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SPECTROSCOPIC CHARACTERIZATION OF Fe-OXIDES AND -OXYHYDROXIDES ASSEMBLAGES RELATED TO ARD PROCESSES (LIBIOLA MINE, ITALY)

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The Libiola Fe-, Cu-sulfide mine (Eastern Liguria, Italy) represents one of the most important Italian exploited sulfide-ores. The ore deposit was mined from 1864 to 1962 either through open pits and underground excavations, in an area comprising 18 galleries, 7 open pits, and over 30 vertical shafts. Mine wastes were deposited in five major piles and in several minor waste-rock and tailings dumps, placed throughout the mining area.

In the Libiola Mine area numerous evidences of active ARD processes are present, occurring where the water-sulfides interactions are strongly favoured by the mining activities. The major mineral phases, resulting from these processes are the Fe-oxides and -oxyhydroxides occurring within ochreous to reddish crusts or within ochreous unconsolidated muds (MARESCOTTI & CARBONE, 2003).

An accurate characterization of the nanocrystalline Fe-oxides and -oxyhydroxides has been undertaken using X-ray powder diffraction (through the Rietveld quantitative interpretation), several spectroscopic techniques (Diffuse Reflectance Spectroscopy, IR, μ-Raman, EPR) and magnetic measurements (performed using a SQUID magnetometer).

The experimental evidences of XRPD, DRS and IR point to the presence of hematite and goethite as the main constituents of the crusts, with rare minor associations of quartz. The complex banded pattern of the samples has been related to different stages of the evolution of the precipitate. Thus, most of the macroscopic features of the assemblages arise from the intergrowth of these two main components. Moreover, both the IR and μ-Raman investigations revealed the presence of some accessory phases, namely lepidocrocite and schwertmannite, which represent "relics" of the pristine deposition of the precipitates and of the early stages of their evolution.

EPR spectra present features which can not be simply related to bulk hematite and goethite and to their relative proportions. In fact the reduced size of the grains substantially modifies the magnetic behavior of both minerals as indeed shown by magnetic measurements, which show for all the investigated samples, the characteristic behavior of superparamagnetic assemblies of particles.

References

MARESCOTTI, P. & CARBONE, C. (2003): GEAM, **109**: 45-53.