Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Charging in CdSe nanocrystals and mechanistic elucidation of the electrophoretic deposition of nanocrystal films SHENGGUO JIA, SARBAJIT BANERJEE, IRVING HERMAN, Materials Research Science and Engineering Center, Columbia University — The charge on nanocrystals is not only used to stabilize the colloidal systems but also to assemble these materials into novel films and superlattices. Here, we propose a model for charging in nanocrystals involving the dissociation of ligand molecules from specific surface sites. We also develop a mechanistic model to explain the electrophoretic deposition of nanocrystal films based on electrophoretic mobility measurements, photoluminescence from nanocrystal solutions and films, and observations from deposition experiments. Even though equally thick nanocrystal films are obtained on both negative and positive electrodes, the numbers of positive and negative nanocrystals are not equal in solution. After appropriate reprecipitation cycles, the nanocrystals are "sticky" enough to be deposited on the electrodes and nanocrystal films can be formed by electrophoresis. The limiting factor for the maximum thickness to which the films can be grown is the concentration of the minority charged crystals (negatively charged nanocrystals in this case). The charge on the nanocrystal surfaces can be adjusted by the addition of ligands. This work was supported primarily by the MRSEC Program of the NSF under Award No. DMR-0213574 and by NYSTAR.

Shengguo Jia
Materials Research Science and Engineering Center, Columbia University

Date submitted: 17 Nov 2006 Electronic form version 1.4