SYNTHESIS OF ZNS/ZNO AND ZNO/ZNS CORE-SHELL QUANTUM DOTS VIA MICROWAVE-ASSISTED HYDROTHERMAL METHOD

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In recent years, ZnS and ZnO based core-shell quantum dots (QDs) have gained significant attention due to their unique optical properties and potential applications in different fields, for example, in optoelectronics, and biomedical imaging [1-2]. This study focuses on synthesizing ZnS/ZnO and ZnO/ZnS core-shell QDs for further application in fabrication of Alternating Current Thin Film Electroluminescent devices using a microwave-assisted hydrothermal method. [3]

The synthesis process involved the initial preparation of ZnS and ZnO nanoparticles for core of the quantum dots through a microwave-assisted hydrothermal reaction, and followed by the deposition of a ZnO or ZnS shell by microwave-assisted method or co-precipitation method. To explore the influence of doping on the properties of the QDs, three different sample pairs were prepared: undoped, Mn-doped, and Cu-doped ZnS/ZnO and ZnO/ZnS QDs.

The core-shell structure was confirmed through X-ray diffraction, which revealed distinct peaks corresponding to both ZnS and ZnO phases. Scanning transmission electron microscopy showed well-defined spherical particles with uniform size distribution. Energy-dispersive X-ray spectroscopy confirmed the presence of Zn, S, O, Mn, and Cu in the expected stoichiometric ratios.. The photoluminescence spectra exhibited strong emission peaks and were found to be tunable by varying the type of dopant, and techniques used for deposition of a shell for QD core-shell structure.

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