Characterization of Goethite and Hematite in a Tunisian Soil Profile by Mössbauer Spectroscopy

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Abstract: As part of the characterization of a Tunisian red soil profile, six samples, taken at different depths, were investigated by Mössbauer spectroscopy at room temperature and at 80 K to obtain information about the various types of Fe oxides present. By considering magnetic hyperfine field distributions, the spectra of goethite and hematite were well resolved. Chemical analyses of the samples revealed a partial substitution of Fe by Al and Mn. The spectral behavior of the goethite was predominantly influenced by crystallinity and amount of Al substitution which resulted in a reduction of the magnetic hyperfine field. The effect of Mn substitution was much more pronounced in the hematite spectrum as a consequence of a stronger suppression of the Morin transition by Mn than by Al.

Key Words: Aluminum • Goethite • Hematite • Iron • Manganese • Mössbauer spectroscopy • Soil

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