Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

The Effect of Substrate on the Electron Transport Properties of MoS_2 Field-Effect Transistors[1] BHIM CHAMLAGAIN, HSUN-JEN CHUANG, MEEGHAGE MADUSANKA PERERA, ZHIXIAN ZHOU, Wayne State University — Substrate plays an important role in the performance of field-effect transistors (FETs) with two-dimensional transition metal dichalcogenide (TMD) channels. In this work, we systematically study the transport properties of few-layer MoS_2 FETs consistently fabricated on various substrates including SiO_2, Al_2O_3, SiO_2 modified by octadecyltrimethoxysilane (OTMS) self-assembled monolayers (SAMs), and hexagonal boron nitride (hBN). Standard four-probe electrical transport measurement was carried out at temperatures ranging from 77 K to room temperature to understand the scattering mechanism. Surprisingly, the room temperature mobility extracted from devices on different substrates is nearly the same. In contrast, a substantially higher mobility is observed in MoS_2 devices on clean hBN substrates at low temperatures. The role of various sources of scattering originating from the substrate and the channel/substrate interface such as charged impurities, charge traps, surface roughness, and remote surface optical phonons will be discussed.

[1]This work was supported by NSF (No. ECCS-1128297) and Thomas C. Rumble Fellowship Award.

Bhim Chamlagain
Wayne State University

Date submitted: 13 Nov 2014 Electronic form version 1.4