



Hydrothermal synthesis of cobalt carbonates using different counter ions: An efficient precursor to nano-sized cobalt oxide (Co₃O₄)

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ABSTRACT

Synthesis of submicrometer crystalline particles of cobalt carbonate was achieved hydrothermally using different cobalt salts and urea with a molar ratio from 1:3 to 1:20 (cobalt salt:urea) in aqueous solutions at 160 °C for 24–36 h, in the presence of cetyltrimethylammonium bromide (CTAB) as a surfactant. Nanoparticles of Co₃O₄, with an average size from 30 to 39 nm, were obtained by thermal decomposition of CoCO₃ samples at 500 °C for 3 h in an electrical furnace. The as-synthesized products were characterized by powder X-ray diffraction (XRD), Fourier transform infrared spectra (FT-IR), transmission electron microscopy (TEM), scanning electron microscopy (SEM), UV–Vis spectra and thermal analysis. Studying the optical properties of the as-prepared cobalt oxide nanoparticles showed the presence of two band gaps, the values of which confirmed the semiconducting properties of the prepared Co₃O₄.

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