

## **A New Geological Model for the Chelopech Au-Cu Deposit in Bulgaria: Exploring a Maar-Diatreme System Within an Intrusive Environment**

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The Chelopech ore deposit is located within the Panagyurishte metallogenic district in the central part of the Srednogorie zone in Bulgaria, which is part of Late Cretaceous Apuseni Mountains-Banat-Timok-Srednogorie belt. The Panagyurishte metallogenic district is defined by a north-northwest alignment of porphyry-copper (Elatsite, Assarel, and Medet) and epithermal Cu-Au deposits, oblique to the east-west orientation of the Srednogorie belt. The largest epithermal deposit in the district is exploited at the Chelopech underground mine, which currently has 31.4 Mt of measured and indicated resources at an average grade of 1.14% Cu, 3.73 g/t Au, and 9.27 g/t Ag, and has considerable past mining production since 1954. Earlier models interpreted the Chelopech deposit to be hosted by the Chelopech andesitic stratovolcanic sequence, formed in a subaqueous environment. These genetic models implied a complex structural and laterally extended stratigraphic control. Continual efforts to check and improve this model, including a two-year relogging program, have resulted in a new geological model. The main implication of the new model is that the ore-hosting magmatic environment at Chelopech is dominated by a multiphase intrusive complex.

The high-sulfidation hydrothermal system formed within a shallow intrusive multistage porphyritic diorite/microdiorite system pierced by several vertically extended, intrusion-related breccia bodies. These bodies include numerous blind breccia pipes and at least one large surface-reaching maar-diatreme (i.e., phreatomagmatic explosive) eruptive center. The diatreme is related to a granodiorite phase associated with 1) porphyry Cu-Mo-Au stockwork and potassic-phyllitic alteration (in Petrovden area), 2) distal base metal sulfide veins (Petrovden and Vozdol areas), and 3) high-sulfidation Cu-Au mineralization (Chelopech and Sharlo Dere areas). The high-sulfidation mineralization occurs within sulfide- and sulfosalt-rich zones of replacement silicification surrounded by halos of advanced argillic alteration. The orebodies, both complex branched hydrothermal breccia bodies and discrete pipes, vary from 150 to 300 m in length, are 30 to 120 m thick, and can extend at least 350 m down-plunge. The high-sulfidation system is localized within the diatreme intruded by tuffisite and porphyry dikes. Subsequently, intermittent postmineral thrusting and normal faulting both juxtaposed and preserved different levels of the mineralized system. The shift of the magmatic model from volcanic to intrusive host environment of the mineralization processes, in particular the lithological control on ore deposition at Chelopech, changes both the perspectives and the strategies to be followed by further exploration endeavors.