Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Carrier Multiplication in PbSe Nanocrystals and Extraneous Processes[1] JOHN A. MCGUIRE, JIN JOO, JEFFREY M. PIETRYGA, ISTVAN ROBEL, VICTOR I. KLIMOV, Chemistry Division, Los Alamos National Laboratory — Spatial confinement of electronic wave functions in semiconductor nanocrystals (NCs) can enhance the efficiency of carrier multiplication (CM), a process whereby multiexcitons are generated from single absorbed photons. In the last year, a controversy has emerged due to large discrepancies between values of CM efficiencies reported by different groups using different techniques – transient absorption (TA) and photoluminescence upconversion (uPL). We report studies of CM in solutions of PbSe NCs using measurements of exciton dynamics by both TA and uPL and find excellent agreement between the CM efficiencies extracted by both techniques. Moderate variations in efficiencies are observed for nominally similar samples. More dramatically, measurements of static and stirred solutions can display large differences in dynamics. This indicates that extraneous effects such as NC photoionization can distort the results of CM studies and are a likely contribution to the discrepancies between previously reported CM efficiencies.

[1]This work was supported by the Office of Basic Energy Sciences of DOE, the DOE Center for Integrated Nanotechnologies, and Los Alamos LDRD funds.

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Date submitted: 21 Nov 2008 Electronic form version 1.4