Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Transient Photoluminescence in Ligand-Exchanged Quantum Dot Assemblies[1] MICHAEL E. TURK, PATRICK M. VORA, AARON T. FAFARMAN, BENJAMIN T. DIROLL, CHRISTOPHER B. MURRAY, CHERIE R. KAGAN, JAMES M. KIKKAWA, University of Pennsylvania — Improving electronic contact between nanocrystals (NCs) within self-assembled NC solids is a long standing goal, and recent work on ligand exchange using ammonium thiocyanate has demonstrated marked improvements in the charge mobility of NC films over longer, more insulating ligands [1]. Here, we use transient photoluminescence (PL) to study changes in radiative lifetime caused by ligand exchange. Our work begins by examining differences in lifetime and radiative efficiency between liquid dispersions and solid films of CdSe semiconductor NCs, and moves on to study additional changes in both types of samples correlated with ligand substitution. We use a combination of time-correlated single photon counting and non-linear optical Kerr gating to study PL on nanosecond and sub-picosecond time frames, respectively. We discuss the relationship between nanosecond and picosecond dynamics, and examine temperature dependence from 300 to 5 Kelvin. Initial data indicate a decrease in PL lifetime with ligand exchange, which we discuss in the context of increased transport mobilities and decreased interparticle separations, as well as changes in the steady-state optical spectra of these systems. [1] A.T. Fafarman, et al, J. Am. Chem. Soc., 133, 15753 (2011).

[1]Transient PL work supported by the Department of Energy Office of Basic Energy Sciences Award DE-SC0002158, and sample synthesis supported by the NSF Solar Program under Award No. DMS-0935165.

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Date submitted: 11 Nov 2011 Electronic form version 1.4