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Manganese minerals from the Chaparral manganese mine, Alosno, Huelva, Spain

T. Datzira, J.C. Melgarejo, and M. Campeny

Departament de Cristal·lografia, Mineralogia, Dipòsits Minerals, Universitat de Barcelona, Barcelona, Spain (joan.carles.melgarejo.draper@ub.edu)

Manganese deposits were exploited in many areas of the Iberian Pyrite Belt. These deposits are considered to be contemporaneous with the development of the massive sulfide bodies, and could be produced in a distal position respect to the pyrite lenses. E-W trending lenses of manganese minerals were exploited in a open pit at the Chaparral mine, ENE of the Alosno village. Stratiform bodies have several meters in thickness, and are hosted by cherts and shales of Lower Carboniferous age. Late veinlets with younger mineralization cut the above materials, and the ensemble was deformed and affected by low grade metamorphism during the Hercynian Orogeny.

Ore lenses are composed by rhodochrosite bands interbedded with chert bands, magnetite-rhodochrosite bands, or shales. Chlorite and quartz are common as mm veinlets or as a replacement product of the host rocks.

Rhodochosite bands have some centimeters in thickness, and fine-grained rhodochrosite is the dominant mineral, with only minor amounts of euhedral pyrite, accompanied in some cases by euhedral cobaltite. Pyrite is scattered in rhodochrosite bands or forms mm-thick bands. Rhodochosite nodules, up to some cm in diameter, are also found scatered in chert or shales. Fine-grained rhodonite may be found at the contact with the siliceous sediments. Magnetite-rhodochrosite bands have also significative contents of albite and ferrogedrite, with accessory amounts of apatite, cobaltite, pyrite, pyrophanite and scheelite.

Late veins consist of quartz with chlorite, with a fine-grained complex association of chalcopyrite, galena, arsenopyrite, molybdenite, clausthalite, gersdorffite, altaite, alloclasite, niccolite, alabandite, hübnerite, pyrophanite, lanthanite-(Ce), barite, celsian, chlorite and secondary silicates of manganese, mainly friedelite. These veins can exhibit evidences of having suffered deformation.

Primary manganese ores were replaced by Mn oxydes during supergene processes.

Mineral associations in the bands suggest an exhalative origin in a reducing sedimentary environment, producing carbonate manganese and manganese sulfide instead of oxydes. The occurrence of hydrothermal alterations and extensive veining suggest a proximal origin with the exhalative vents. The accessory mineralogy of the veins is similar to that found in the stockwork ores of the Tharsis sulfide deposit, which is found at a distance less than 10 km. δ34S values in pyrite range between -9,5 and -26,7 ‰ and can be produced by bacteriogenic activity. These values are in the range of those found in pyrite from the massive sulfide deposits of the Iberian Pyrite Belt. Manganese ores were deformed during the Hercynian Orogeny and affected by low-grade metamorphism.