

Contribution to the Study of Copper Mineralization in Marghout and Amane Tazougart area (Ouarzazate, Central Anti-Atlas, Morocco)

HICHAM KHEBBI¹, ALI LHACHMI², ABDELAZIZ EL BASBAS³, YOUNES ABOUABILA⁴, OTHMAN SADKI⁵, HASSAN IBOUH⁶ AND ILHAM M'HAMDI ALAOUI⁷

¹Sidi Mohamed Ben Abdellah University, Fez – Multidisciplinary Faculty of Taza

²Sidi Mohamed Ben Abdellah University, Fès – Polydisciplinary Faculty of Taza

³National School of Mines of Rabat

⁴National Office of Hydrocarbons and Mines (ONHYM)

⁵Office National des Hydrocarbures et des Mines

⁶Faculty of science and technology, Cadi Ayyad university, Marrakech, Morocco

⁷Mohammed V University – Mohammadia School of Engineers

The Marghout, Issougrid and Amane Tazougart sectors are located approximately 10 kilometers southeast of the city of Ouarzazate, in the central Anti-Atlas. The analysis of hyperspectral imagery has demonstrated the capability of satellite data to identify hydrothermal alterations associated with copper mineralization in the Ouarzazate region and to generate high-resolution mineral potential maps. Sentinel and ASTER data, combined with GIS techniques, have enabled precise mapping of tectonic lineaments.

The lithology is dominated by volcanic formations attributed to the Ediacaran period, primarily composed of andesites and rhyolites, along with local occurrences of ignimbrites and, more rarely, intrusions of diorites and microgranites. Rhyolitic and andesitic dykes are frequently observed, as well as volcano-detrital layers indicating temporary pauses in volcanic activity. These volcanic and volcano-sedimentary formations are affected by brittle deformation along NE-SW, ESE-WNW, and N-S directions. Copper mineralization is hosted within the andesites, occurring as veinlets and disseminations. Microscopic observation reveals a simple paragenesis consisting of malachite, chrysocolla, azurite, chalcopyrite, covellite, bornite, and chalcocite, associated with pyrite, sphalerite, galena, and, less commonly, magnetite and hematite. Field data and preliminary microscopic analyses support the interpretation of hydrothermal mineralization (bornite, chalcopyrite, and pyrite) controlled by brittle structures. The primary paragenesis underwent supergene alteration, leading to the formation of secondary minerals such as chalcocite, covellite, malachite, chrysocolla, and occasionally azurite.