Abstract Submitted
for the OSF12 Meeting of
The American Physical Society

Few-layer $MoSe_2$ Ambipolar Field-Effect Transistors[1] BHIM CHAMLAGAIN, HSUN-JEN CHUANG, MEEGHAGE MADUSANKA PERERA, MING-WEI LIN, Wayne State University, JIAQIANG YAN, NIRMAL JEEVI GHIMIRE, DAVID MANDRUS, The University of Tennessee, ZHIXIAN ZHOU, Wayne State University — Field-effect transistors were fabricated from few-layer $MoSe_2$ quasi-two dimensional flakes produced by mechanically exfoliating high quality $MoSe_2$ crystals synthesized using a vapor transport method. Electrical transport measurement on back-gated $MoSe_2$ devices shows that they are n-type and their extrinsic mobility is in the range of 0.1 - 10 cm^2 V^1S^{-1}, similar to few-layer MoS_2 field-effect transistors. Ambipolar behavior is observed in ionic-liquid-gated $MoSe_2$ devices, with the On/Off current ratio exceeding 10^6 for both electrons and holes. For the electron channel, the extrinsic mobility measured in the ionic-liquid-gate configuration increases by over an order of magnitude, which can be attributed to the reduction of Schottky barrier by the more efficient gating. In addition, the electron mobility increases with decreasing temperature above 250 K, suggesting that the phonon scattering is a significant contributor to the channel resistance. On the other hand, the hole mobility is substantially lower and does not show significant temperature dependence, which is likely due to the higher contact resistance for holes.

[1]This work was supported by NSF (No. ECCS-1128297). Part of this research was conducted at the Center for Nanophase Materials Sciences under project # CNMS2011-066.

Zhixian Zhou
Wayne State University

Date submitted: 05 Sep 2012 Electronic form version 1.4