

Geology and Discovery History of the Chukaru Peki Cu-Au deposit, Timok Magmatic Complex, Serbia

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The Chukaru Peki copper-gold deposit is located in eastern Serbia, in the central Timok Magmatic Complex (TMC), part of the broader Tethyan metallogenic belt. The TMC developed as an extensional, and subsequently compressional, back-arc basin during the Upper Cretaceous, and contains Europe's largest magmatic-related copper-gold endowment.

The deposit is located approximately six kilometers south of the Bor ore field, roughly along trend of the NNW-striking fault system which localizes Bor and other deposits of the eastern TMC. Intersection of an inferred east-west fault system with this NNW trend likely localizes the deposit. The Upper Zone ('UZ') of the Chukaru Peki deposit is a deep (generally >450m), blind, and covered high-sulfidation body that is concealed both by post-ore Cretaceous and Miocene sedimentary rocks that unconformably overlie the host andesites, and by a thin, relatively unaltered but apparently pre-ore andesite above high-grade mineralization. Copper-gold mineralization in the UZ consists of paragenetically-early fine-grained pyrite, with generally later covellite, sparse enargite, and traces of other sulfosalts and sulfides in veins, breccia fillings and replacements, contained within a relatively narrow envelope of advanced-argillic altered andesite. An underlying, as yet poorly-defined zone of porphyry-style mineralization (Lower Zone, 'LZ'), extends to at least 2.1km below surface and contains chalcopyrite-pyrite-(molybdenite-bornite) mineralization associated with quartz-sulfide-magnetite-hematite stockwork, locally with secondary biotite and K-feldspar, which has been overprinted at various scales to an assemblage of covellite-pyrite with quartz-clay±sericite alteration. These deep covellite zones likely represent conduits to the shallower Upper Zone mineralization. Based on oxidized, weathered rocks intersected immediately beneath post-mineral Miocene sediments in the eastern, up-dip edge of the deposit, a small portion of the system likely cropped out prior to the Miocene. While the coupled Chukaru Peki UZ high-sulfidation and LZ porphyry systems show remarkable geologic similarities to the Bor high-sulfidation and underlying Bor River porphyry deposits, a relatively significant intermediate-sulfidation Au-(Ag-polymetallic) occurs immediately west of Chukaru Peki near Brestovac village, and appears to be unique within the Timok district. Latest Cretaceous compression deformed the Chukaru Peki deposit and environs.

The deposit was discovered by Freeport McMoRan Exploration Corporation in early 2012, in the tenth diamond drill hole which penetrated Miocene cover rocks, eleven years after an initial visit to Serbia and after eight years of exploration by FMEC and its various partners within the Timok complex. Factors critical to discovery include the ability to stay in a well-endowed mineral belt over adequate timeframes to allow application of new geophysical techniques, and to allow consideration of increasingly deep targets using contemporary high-grade porphyry discoveries elsewhere as analogues. In parallel with its exploration in the TMC during this same period, FMEC

identified and explored several outcropping Tertiary-aged Cu-Au porphyry systems both in Serbia, and adjacent parts of the western Tethys. While these often returned encouraging drill intercepts, they invariably resulted in definition of smaller and lower-grade systems.