Abstract

L-cysteine capped CdTe quantum dots (QDs) were synthesized in aqueous solution in open air. In order to improve the crystallinity of the CdTe QDs, synthesis conditions were optimized. Effects of different solution pH were investigated in order to determine the optimum pH for the growth of highly crystalline CdTe QDs. X-ray diffraction patterns (XRD) for all the as-prepared samples displayed a zinc blende crystal structure. The XRD peak intensities were found to increase to a certain pH level. This was accompanied by a general increase in the crystallite sizes (3.01–3.25 nm) of the CdTe QDs as the solution pH was gradually increased from 7 to 12.5. The calculated strain in the CdTe QDs was observed to decrease with an increase in the solution pH level. The morphological studies obtained from scanning electron microscope showed clear changes in the shape of CdTe QDs with various solution pH. The shape of the QDs changed from small spherical to large flower-like and needle-like structures for various solution pH. The optical spectroscopy studies revealed that the photoluminescence emissions were shifted to longer wavelength (545–593 nm) as the pH was increased from 7 to 12.5. The ultraviolet–visible analysis displayed a red shift in the absorption peaks with an increase in the pH levels. The optical band gaps obtained from the Tauc formula displayed an inverse relation with the solution pH which could be due to increase in the QDs' sizes with increasing pH level.