Abstract

Well-crystallized cadmium telluride quantum dots (CdTe QDs) were fabricated by a simple wet chemical process under open air condition at a growth temperature of 100 °C. Various amounts of the capping ligands were used in order to study the effects of them on the structural, optical and luminescence properties of C dTe QDs. The structural properties were studied using x-ray diffractometer (XRD) and scanning electron microscope (SEM). All the as-obtained CdTe QDs displayed a zinc blende crystal structure with no extra phases observed in the XRD analysis. The diffraction reflection intensities were enhanced with an increase in the capping ratio with the optimum condition achieved at a capping ratio of 1.2. The average particle sizes estimated from various techniques increased with an increase in the amounts of capping ligands used (2.14, 3.19, 2.75, 3.00, 3.27 and 4.47 nm for 0.8, 1.0, 1.4, 1.6 and 2.0 capping ratio). The SEM analysis revealed spherical shaped CdTe QDs with string-like features covering the surface of the QDs observed at higher capping ratio. Aggregation of the CdTe QDs was observed for the QDs prepared at a lower capping ratio (Cd:Cyst of 1:0.8). The Photoluminescence (PL) studies displayed a red shift in the emission wavelength accompanied by variation in the emission peak intensity. The emission wavelength shifted from 558–571 nm for 0.8–2.0 capping ratio. Highest PL emission peak intensity was obtained at a capping ratio of 1.2 which was in line with the results obtained from the XRD. The absorbance of the as-prepared CdTe QDs increased while the band gap decreased with increasing capping ratio due to the growth of the QDs.