

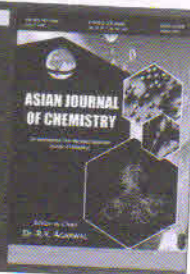


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Impact of Annealing Temperature on Structural Variations, Optical and Magnetic Behaviour of CdO/FePO₄ Nanophosphors

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In present investigation, cadmium oxide-iron phosphate (CdO-FePO₄) nanophosphors were prepared by chemical precipitation method. To understand the internal structural, optical, luminescence variations with effect of annealing temperature, the prepared samples are annealed at 200 °C and 400 °C for 8 h. X-ray diffractometry (XRD) analysis of the synthesized powder nanophosphors reveals the presence of an amorphous FePO₄ phase along with a crystalline cubic CdO phase at a calcination temperature of 200 °C. Upon increasing the annealing temperature to 400 °C, the amorphous FePO₄ transitions into a hexagonal crystalline phase, while the CdO phase remains unchanged in its cubic structure. The average crystallite size, lattice strain and dislocation density were also calculated to further characterize the material structure. Field emission scanning electron microscopy (FE-SEM) images show a heterostructured morphology consisting of rectangular flakes surrounded by hexagonal spheres. As the annealing temperature increases, the size of the rectangular flakes decreases and the hexagonal spheres develop into a network structure, forming narrow rod-like morphologies that are distributed over the surface. Energy dispersive X-ray spectroscopy (EDAX) confirms the presence of all requisite elements in the prepared nanophosphors. Fourier transform infrared (FT-IR) spectroscopy indicates vibrational modes corresponding to regular PO₄ tetrahedra and metallic Cd-O bonding. With increasing temperature, the energy band gap decreases, it confirms the semiconducting behaviour of the CdO-FePO₄ nanocomposites.

Keywords: Cadmium oxide, Iron phosphate, Chemical precipitation, Energy band gap, Semiconducting nanocomposites.