

Shape Evolution of CdSe Quantum Dots during the Synthesis in the Presence of Silver Halides

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Abstract : We propose the investigation of CdSe quantum dots which were synthesized in the presence of silver halides. To understand a process of nanoparticle formation in more detail, we varied the silver halide amount in the synthesis and proposed a sampling during colloidal growth. The attempts were focused on the investigation of shape, structure and optical properties of nanoparticles. We used the colloidal method of synthesis. Cadmium oleate, tri-n-octylphosphine selenide (TOPSe) and AgHal in TOP were precursors of cadmium, selenium and silver halides correspondingly. The molar Ag/Cd ratio in synthesis was varied from 1/16 to 1/1. The sampling was basically realized in 20 sec, 5 min, and 30 min after the beginning of quantum dots nucleation. To investigate nanoparticles we used transmission electron microscopy (including high resolution one), X-ray diffraction, and optical spectroscopy. It was established that silver halides lead to obtaining tetrapods with different leg length and large ellipsoidal nanoparticles possessing an intensive near IR photoluminescence. The change of the amount of silver halide in synthesis and the selection of an optimal growth time allows controlling the shape and the share of tetrapods or ellipsoidal nanoparticles in the product. Our main attempts were focused on a detailed investigation of the quantum dots structure and shape evolution and, finally, on mechanisms of such nanoparticle formation.

Keywords : colloidal quantum dots, shape evolution, silver doping, tetrapods

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