Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

n and p Type HgTe Colloidal Quantum Dot Film[1] HENG LIU, SEAN KEULEYAN, PHILIPPE GUYOT-SIONNEST, James Franck Institute, The University of Chicago — HgTe colloidal quantum dots (CQDs) are a new system that can be stably charged n- and p-type by electrochemistry and it exhibits carrier-dependent photoresponse and magneto-resistance. For both electron or hole injection, interband bleach and intraband absorption confirm that the charges can be injected in the delocalized quantum states. Both carrier types lead to conductivity and show similar mobilities (~ 0.1 cm^2/Vs). However p-type films show good photoresponse and long photocurrent lifetime of hundreds of microseconds, while n-type films show 100 times shorter lifetimes and little or no photoresponse. With these samples, p-type will therefore be better for photovoltaic response. The magneto-resistance of n-type films is also found to be large while that of p-type films is negligible. This is consistent with the heavier hole mass compared to electrons in HgTe. The HgTe CQDs share similar features with the II-VI CdSe but with the advantage of allowing both n- and p-type charging. While this property is shared with the narrow gap IV-VI PbSe, HgTe has a simpler electronic structure and better stability in ambient conditions. The stability of the HgTe CQDs for n- and p-type charging opens many further investigations.

[1]DOE:DE-FG02- 06ER46326; NSF MRSEC: DMR-0820054

Heng Liu
James Franck Institute, The University of Chicago

Date submitted: 25 Oct 2011 Electronic form version 1.4