

Public Abstract

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Title:CHEMICALLY-INDUCED CONTROLLED GROWTH OF
CsPbBr₃ PEROVSKITE NANOCRYSTALS

Trihalide perovskite nanocrystals have recently emerged as a new class of superior nanoscale semiconductors due to their outstanding optoelectronic properties. A family of all-inorganic CsPbX₃ (X=Cl, Br, and I) perovskite nanocrystals is of a particular interest, due to its higher resistance to moisture, heat, and continuous irradiation.

In this thesis work a novel chemical route was designed and studied for inducing the growth of CsPbBr₃ perovskite nanocrystals at room temperature by intentional depletion of stabilizing ligands, leading to the nanocrystals' fusion. The growth of nanocrystals was achieved from 8 nm to 35 nm in average lateral dimensions, while preserving their optical and colloidal integrity. The thickness was found to be approx. 14 nm. Both UV-visible absorption and photoluminescence emission spectra indicated a red shift in the grown nanocrystals, compared to that of as-synthesized 8 nm nanocrystals. It was determined that the growth of NCs happened in all three dimensions, supporting the theory of induced fusion.

The discovered chemical route for triggering post-synthetic growth of as-synthesized perovskite nanocrystals offered a new perception on understanding the role of stabilizing surfactants on the surface of perovskite nanocrystals. It was shown experimentally that the ligands not only participated in colloidal stabilization and photoluminescence enhancement, but also could be efficiently employed for post-synthetic manipulation of nanocrystals' size, band gap and shape.