Doping semiconductor quantum dots, effect of indium doping on the growth kinetics of CdSe quantum dots, Terahertz spectroscopy of charged quantum dots

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In the heterogeneous growth regime, CdSe nanoparticles with well defined and very different sizes can coexist in a solution. The average size and size distribution of the nanoparticles is primarily not controlled by the usual focusing—defocusing (Ostwald ripening) of particles, rather by the formation of ‘magic' size particles. In these studies, the effects of indium doping from indium chloride on the growth kinetics, size, size distribution, as well as the quantum yield of the various particles in the growth solution is investigated. Specifically, it is shown that the indium atoms accelerate the dissolution of the magic size CdSe nanoparticles, while the chloride ions seem to stabilize the magic size particles. The present results will help to improve the understanding of how dopant atom can affect the growth kinetics of semiconductor nanoparticles.

The terahertz work aims to determine the polarizability of confined electrons in CdSe quantum dots (QD). The dielectric response of uncharged and charged CdSe quantum dots (3.2 nm and 6.3 nm) has been measured using terahertz time-domain spectroscopy in the frequency range of 2.0 to 7.0 THz. A strong coupling between the surface plasmons and surface phonons appears upon charging the QDs. The observed plasmon-phonon coupling is expected to play an important role in electron relaxation in absence of a hole in CdSe QDs.