gold-bearing quartz veins containing pyrite, arsenopyrite, chalcopyrite, pyrrhotite, and iron oxides. Gangue minerals include quartz, calcite, siderite, ankerite, dolomite, K-feldspar, tourmaline, fluorite, barite, epidote, and graphite. The auriferous quartz reefs are variable in color and size, and textures include saccharoidal, banded, and massive. The width of the veins range from a few centimeters (stringers, veinlets) to greater than 0.5 m. They usually occur as discontinuous isolated patches due to pinch and swell. The veins are preferably hosted in the amphibolites and calc-silicates, and are not common in quartzites and gneisses.

Shearing processes and retrograde metamorphism are associated with remobilizing gold in the quartz veins and redepositing it in structural traps. The spatial distribution of Abu Khalag auriferous reefs, the zonal nature of associated wall-rock alteration, and the structural/lithological evidence suggest that the mineralization is related to episodic fluid flux during deformation. The deposition of gold was contemporaneous with the retrograde metamorphism and the fault reactivation along the shear zones.

The gold occurs as free gold in quartz or as disseminations in sulfides. Gold also occurs as placers (Fig. 1). Structurally-controlled auriferous quartz vein mineralization in Abu Khalag area forms two main groups. An early phase includes veins that are concordant with schistosity of the host rocks and show boudinage features. Gold grade in this group ranges between 0.05 ppm and 1.9 ppm. The later phase of quartz veins is associated with ductile dextral shearing where gold is located in tension gashes. These quartz veins have an average thickness of 1 m and gold concentration range from 0.05 to 0.4 ppm.

The geochemical, lithological, structural, and mineralogical features, as well as the style of wall rock alteration of the quartz veins suggest that they best classified as reflecting an orogenic gold deposit type.

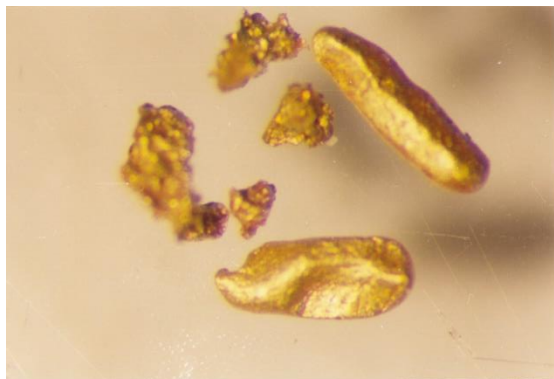


Figure 1: Different shapes of gold nuggets in a stream sample from the Abu Khalag area. x30.

