Paper Number: 2465

Mineralogical characterization of non-sulfide Zn–Pb mineralization at Mehdiabad deposit, Iran

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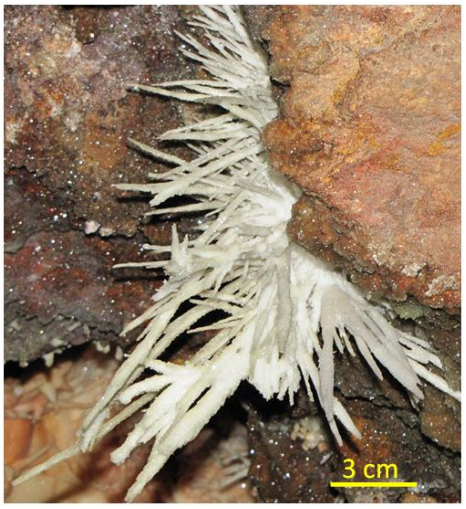
The Zn-Pb-Ba (Cu) Mehdiabad deposit is located in the Yazd Anarak metallogenic belt, 550 km to the southeast of Tehran. The host rocks of the deposit consist of Lower Cretaceous silty limestone and dolomite. The main occurrences are the Calamine mine (CM), the Black-Hill Ore (BHO), the East Ridge (ER) and the Central Valley Orebody (CVOB). The orebody consists of a primary sulfide ore and a supergene non-sulfide ore, this latter one having been mined at CM. The total geological resource of the Mehdiabad deposit is about 218 Mt at 7.20% Zn, 2.30% Pb, and 51 g/t Ag. Despite its huge size, the deposit has been scarcely studied. Modern investigations only include the geology and the mineralogy of the deposit [1], as well as geochemical constraints on the oxide ores and past to current weathering conditions [2].

Mineralization occurs as stratabound blanket-like, tabular orebodies and breccias. Two horizons have been recognized. The sulfide and non-sulfide ores of horizon I (BHO, CVOB, ER) is hosted within organic matter-rich shale, silty limestone, dolomite and silty shale of the Taft Formation, whereas the non-sulfide ore of the ore horizon II (CM) is hosted by limy shale and thin-bedded limestone of the Abkuh Formation. The most abundant sulfide minerals within the ore horizons are sphalerite, galena, pyrite and chalcopyrite that coexist with baryte. Diagenetic replacement textures, pyrite framboids and laminated colloform sulfide aggregates were obsereved. Together with the presence of normal syn-sedimentary faults and the lateral metal zonation, these features support that sulfide mineralization was coeval with the deposition of the Lower Cretaceous host rocks.



The non-sulfide ore include hemimorphite, hydrozincite, and smithsonite, as the principal zinc-bearing minerals. Cerussite and anglesite also occur, generally associated with lenses of residual galena. The non-sulfide zinc ore of the Mehdiabad deposit can be subdivided into a red zinc ore (RZO), including Fe-oxi-hydroxides such as goethite, hematite, and a white zinc ore (WZO). Two important factors have contributed to the genesis of the non-sulfide mineralization: 1) the proximity to the surface of the sulfide ore and 2) the presence of highly permeable karst-originated breccia that allowed percolation of metal-rich groundwaters.

Figure 1: Non-sulfide mineralization of the Mehdiabad deposit, showing the development of hemimorphite of the WZO over the red aggregate of the RZO.

References:

[1] Ghasemi M (2006) Formation mechanism of the Mehdi Abad Zn–Pb deposit and its comparison with other near lead and zinc deposits [Unpublished M.Sc. thesis]: Research Institute of Earth Sciences, Geological Survey of Iran: 238 p.

[2] Reichert J (2007) A metallogenetic model for carbonate-hosted non-sulfide zinc deposits based on observations of Mehdi Abad and Iran Kouh, central and southwestern Iran [Unpublished Ph.D. thesis]: Shillong, University of Martin Luther: 129 p.