

SEG 2024 Conference: Sustainable Mineral Exploration and Development

Tellurium and Selenium in and Epithermal Gold Deposit in the Chatkal-Kurama Region (Uzbekistan)

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The average concentration of tellurium (Te) and selenium (Se) in the Earth's crust is low, being 100 parts per billion (ppb) and only 2 ppb, respectively. Similarly to other Group VI elements, they can occur in the form of mineral groups such as tellurides and selenides. A characteristic feature of these elements is their potential association with gold (Au), silver (Ag), bismuth (Bi), lead (Pb), and copper (Cu) as manifested in gold-(silver)-telluride-(selenide) deposits.

The Chatkal-Kurama region presents outcrops of the Valerianov-Beltau-Kurama Magmatic Arc, an insular arc formed by the subduction of the Turkestan Ocean. Connected with Paleozoic magmatic activity, several porphyry, epithermal, and skarn ore deposits formed. Kochbulak and Kyzylalmasay represent two epithermal deposits, respectively, with Au-Te and Au-Se linked to the last intense phase of magmatism (late Carboniferous-early Permian). The geochemical anomaly of Te and Se is evident in the complex mineralogy of the deposits, which binds tellurium (hessite, petzite, calaverite) and selenium (naumannite, aguilarite) directly to Au and Ag, which also occur in native form, electrum, in sulfides and sulfosalts (freibergite, polybasite). The mineralizing phases are characterized by different events, as often happens in these cases, but the events that bind Au-Te and Au-Se are well-defined in the paragenetic sequences.

The different geochemical behavior of Te and Se controls their association with Au, Ag, and the resulting complex geochemistry of the ore deposits. Understanding the genesis of the Au-Te and Au-Se deposits in Chatkal-Kurama may contribute to clarifying whether they could behave as useful elements for mineral exploration of epithermal gold-(silver)-telluride-(selenide) deposits.