

Examination of Contaminations in Fabricated Cadmium Selenide Quantum Dots Using Laser Induced Plasma Spectroscopy

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Abstract : Quantum dots (QDots) are nanometer-sized crystals, less than 10 nm, comprise a semiconductor or metallic materials and contain from 100 - 100,000 atoms in each crystal. QDots play an important role in many applications; light emitting devices (LEDs), solar cells, drug delivery, and optical computers. In the current research, a fundamental wavelength of Nd:YAG laser was applied to analyse the impurities in homemade cadmium selenide (CdSe) QDots through laser-induced plasma (LIPS) technique. The CdSe QDots were fabricated by using hot-solution decomposition method where a mixture of Cd precursor and trioctylphosphine oxide (TOPO) is prepared at concentrations of TOPO under controlled temperatures 200-350°C. By applying laser energy of 15 mJ, at frequency 10 Hz, and delay time 500 ns, LIPS spectra of CdSe QDots samples were observed. The qualitative LIPS analysis for CdSe QDs revealed that the sample contains Cd, Te, Se, H, P, Ar, O, Ni, C, Al and He impurities. These observed results gave precise details of the impurities present in the QDs sample. These impurities are important for future work at which controlling the impurity contents in the QDs samples may improve the physical, optical and electrical properties of the QDs used for solar cell application.

Keywords : cadmium selenide, TOPO, LIPS spectroscopy, quantum dots

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