



The Peña Colorada iron oxide-ores, México: Petrological characterization

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The iron-ore of the Peña Colorada mine has been nano-mineralogical and physico-chemical characterized. Two types of ore are identified based on texture, size, and shape. Mineralogical association of magnetite and gangue include massive-disseminated and intergranular ore-type. Analytical methods were performed by humid and dry-via as Plasma Mass Spectrometry and X-ray fluorescence. Mineralogical identifications were done using the polarized reflected-transmitted light microscope, high-resolution transmission electron microscope, electron probe X-ray micro-analyzer and X-ray diffraction. These results allowed for a better understanding of the mineralogy and probable origin of magnetite, physical and chemical behavior, and the effects on the metallurgical and smelting processes. They also permitted better planning of the mining processes. This magnetite is associated to berthierine formed diagenetically in a shallow to deep sea, $\text{pH} > 7$ and low eH (redox potential), with the presence of decomposing organic matter. Identification of magnetite nanoparticles permits a better definition of physicochemical conditions and formation environment of intergranular ores. A hydrothermal process giving Fe-rich solutions, provoke chemical precipitation growing magnetite by nucleation from berthierine, where increase of temperature was the fundamental process. Magnetic properties of magnetic minerals of size ranging from micro to nanometer scale were analyzed, some of them with increasing temperature, observing new nano-mineral formation and increasing sizes.