

One-Step Cation Exchange of CdSe into PbSe

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Cation exchange is known as a powerful tool to design novel nanocrystals which cannot be synthesized by routine hot-injection or heating-up methods. Driven by difference of lattice energy or solvation energy, Pb^{2+} and Cd^{2+} cation can be exchanged with each other in various nanostructures including quantum dots (QDs), nanorods (NRs) and dot-in-rods, showing interesting properties. Although sequential process of cation exchange of CdSe into PbSe through Cu_2Se was reported, direct cation exchange pathway of CdSe into PbSe has not been explored. Since the sequential cation exchange of CdSe includes ultra-fast process, exploring metastable states such as core/shell or other hetero-nanostructures is not possible. We present simple one-step process of Cd^{2+} to Pb^{2+} in CdSe quantum dots and nanorods using Pb-oleylamine complex as Pb precursor. The reaction exerts much milder kinetics which enables to control extent of exchange in Cd Chalcogenide.