Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Highly Nonlinear Photocurrent and Efficient Charge Separation in Lead Sulfide Nanowire Field Effect Transistors YIMING YANG, XINGYUE PENG, DONG YU, Univ of California - Davis — We present our scanning photocurrent microscopy (SPCM) study of lead sulfide (PbS) NW field effect transistors (FETs). PbS NWs were synthesized via chemical vapor deposition (CVD) method, with controlled ambipolar doping from 10^{19} cm^{-3} (n-type) to 10^{18} cm^{-3} (p-type) [1]. We have observed highly nonlinear photocurrent in single PbS NW FETs under high-intensity optical excitation. The spatially resolved photocurrent images obtained from SPCM showed complex patterns, indicating reversal of the photocurrent direction at high excitation intensity, attributable to the non-equilibrium band structure modulated by the photo-injected carriers. Our numerical simulations agree well with the experimental results, when considering the electric field created by the bulk metal contact. In addition, we have also achieved high charge separation efficiency at the Schottky contact to NWs. The wavelength dependent photocurrent can be understood from the absorption cross-section of the NW obtained by the Finite-difference time-domain (FDTD) simulation. [1] Yang, Y. M.; Li, J.; Wu, H. K.; Oh, E.; Yu, D. Nano Lett. 2012, 12, 5890-5896.

Yiming Yang
Univ of California - Davis

Date submitted: 14 Nov 2013 Electronic form version 1.4