

Hydrothermal synthesis of goethite (α -FeOOH) nanorods in the presence of ethylenediamine:thiourea

ABSTRACT

Goethite (α -FeOOH) nanorods were synthesized via the hydrothermal method with the assistance of coordinating ligands, i.e. ethylenediamine and thiourea. The homogeneity of the nanorod size distribution increased and the propensity to agglomerate decreased when ethylenediamine and thiourea were used in conjunction; contrary to goethite synthesis in the presence of a single ligand. The type and mode of structure-directing plays a critical role in the morphology of the final products. When using thiourea only or in combination with ethylenediamine, nanorods and nanoparticles of various morphologies were formed. Conversely, when exclusively using ethylenediamine, in addition to the nanorods, fine needles with a significantly smaller diameter were discernible. With all combinations, structurally uniform α -FeOOH nanorods were formed. This improved nanorod formation in the presence of both ligands might be attributed to a more ordered alignment and regular conformation of ethylenediamine molecules in the presence of thiourea and thus less susceptibility to thermal perturbations. Finally, higher concentrations of ligand influence the final product and increases particle aggregation.

Keyword: Ethylenediamine; Goethite; Hydrothermal synthesis; Nanorod; Thiourea