ST.216

Geologic Setting and Mineralization of Gicik Low-Sulfidation Epithermal Au Deposit (North-Central Anatolia)

Akın Çil, Ali İmer
Department of Geological Engineering, Middle East Technical University, Ankara 06800, Turkey

The Turkish part of the Mesozoic-Cenozoic Western Tethyan Metallogenic Belt contains a large number of epithermal systems mainly clustered in western and northeastern Anatolia. The Gicik gold deposit is located within a rather unexplored section of this belt in north central Anatolia, about 15 km north of Ankara city center. Gold mineralization is hosted in middle Eocene agglomerates and massive to flow-banded andesite to dacite lavas overlying the Variscan basement of the southern margin of the Laurasian Sakarya Zone. Volcanic rocks are medium-K, calc-alkaline in character and show relative depletions in high field strength elements and relative enrichments in large-ion lithophile and light rare earth elements. These characteristics indicate that middle Eocene magmatism at Gicik was developed in a subduction-related setting.

Gold mineralization occurs in a series of NNE-trending, vertical to subvertical siliceous veins (up to 10 meters thick), which have been localized along dextral reverse faults. Fault plane measurements indicated two distinct fault sets: the first oriented NE-SW and hosting the mineralized veins and the second set oriented in NW-SE to E-W, offsetting the mineralized structures. According to the paleostress analyses of fault-slip data, vein-hosted gold mineralization was interpreted to have developed under NW-directed transpression.

Widespread hydrothermal alteration is characterized by vein-proximal silicification consisting of chalcedony/fine-grained massive to colloform-banded quartz to coarser-grained gray quartz as well as late amethystic quartz, surrounded by wider zones of argillic alteration represented by quartz-illite-kaolinite assemblages. District-scale propylitic alteration, characterized by chlorite-epidote-carbonate-quartz-pyrite assemblages, envelops the aforementioned alteration domains.

Siliceous veins display typical textures of low-sulfidation epithermal systems including colloform banding, hydrothermal brecciations, stockwork veinlets, and lattice-bladed textures. Mineralized samples from the surface have been extensively oxidized into hematite and goethite. Relatively fresh exposures along steep valleys, however, contain hypogene sulfide phases including pyrite, arsenopyrite, and Ag tetrahedrite together with native gold. Supergene covellite and digenite locally overprints Ag tetrahedrite hosted in colloform banded veins. Electron microprobe analysis revealed that significant concentrations of gold and silver (up to ~700 ppm and ~8.5 wt %, respectively) are contained within sulfide/sulfosalt minerals.

K-Ar and $^{40}Ar/^{39}Ar$ dating of igneous and hydrothermal minerals suggest that volcanic activity and epithermal-style alteration occurred contemporaneously at ~44 Ma during the terminal stages of widespread Paleogene volcanism in north central Anatolia. This period of volcanism is considered to have been triggered either by collisional processes or by breakoff of the downgoing northern Neotethyan slab following collision between Sakarya Zone and the Tauride-Anatolide Block. Overall deposit characteristics of the Gicik low-sulfidation epithermal system are analogous with similarly aged gold deposits of the collisional belt located in Biga Peninsula and the eastern Pontides. Thus, we propose that middle Eocene tectonomagmatic conditions along the central Sakarya Zone were also favorable for generation of low-sulfidation (and possibly intermediate-sulfidation) epithermal mineralization.