

Influence of the Preparative Parameters on the Microstructural, and Some Physical Properties of Hematite Nanopowder

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Abstract

Controlling the properties of nano-sized hematite (α -Fe₂O₃) is an interesting approach for broadening its multifunctionality and applications. This work presents the effect of the oxalic acid molar ratio from 0.0 to 2.0 and the annealing in the range 350 - 950 °C, on the physical properties of hematite nanopowder prepared by simple chemical solution and evaporation. The microstructural analysis was performed by XRD, HR-TEM and FTIR. Both XRD and FTIR spectroscopy proved the presence of hematite rhombohedral structure as the sole detectable phase. Increasing the oxalic acid molar ratio decreased the crystallite size (C_s), converted the nanorods (NRs) morphology to nanoparticles (NPs) and blue-shifted the optical band gap (E_g). However, increasing the annealing temperature (T_A) increased the C_s value from 50.63 nm to 87.93 nm, improved the NRs growth, and red-shifted E_g from 2.35 eV to 2.20 eV. The influence of these two preparative parameters on the lattice parameters, the dielectric constant and the AC conductivity of the prepared hematite nanopowders are also discussed.

Keywords: Chelating agent; Hematite nanorods; Blue-shift; AC conductivity; Annealing effect