Formation of Goethite and Hematite from Neodymium-Containing Ferrihydrite Suspensions

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Abstract: The effects of neodymium (Nd) on the transformation of ferrihydrite to iron oxides was studied. The possible isomorphous substitution of Nd^{3+} for Fe^{3+} in iron oxides was examined also. Nd was used as an inactive substitute of trivalent radioactive actinide elements. Hydrolysis of ferric nitrate solution containing 0 – 30 mole % of Nd formed Nd, Fe-rich ferrihydrite as initial precipitates, which were poorly crystalline. Aging of the Nd-containing ferrihydrite in 0.3 M OH^- at 40 ° C and at pH 9.2 at 70 ° C formed Nd-free goethite and Nd-substituted hematite. The abundance of these crystalline phases was related to Nd in the parent solutions. Phase abundance, unit-cell parameters, and peak width were estimated by use of the Rietveld method.

Key Words: Ferrihydrite • Goethite • Hematite • Neodymium • Powder X-ray Diffractometry • Rietveld Refinement • Transmission Electron Microscopy

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