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Kodar-Udokan Basin, Siberia (Russia): New Advances in the World-Class Copper District

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The Kodar-Udokan mineral district in Siberia (Russia; Fig. 1) is one of four globally important basins with world-class sediment-hosted copper deposits. A mining complex at the largest Udokan deposit, with resources of 25 Mt Cu (@1% Cu) and 805 Moz Ag (@10 g/t), is being constructed. Several nearby prospects are currently being re-explored.

The 200- x 60-km Paleoproterozoic basin is situated near the boundary between the 3.4-2.9 Ga Olekma and Tynda terranes in the Aldan Shield of the Siberian Craton, amalgamated by 2.6 Ga. The Cu mineralization occurs at several stratigraphic levels within the 12,000-m-thick clastic sequence (2.2-2.06 Ga Udokan Supergroup), deformed at ca 1.9 Ga. This deformation was soon followed by emplacement of 1876 Ma A-type granite, 1867 Ma Fe-Ti-V and Cu-Ni-PGE-bearing layered gabbro, and a 1863 Ma diabase dike swarm, as well as Neoproterozoic mafic dikes.

U-Pb dating of titanite from disseminated Cu ore and Cu-quartz veins at Udokan yielded an 1896 Ma age of mineralization, indicating a syndeformational emplacement of Cu-Ag-bearing fluids shortly prior to emplacement of A-type granites and layered gabbro.

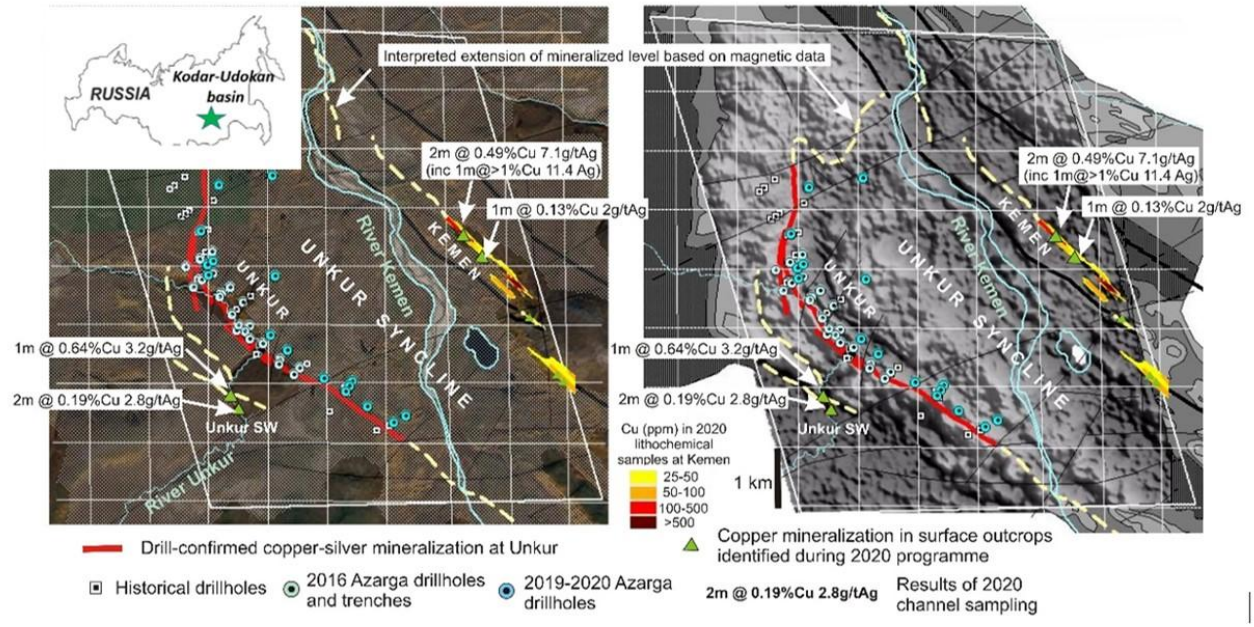
Structurally, the Cu-Ag mineralization is preferentially controlled by the limbs and closures of synclines. The relationships between hosting lithologies, mineralization, and alteration were recently documented by Azarga Metals at the Unkur deposit, hosting >50 Mt of mineralization grading 0.59% Cu and 40 g/t Ag over a strike length of 6.6 km in the southwestern limb of the 10- x 5-km Unkur syncline. Copper oxide minerals were recently identified over 1- to 3-km length on the opposite (northeast) limb of the syncline (Fig. 1A-B) at more than one stratigraphic level, requiring drill testing.

In the southwestern limb, the mineralization occurs at the transition from non-calcareous to calcareous sedimentary rocks (Fig. 1C). The stratabound sulphide minerals comprise chalcopyrite, pyrite, bornite, chalcocite, and covellite oxidized into malachite, chrysocolla, and brochantite. Accessory minerals include magnetite, hematite, and ilmenite.

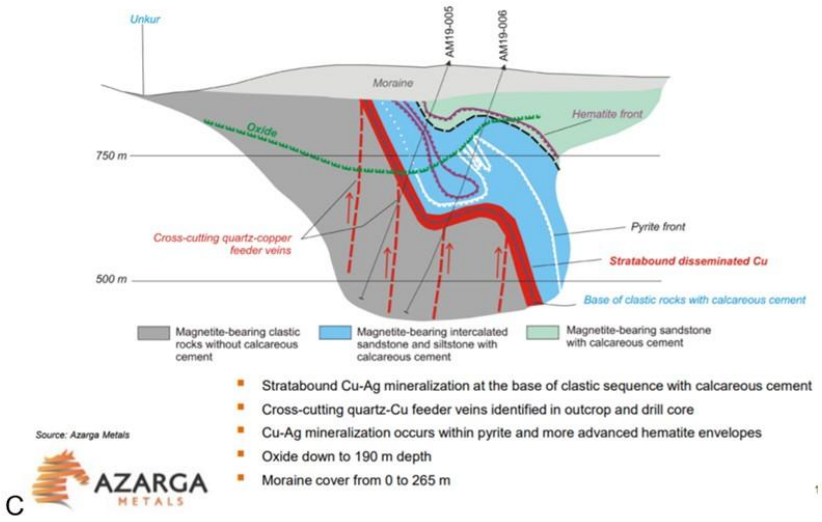
Underneath the stratabound lode are the quartz-copper feeder veins, crosscutting the stratigraphy. They host simpler chalcopyrite-pyrite mineralization.

The hosting formation is characterized by a magnetic high, reflecting widespread presence of clastic magnetite, which is altered into characteristically coloured hematite near Cu-Ag mineralization. The mineralized fluids are interpreted to have passed through the clastic package along the feeder veins and then were deposited within the stratified package at the non-calcareous/calcareous transition. Clastic magnetite was hydrothermally altered into hematite within a large volume of pink-coloured rocks, whereas pyrite formed an IP-detectable wider envelope around Cu sulfides. These regionally continuous magnetic lows and chargeability highs help to better target the drilling programme through the overburden moraine.

Figure 1: (A) Satellite image, (B) reduced-to-pole magnetic map, and (C) lithological-structural setting of two types of Cu-Ag mineralization at Unkur prospect in the Kodar-Udokan basin, Russia.



A B



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