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The new World-Class Tizert deposit (Anti-Atlas, Morocco): future supply for copper in Europe?

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KEYWORDS. — Acid Neutralization; Geology; Oxidation; Supergene Ores; Weathering.

SUMMARY. — Since the 2000s, the increasing request for metals in new technologies restarted the interest in new ore deposits. In this context, exploration of supergene ores has been carried out in many countries, including Morocco. Supergene deposits form near the surface of the Earth, associated to oxidizing conditions and meteoric fluids, as a result of modifications of hypogene ores (primary sulfides), which are only stable under reducing conditions at shallow depth. This study, in collaboration with the Managem Group (Morocco), aims to complete our knowledge of the mineralization, initiated by OUMMOUCH *et al.* (2017), in order to start the exploitation of the deposit.

The giant Cu Tizert deposit is considered as the largest copper deposit in the western Anti-Atlas and resources are estimated to 57 Mt @ 1.03 % Cu and 23g/t Ag (OUMMOUCH *et al.* 2017). The deposit is characterized by Cu mineralization mainly carried by malachite, chalcocite, covellite, bornite and chalcopyrite; azurite is not observed. The host rocks are mostly limestones/dolomites (Lower Limestone/Tamjout Dolomite Formation) and sandstones/siltstones (Basal Series) of the Ediacaran/Cambrian transition (540 Ma). The secondary/supergene enrichment is most likely related to episodes of uplift/doming (last event took place since 30 Ma) which triggered the exhumation of the primary/hypogene mineralization (chalcopyrite, pyrite, galena, bornite I and chalcocite I) generating their oxidation and the release of acidic fluids (H_2SO_4) and of Cu ions. The precipitation of secondary sulfides, carbonates and Fe-oxyhydroxides was only possible by partial or total neutralization of this acidic fluids. Tizert is characterized by an abundance of Cu carbonates (saprolite or "green oxide zone") because of the rapid neutralization of acidic meteoric water by the carbonate host rocks (mostly Tamjout Dolomite Formation) and chlorite in the sandstones/siltstones of the Basal Series. Secondary sulfides (cementation zone) such as covellite, chalcocite II and bornite II are much less present as they require lower pH and more reducing conditions.

Overall, the mineralization is relatively homogeneous in the entire deposit (*i.e.* the malachite present in the "green oxide zone"), which could be a major advantage for potential mining, compete with other world-class Cu deposits and supply some copper to Europe.

REFERENCE

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