Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Black Phosphorus Field-effect Transistors LIKAI LI, YIJUN YU, Fudan University, GUOJUN YE, University of Science and Technology of China, QINGQIN GE, XUEDONG OU, HUA WU, DONGLAI FENG, Fudan University, XIANHUI CHEN, University of Science and Technology of China, YUANBO ZHANG, Fudan University, UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA COLLABORATION — Black phosphorus is a layered allotropy of phosphorus that closely resembles graphite. But unlike graphene monolayer, black phosphorus is a semiconductor with a predicted band gap of $\sim$2 eV, which reduces to $\sim$0.3 eV in the bulk crystal. We investigate the electric property of black phosphors thin flakes with thickness down to a few nanometers. High conductance modulations up to 10^6 and field effect mobility up to 1000 cm^2/Vs at room temperature are achieved in a Metal-Insulator-Silicon (MIS) field effect transistor structure. We further uncover the mechanism that limits the mobility in black phosphorus thin flakes through temperature-dependent electronic transport measurements. Our results provide the first basic understanding of the electronic properties of black phosphorus thin flakes, and will greatly facilitate further exploration of its future applications.

Likai Li
Fudan University

Date submitted: 15 Nov 2013 Electronic form version 1.4