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Synthesis and Characterization of Mercaptoacetic Acid Capped Cadmium Sulphide Quantum Dots

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Abstract

This paper reports the facile synthesis and detailed characterization of mercaptoacetic acid capped cadmium sulphide (CdS) quantum dots using various cadmium precursors. The mercaptoacetic acid capped CdS quantum dots were prepared by facile and simple wet chemical method and characterized by several techniques such as energy dispersive spectroscopy (DS), X-ray diffraction, Fourier transform infrared (FTIR) spectroscopy, UV-vis. spectroscopy, photoluminescence spectroscopy, high-resolution transmission microscopy (HRTEM) and thermogravimetric analysis. The EDS studies revealed that the prepared quantum dots possess higher atomic percentage of sulfur compared to cadmium due to the coordination of thiolate to the quantum dots surfaces. The X-ray and absorption analyses exhibited that the size of quantum dots prepared by cadmium acetate is larger than the quantum dots prepared by cadmium chloride and cadmium nitrate. The increase in size can be attributed to the low stability constant of cadmium acetate in comparison with cadmium chloride and cadmium nitrate. The FTIR and thermogravimetric analysis showed that the nature of capping molecule on the surface of quantum dots are different depending on the cadmium precursors which affect the emission from CdS quantum dots. Photoemission spectroscopy revealed that the emission of quantum dots prepared by cadmium acetate has high intensity band edge emission along with low intensity trapping state emission. However the CdS quantum dots prepared by cadmium chloride and cadmium nitrate produced only trapping state emissions.

Keywords

Author Keywords: CdS Nanoparticles; Luminescence; Themogravimetric Analysis; UV-Vis Spectroscopy; Infrared Spectroscopy

KeyWords Plus: COLLOIDAL CDS PARTICLES; OPTICAL-PROPERTIES; GRAPHENE OXIDE; SOLAR-CELLS; THERMAL-DEGRADATION; ZNO NANOPARTICLES; IN-SITU; NANOCRYSTALS; ELECTROLUMINESCENCE; LIGHT

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