220a General Shape Control of Colloidal Cds, Cdse and Cdte Semiconductor Nanorods and Nanorod Heterostructures

Aaron E. Saunders, Felice Shieh, and Brian A. Korgel

In this work we demonstrate that the shape of cadmium chalcogenide (CdS, CdSe and CdTe) semiconductor nanocrystals can be manipulated during synthesis by controlling the amount and frequency of precursor injections into the reactant mixture. Tuning the reaction kinetics provides a general method to control the resulting nanocrystal shape without changing the underlying reaction chemistry. The nanocrystal shape can be changed from spherical nanoparticles to elongated nanorods by varying the processing conditions from batch (single-step) precursor injection to stepwise injection. This method can be extended to produce nanorod heterostructures with type I or type II band structures. The nanostructures are characterized using x-ray diffraction, high resolution transmission electron microscopy and optical spectroscopy. We illustrate how the optical properties of the nanoparticles depend strongly on size, shape, composition and surface chemistry.