Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

One-Dimensional Electrical Contact to Molybdenum Disulfide ZHENG YANG, CHANGHO RA, SKKU Advanced Institute of Nano Technology, FAISAL AHMED, SKKU Mechanical Engineering Department, DAEYEONG LEE, MINSUP CHOI, XIAOCHI LIU, DESHUN QU, WON JONG YOO, SKKU Advanced Institute of Nano Technology, NANO DEVICE PROCESSING LAB TEAM
— Molybdenum disulfide (MoS_2) is one of the promising two-dimensional materials for future application in nano electronics, which has high carrier mobility, very good stability under atmosphere, proper band gap, etc. However, its application to electronic switching devices is hindered by Fermi level pinning at metal-MoS_2 interfaces. Here, we experimentally demonstrate one-dimensional electrical contact to MoS_2 formed via controllable plasma etching. We fabricated Al/MoS_2 FET (n-type), Mo/MoS_2 FET (n-type), and Pd/MoS_2 FET (ambipolar). For Mo/MoS_2 FET (n-type), on/off current ratio is around 10^8 and mobility is around 104 $cm^2/(Vs)$. By contrast, for Pd/MoS_2 FET (ambipolar), on/off current ratio is around 10^8, hole mobility is ranged from 350 to 650 $cm^2/(Vs)$, and the mean free path of holes at 9K is around 23 nm. All the measured mobilities are evaluated by using two-terminal field-effect configuration. We can also achieve complementary logic gates with intrinsic MoS_2/metal one-dimensional electrical contact.

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Date submitted: 06 Jan 2016 Electronic form version 1.4