Synthesis and characterization of of binary (CuO)0.6(CeO2)0.4 nanoparticles via a simple heat treatment method

ABSTRACT

A binary (CuO)0.6 (CeO2)0.4 nanoparticles were prepared via thermal treatment method, using copper nitrate, cerium nitrate as precursors, PVP as capping agent and de-ionized water as a solvent. The structures, morphology, composition of the element and optical properties of these nanoparticles have been studied under different temperatures using various techniques. The XRD spectrum of the samples at 500 °C and above confirmed the existence of both monoclinic (CuO) and cubic fluorite (CeO2) structures. The findings of FESEM and TEM exhibited the average practical size and agglomeration increment with an elevation in the calcination temperature. The synthesized nanoparticles were also characterized by FTIR, which indicated the formation of binary Cu−O and Ce−O bonds. The EDX analysis was performed to indicate the chemical composition of the sample. The double energy band gaps of (CuO)0.6(CeO2)0.4 reduction with rising calcination temperature, can be referred to the enhancement of the crystallinity of the samples. PL intensity of (CuO)0.6(CeO2)0.4 nanoparticles peaks, which increased with the elevation of the calcination temperature to 800 °C was observed from the PL spectrum; this was due to the increment of the particle size that occurred.

Keyword: CuO nanoparticles; CeO2 nanoparticles; Calcination temperatures