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PYRITE ZONING AND PRECIPITATION OF GOLD IN ATUD AND SUKKARI GOLD DEPOSITS, EASTERN DESERT, EGYPT

by

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The Sukkari and Atud gold mines are located in the Eastern Desert of Egypt (Fig. 1). These deposits are of the vein-type hosted in late Precambrian granite. Different generations of quartz are observed within the same vein. The large and small veins are usually surrounded with extensive alteration (Fig. 2).

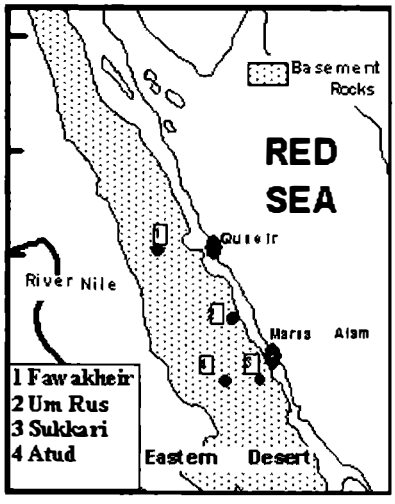

Fig. 1
Location map of the studied gold deposits.

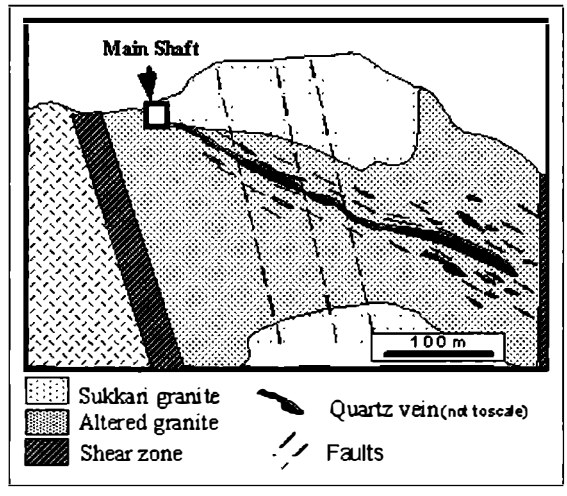

Fig. 2
Cross section in the Sukkari gold mine.

In these deposits, gold is associated with sulphides in quartz veins and in alteration zones. The sulphide ore comprises pyrite and arsenopyrite, as major constituents, and minor sphalerite, chalcopyrite and galena. More than one pyrite generation is recognized in each deposit; large subhedral As-poor pyrite (PI), large euhedral arsenian pyrite (PII) and fine-grained angular and deformed euhedral As-poor pyrite (PIII).

Two types of pyrite zoning are recognized in the Sukkari and the Atud mine (Fig. 3, 4):
a) Simple zoning, with a core of As-poor pyrite (PI) surrounded by a thick zone of As-rich pyrite (PII), and b) Oscillatory zoning of coarse-grained, euhedral pyrite. In this type, As-rich zones alternate with As-poor ones. High arsenic contents (up to 2.6 and 3.4 wt.% in the Sukkari and Atud deposits, respectively) were detected in zoned pyrite while gold contents in As-rich and As-poor pyrite are below the microprobe detection limit.
Gold occurs in three distinct positions; 1) anhedral grains (GI) at the contact between As-rich zones within the arsenian pyrite; 2) randomly distributed anhedral grains and along cracks in arsenian pyrite and arsenopyrite (GII) and 3) large gold grains (GIII) interstitial to fine-grained PIII pyrite and arsenopyrite. Gold from different textures is always alloyed with 12 - 14 wt.% silver (electrum).

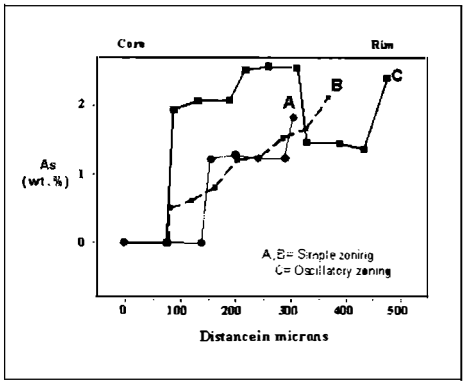

Fig. 3
Microprobe stepscans across zoned pyrite grains from Sukkari mine.

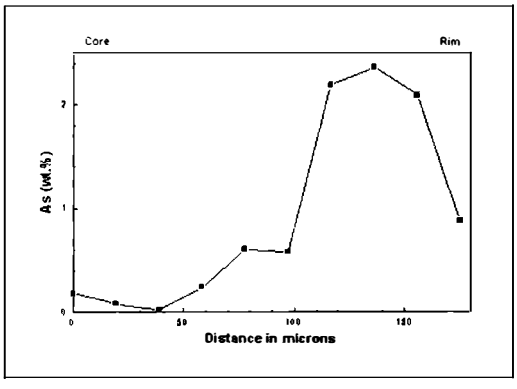

Fig. 4
Microprobe stepscans across zoned pyrite grains from Atud mine.

The textural positions of gold indicate strong relationship with arsenic concentration in the ore forming fluids. At early stage, before fluids attained saturation with gold and arsenic, gold deposition was controlled by the fluctuation in the arsenic content where both were incorporated in the pyrite structure. When the ore fluids attained As and Au saturation, gold was contemporaneously deposited with arsenopyrite. It is suggested that the concentration of arsenic in the ore forming fluids plays an important role in gold siting in the studied deposits.