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Mechanical Properties of Electrophoretically-Deposited CdSe Nanocrystal Films[1] SHENGGUO JIA, APS, MOHAMMAD ISLAM, YUQI XIA, BEN SMITH, SARBAJIT BANERJEE, YIKANG DENG, JOZE BEVK, JEFFREY KYSAR, IRVING HERMAN, MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER, COLUMBIA UNIVERSITY TEAM — Approaches to measuring and then minimizing the strain in electrophoretically deposited CdSe nanocrystal films are investigated. Under some conditions, fractured films are seen for films thicker than a critical thickness of about 0.8 microns for 3.2 nm nanocrystals. Cracking and some delamination are seen by SEM and AFM, and they are attributed to high strain energy in this film. The deposition conditions are varied to minimize this strain, which is thought to be due to the evaporation of residual hexane solvent after electrophoretic deposition - which changes the equilibrium separation of the nanocrystal cores. In situ observation confirms this assumption about the origin of film strain. These CdSe nanocrystal films become mechanically stronger and more resistant to chemical dissolution after being treated by cross-linker molecules such as 1,6-hexanedithiol and 1,7-heptanediamine.

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