J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C1-021

Time-resolved photoluminescence of CdSe/CdS/CdZnS colloidal quantum dots

Igor V Beloussov, V I Pavlenko and I I Dobynde
Institute of Applied Physics, Republic of Moldova

We used highly luminescent CdSe/CdS/CdZnS colloidal Quantum Dots (QDs) prepared by a standard chemical synthesis method dispersed in low concentration into toluene in a 1 mm length quartz cuvette. The inner shell between the core and the outer shell allows one to reduce mechanical stresses inside the QD, since CdS has a lattice parameter intermediate between CdSe and CdZnS, which allows obtaining a significant PL quantum yield of these QDs (up to 85%). A sample with the photoluminescence (PL) peak at 628 nm was studied by transmission electron microscopy, optical absorption spectroscopy and luminescence spectroscopy. It was determined that the diameter of the CdSe nucleus of QD amounts to 5.4 nm with the size dispersion of 8%. The thickness of the CdS/CdZnS shell was 2.6 nm. The PL in QDs was excited by a single 30 ps pulse of the second harmonic (539 nm) of a mode-locked YAlO3: Nd3+ laser at room temperature. The spectral decomposition of the PL signal collected from the front face of the cuvette was performed using a polychromator. The PL kinetics was recorded by a streak camera. The PL spectrum is located along the streak camera entrance slit. The image of time-resolved PL spectrum of QDs obtained on the streak camera screen was registered by a digital camera. The spectral resolution was about 5 meV and 9 meV for the time-integrated mode and the time-resolved mode, respectively and an overall time resolution of about 40 ps was obtained. The time-resolved kinetics of PL is presented. To describe the results of our measurements and find the decay times of the exciton and biexciton components of radiation, we propose simple theoretical models. We determine the spectral position and widths of the exciton and biexciton bands of photoluminescence and the biexciton binding energy.

igor.beloussov@phys.asm.md

Notes: