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Aqueous synthesis and characterization of CdTe@$Co(OH)_2$ (core–shell) composite nanoparticles

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ABSTRACT

Multi-functional CdTe@$Co(OH)_2$ core–shell nanoparticles were synthesized in aqueous solution by a seed-mediated growth approach. Initially, CdTe nanocrystals were synthesized with bi-functional molecule mercaptoacetic acid as a stabilizer. The Co^{2+} in the form of $Co(NO_3)_2$ was added to CdTe nanocrystals in aqueous solution and slowly hydrolyzed to deposit a layer of hydroxide ($Co(OH)_2$) onto the luminescent CdTe nanocrystals as a core in the presence of stabilizer at pH ≈ 11.2. The synthesized CdTe@$Co(OH)_2$ core–shell composite nanoparticles were characterized with XRD, EDAX, TEM, FT-IR, Raman, EPR, and thermal analysis (TG/DTG curves). The effect of refluxing time and the concentration of Co^{2+} on the optical properties of these samples were evaluated using UV–Visible absorption and photoluminescence analysis. The emission peak of the (CdTe@$Co(OH)_2$) composite nanoparticles shifted to 626 nm from 605 nm (CdTe seed). The sizes of CdTe and CdTe@$Co(OH)_2$ composite nanoparticles averaged about 3.43 nm and 6.12 nm, respectively.