

Nickel Insertion in Natural goethites : Structural Investigation by X- Ray Absorption Spectroscopy

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Goethite (α -FeOOH) has great abundance at Earth's surface and unusual capacity to adsorb and fix elements from migration solutions. Understanding how the insertion of these elements in goethite occurs has many implications on environment and mining problems. XAS (X-ray absorption spectroscopy) has been used to get structural information on the local environment of nickel in natural Ni-doped goethites (from 0.9 to 2.4w%Ni) from Vermelho lateritic deposit of Serra dos Carajás (Brasil) and synthetic analogous. The data were collected at the XAS beam line of the Laboratório Nacional de Luz Síncrotron at the Ni K-edge, at room temperature and at 8K. Ni is found in the same environment in all natural and synthetic samples, with negligible thermal disorder. The coordination polyhedron is a tetragonal dipyramid of oxygen showing that the nickel preserves its usual local symmetry. This is compatible with a model in which nickel for iron substitution is accompanied by a proton capture resulting in $\text{NiO}_4(\text{OH})_2$ octahedra. The polyhedra linkages are similar to that of pure α -FeOOH, showing four edge links at about the same metal-metal distances, as in the undoped compound. The third metal-metal distance is about 10% larger than the expected corner-sharing distance in α -FeOOH structure.

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