Gold in the massive sulphide deposit of Jebilet massif (Hercynian, Morocco). The example of Sidi Mbark (Draa Sfar North)

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Most of the sulphide massive deposits of the Hercynian fold belt of Morocco are located in the central part of the Jebilet massif, an area characterized by an intense Carboniferous magmatic and hydrothermal activity. The deposits are hosted in the Sarhlef shales, a volcano-sedimentary series of upper Viséan age, folded and metamorphosed in the green schist facies, and intruded by granodiorite plutons and numerous acidic and basic intrusions. Some massive sulphide deposits are being exploited (e.g. Draa Sfar deposit) and others are under development (e.g. Koudiat Aicha deposit). These deposits are mainly explored for base metals. Recently, in the northern part of Draa Sfar deposit (Koudiat Sidi Mbark), the mining industry targets, in addition to base metals, gold, which has grades up to 0.5 g / t. The Sidi Mbark deposit is located on the northern shore of oued Tensift, 17Km to the NW of the city of Marrakech. More precisely, it is located at a hundred meters in the northern prolongation of Kt. Tazakourt (southern part of Draa Sfar). Although Sidi Mbark and Tazakourt are part of the same deposit, geology and exploitation differ from one part to another.

The southern part of Draa Sfar (Tazakourt deposit) is mainly exploited for zinc. The mineralization consists of 90% pyrrhotite in which other mineral phases are disseminated: sphalerite, galena, chalcopyrite, ilmenite and cobaltite. The mineralization is in the form of a subvertical mega lens exceeding 1km in length in the sub-meridian direction. Its depth exceeds 1500 m and its thickness varies from 1 to 50m. The orebody is hosted in a series of rhyodacites, tuffs and grey argillite on the footwall, and black carbonaceous argillite on the hanging wall.

The northern part of Draa Sfar (Sidi M'bark deposit) appears on the surface as a small elongated submeridian gossan emerged within an alluvial formation of oued Tensift. In depth there are ten lenses of sigmoidal shape, sub-concordant with the schistosity. These lenses can reach 150m in length and 10m in thickness, and are currently known to a depth of 250m. The host rocks consist of sandstone argillite and black carbonaceous argillite similar to those of Kt. Tazakourt, while rhyodacites and tuffs are absent.

Among the mineralized lenses of Sidi M'bark, only one is zinciferous and has a mineralogy and texture similar to that of the Kt. Tazakourt lens. The other lenses are copper-bearing and have variable textures, such as disseminated chalcopyrite within massive pyrrhotite, or alternating ribbons of chalcopyrite, pyrrhotite and/or pyrite. The ore minerals consist of pyrrhotite, chalcopyrite, pyrite, arsenopyrite, ilmenite, cobaltite, bismuth, sphalerite, galena (rare), and cassiterite.

The zinc-bearing and copper-bearing lenses have undergone different degrees of deformation. The zinc-bearing lens is highly deformed comparatively to the copper-bearing lenses. It is affectd by shearing and microfolding while inclusions of shale fragments are deformed and wrinkled. On the contrary ductile deformation is less pronounced in the copper-bearing lenses. Texturally, pyrrhotite is fine-grained in the zinciferous lens and coarse-grained in the copper lenses.
Gold of Kt. Sidi Mbark is invisible. It was observed using the scanning electron microscopy in massive ore where it is present as inclusions in chalcopyrite, cobaltite and pyrrhotite, and in banded ore where it occurs as inclusions in arsenopyrite. The inclusions have a size between 1 and 10 microns and are composed of native gold grains or associated with Bi and/or Ag.