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# Effect of Cobalt on the Formation of Crystalline Iron Oxides from Ferrihydrite in Alkaline Media

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**Abstract:** At pH 12 Co-ferrihydrite transformed to either Co-goethite or Co-magnetite, the latter compound appearing at Co additions of > 18 mole %. Although Co was readily taken up by the magnetite structure, chemical analysis showed that no more than 7 mole % substitution of Co in goethite was achieved. Hematite formation was not strongly promoted by the presence of Co; with 9 mole % Co in the system, the amount of hematite relative to goethite in the product increased slightly. Co-substituted goethites grew as long, thin crystals. The presence of Co promoted some dendritic twinning of goethite. Cobalt retarded the transformation of ferrihydrite to more crystalline oxides mainly by stabilizing ferrihydrite against dissolution. A comparison of Co with divalent ions previously studied showed that their stabilizing ability decreases in the order Cu > Co > Mn, i.e., they follow the Irving-Williams series for the stability of metal complexes.

**Key Words:** Cobalt • Crystal growth • Ferrihydrite • Goethite • Spinel • Transmission electron microscopy

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