Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Control on the Dispersion of Colloidal Quantum Dots with Unconventional Block Copolymers in Nanocomposite Films KOOKHEON CHAR, WAN KI BAE, JEONGHUN KWAK, CHANGHEE LEE, Seoul National University, MATTHIAS ZORN, RUDOLF ZENTEL, University of Mainz — Dispersion of colloidal quantum dots (QDs) with unconventional block copolymers (BCP) in thin films was investigated. Unconventional BCPs consisting of either thiol (SH) anchoring groups or fluorinated (F) phenyl groups in the minor block (with 11 repeat units) and either poly(triphenylamide) (PTPA) or polystyrene (PS) in the major block (with $\sim$ 60 repeat units) were synthesized by the Reversible Addition Fragmentation Chain Transfer (RAFT) Polymerization. QDs encapsulated with alkyl hydrocarbons were mixed with both types of BCPs and deposited by solvent casting on substrates to yield hybrid thin films with thicknesses less than 100 nm. With combined characterization with TEM, AFM, and Kelvin Probe Microscopy (KPM), we confirmed that QDs were uniformly distributed within the BCP matrix film, when thiol (SH) anchor blocks were used, due to the favorable enthalpic interaction between QD and BCP. In contrast, QDs were segregated from the BCP matrix film either at the top or at the bottom when fluorinated phenyl blocks were employed. Based on the uniformly distributed QDs in the BCP matrix film, we were able to realize QD-based light-emitting diodes containing organic-inorganic hybrid active layers with high quantum yield.

Kookheon Char
Seoul National University

Date submitted: 19 Nov 2009 Electronic form version 1.4