

Structural Geology, Lithology, Mineralization, and New Perspectives on the Gadir Low-Sulfidation Deposit, Gedabek District; a Newly Discovered Orebody in the Tethyan Metallogenic Belt, Lesser Caucasus, Azerbaijan

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One of the recently discovered low-sulfidation epithermal gold deposits is the Gadir deposit near Gedabek mine. This deposit belongs to the Tethyan metallogenic belt, which itself is part of the Alpine-Himalayan orogenic system.

The Gadir low-sulfidation deposit was discovered during geological exploration work and mapping in the northwest flank of the Gedabek mine by Gedabek Exploration Group (GEG) and geological consultant Allahverdi Agakishiyev in 2012.

The northwest flank of Gedabek mine is located in the Yogundag Mountain area at an elevation of 2,085 m, which belongs to the Gedabek volcano-plutonic structure of the Shamkir uplift of the Lok-Karabakh structure-formation, Lesser Caucasus metallogenic zone. This structure is elongated on the Gedabek-Bittibulag abyssal fault system, which is one of the main ore-controlling faults in the Gedabek ore district.

The Gadir low-sulfidation epithermal Au + Cu + Ag deposits developed from dilute, near-neutral pH fluids and formed in arc low-sulfidation conditions; the main ore and alteration minerals derived dominantly from a magmatic source.

The Gadir low-sulfidation deposit has a complicated geological structure, and consists of different phases of variable composite intrusive bodies and fracture systems hosted in deformed Middle and Upper Jurassic sediments. Its geometry is complex, with intrusive masses with fracture structures of different ages and types.

The Gadir deposit is a Pb-Zn-Cu-Ag-Au vein deposit, which is characteristic of low-sulfidation epithermal deposits. The main ore minerals are pyrite, sphalerite, chalcopyrite, and trace amounts of galena. The silver content of the deposit is highly variable. The higher-grade silver zones tend to be peripheral to the high-grade gold zones. The majority of the gold mineralization is very fine grained (0.5–30 μm), occurring as occluded grains in pyrite, chalcopyrite, and sphalerite. Gold is also, to a lesser extent, present in galena. Higher gold grades, however, are not directly related to sulfide percentages.

At present, underground mining is ongoing at the Gadir low-sulfidation deposit in a licensed open-field site (20.8 ha) near the northwest flank of Gedabek mine, located approximately 900 m from the Gedabek open-pit mine.

Surface outcrop mapping defined a quartz porphyry subvolcanic formation of Upper Bajocian age that exhibits intensive silicification alteration, which was considered the dominant host rock to mineralization at depth. Mineralization was thought to be located in the contact zone of this rhyolite-dacite subvolcanic strata, which provided the target for the first core drill hole in 2012. During this geological-structural mapping and drilling period, the area was defined as the Gadir uplift structure.

At present, underground mining and exploration activities are ongoing at Gadir mine, and surface exploration continues on the flanks of the Gadir low-sulfidation deposit to define the mineral zone footprint.