

Geology, Genetic Aspects, and Hydrothermal Evolution of the Dəmirli Copper Porphyry Deposit, Lesser Caucasus, Agdara, Azerbaijan

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The Dəmirli (Dəmirli) copper porphyry deposit, located 1-3 km south of Dəmirli village in the Ağdərə district of the northeastern Lesser Caucasus, is part of the Qarabağ ore district within the Lök-Qarabağ island arc structural zone. The region incorporates portions of the Xocavənd synclinalorium and Ağdam anticlinorium. Host geology is dominated by the two-phase Cənubəq granitoid pluton, associated dikes, and minor intermediate-to-acidic intrusions, overlain by Middle-Upper Jurassic dacite, andesite, and andesite–dacite formations with pyroclastic facies, and Cretaceous carbonate sequences.

Mineralization is hosted in gabbro-diorite-granodiorite and volcanogenic formations and has been shaped by tectonic, hydrothermal, and metasomatic processes. The district includes multiple ore occurrences, notably Cənubi Dəmirli, Şimali Dəmirli, and Şimal-Şərqi Dəmirli, with two principal ore bodies identified in Dəmirli: Central and Western. Ore is hosted in metasomatically altered diorites, quartz-diorites, and syenite-diorites, showing intense hydrothermal alteration, including quartzization, sericitization, kaolinitization, chloritization, and gypsification.

Mineralization progressed through multiple hydrothermal stages: quartz, quartz-pyrite, quartz-molybdenite, quartz-anhydrite-pyrite-chalcopryrite-molybdenite, quartz-calcite-pyrite-chalcopryrite-sphalerite, quartz-carbonate, and gypsum. Supergene and hypogene processes generated oxidized zones with hematite, limonite, malachite, and azurite, demonstrating complex vertical zonation.

Geological, structural, and mineralogical characteristics indicate a genetically controlled porphyry-type Cu-Mo system formed under multi-stage hydrothermal conditions. The combination of intrusive-related structures, alteration zonation, and sequential mineralization highlights the significant exploration potential of the Dəmirli district. Notably, the area represents one of Azerbaijan's largest prospective zones for copper porphyry mineralization, with total copper mineralisation resources estimated to reach up to 500 million tonnes.