Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Transport and Optoelectronic Studies of Monolayer MoS_2 Homojunctions & Nanostructures Controlled By Ferroelectric Domain Patterning ZHIYONG XIAO, JINFENG SONG, Univ of Nebraska - Lincoln, DAVID FERRY, Arizona State University, DAWEI LI, YONGFENG LU, STEPHEN DUCHARME, XIA HONG, Univ of Nebraska - Lincoln — Transition metal dichalcogenide (TMDC) monolayers such as MoS_2 have direct band gap and are promising for building nanoelectronic and optoelectronic applications. In this study, we have fabricated MoS_2 homo-junctions and nanostructures using the ferroelectric field effect combined with scanning probe controlled domain patterning. Monolayer MoS_2 field effect transistors (FETs) are fabricated on SiO_2/Si substrates, and a top gate of ferroelectric copolymer poly(vinylidene fluoride-trifluoroethylene) [PVDF-TrFE] are deposited using Langmuir-Blodgett approach. The extracted band mobility of our devices ranges from 1 to 10 $cm^2V^{-1}s^{-1}$ depending on the carrier density, which suggests charged impurity rather than phonon as the major scatters. Modeling the transfer characteristics in the two polarization states shows that the polarization switching does not affect the sample mobility. By patterning the top gate into half polarization up and half polarization down domains, we created a Schottky junction with a barrier height tunable by the back gate. We also create nanoscale conducting wire at the center of the channel sandwiched by two insulating regions. The optical response of the devices will be discussed.

Zhiyong Xiao
Univ of Nebraska - Lincoln

Date submitted: 11 Nov 2016 Electronic form version 1.4