

Controlled Synthesis of CdSe Quantum Dots via Microwave-Enhanced Process: A Green Approach for Mass Production

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Abstract : A method that does not employ hot injection techniques has been developed for the size-tunable synthesis of high-quality CdSe quantum dots (QDs) with a zinc blende structure. In this environmentally benign synthetic route, which uses relatively less toxic precursors, solvents, and capping ligands, CdSe QDs that absorb visible light are obtained. The size of the as-prepared CdSe QDs and, thus, their optical properties can be manipulated by changing the microwave reaction conditions. The QDs are characterized by XRD, TEM, UV-vis, FTIR, time-resolved fluorescence spectroscopy, and fluorescence spectrophotometry. In this approach, the reaction is conducted in open air and at a much lower temperature than in hot injection techniques. The use of microwaves in this process allows for a highly reproducible and effective synthesis protocol that is fully adaptable for mass production and can be easily employed to synthesize a variety of semiconductor QDs with the desired properties. The possible application of the as-prepared CdSe QDs has been also assessed using deposition on TiO₂ films.

Keywords : average life time, CdSe QDs, microwave (MW), mass production oleic acid, Na₂SeSO₃

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