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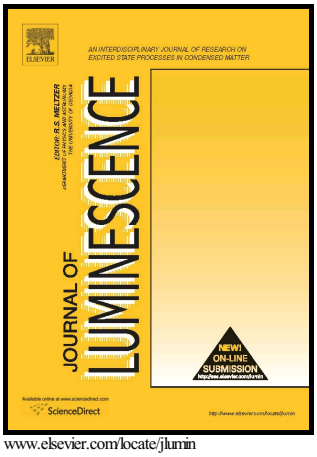

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A Facile Single Injection Hydrothermal Method for the Synthesis of Thiol Capped CdTe Quantum Dots as Light Harvesters

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ABSTRACT:

A facile, Single Injection Hydrothermal (SIH) method has been developed to synthesize high quality 3-Mercaptopropionic Acid (MPA) stabilized aqueous CdTe QDs, entirely in ambient environment. The synthesis protocol eliminates the use of inert atmosphere for reducing elemental Tellurium powder to Te precursor avoiding the oxidation of Te powder. The XRD result revealed that the synthesized QDs are in cubic zincblende type crystalline structure, without signature of Te oxidation. FTIR spectra have confirmed the attachment of short chained organic compound MPA to the surface of QDs by covalent bond. The Quantum confinement effect was clearly evident by shift in Longitudinal Optic (LO) peak of Raman spectra and absorption peak wavelength with respect to bulk CdTe materials. The optical direct band gap energy of CdTe QDs is between 3.63 eV to 1.96 eV and QDs size below 6 nm, confirm the QDs are well under strong Quantum confinement regime. Also, photoluminescence spectra depict a stable and high luminescence emission from green to dark red color. All these results corroborate that the synthesis of CdTe QDs procedure is very advantageous and present a simple, economical and easily up scalable method for large scale production.

KEYWORDS

1. MPA capped CdTe Quantum Dots. 2. Single Injection Hydrothermal method 3. Quantum confinement effect 4. Optical property. 5. Aqueous synthesis

ABBREVIATIONS

SIH, Single Injection Hydrothermal; CdTe, Cadmium Telluride; QDs, Quantum Dots; MEG, Multiple Exciton Generation; NaHTe, Sodium Telluride; $Cd(NO_3)_2$, Cadmium nitrate; Te, Tellurium; $NaBH_4$, Sodium Borohydride; MPA, 3-Mercaptopropionic Acid.

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