

Ultra-Small CdSe Quantum Dots Synthesized by Aqueous Route and Their Promising Applications in Forensic Sciences [†]

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Abstract: The study presents the photoluminescence characteristics of water-soluble CdSe quantum dots synthesized using an environmentally friendly aqueous route method. Synthesis was performed in open-air conditions, and the obtained quantum dots are thermally stable and ultra-small with a size smaller than 3.5 nm. Prepared CdSe quantum dots are homogeneous and exhibit excellent stability against precipitation for nearly one year. Photoluminescence from these nanocrystals covers almost the entire visible region from violet to red. CdSe quantum dots emitting sharply at 400 nm and 415 nm in the violet region of the UV-visible spectrum have been obtained for the first time through this aqueous route synthesis method. To check the particle size and luminescence properties of prepared quantum dots, a number of characterization methods such as X-ray diffraction, dynamic light scattering, transmission electron microscope, high-resolution transmission electron microscope, absorption, and photoluminescence spectroscopy were used. The effect of pH values and concentration of 3-MPA on the luminescence properties was investigated. Owing to the superior performance of quantum dots, their inexpensive synthesis, and their expected nontoxic nature in the aqueous phase for forensic applications, an extensive literature survey has been carried out, and promising applications of synthesized CdSe QDs in forensic sciences have been discussed.

Keywords: CdSe; quantum dot; homogeneous; photoluminescence; pH; forensic; fingerprint; explosive; sensor; biology; DNA.

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Conflicts of Interest

The authors declare no conflict of interest.