Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Liquid-gated ambipolar transistor with ransition-metal dichalcogenides YIJIN ZHANG, JIANTING YE, YOSHIHIRO IWASA, Quantum-Phase Electronics Center and Department of Applied Physics, the Univ. of Tokyo — Transition-metal dichalcogenides (TMDs) are graphene-like layered materials. In particular, semiconducting group of TMDs are attracting great interests as a post-graphene material since they have a finite band gap which is an important feature for FET applications. We fabricated semiconducting TMD-based FETs using a new type of gate dielectric called electric double layer (EDL). EDL is formed by solid and ions inside liquid at the solid-liquid interface. This nano-scale capacitor provides extremely large charge accumulation capability and realizes high performance FETs and field-effect phase control. We observed ambipolar FET operation of molybdenum disulfide (MoS_2) for the first time in addition to its well-known n-type operation [1] and field-effect superconducting transition [2]. High performance is not only observed in MoS_2 but also in other semiconducting TMDs like tungsten diselenide (WSe_2). The ambipolar operation is also important for applications, for example, light-emitting devices like organic materials. We investigated possibilities of EDL-based optical coupling devices. [1] Y. J. Zhang et al. Nano. Lett. 12, 1136 (2012) [2] J. T. Ye, Y. J. Zhang et al. Science in press

Yijin Zhang
Quantum-Phase Electronics Center and
Department of Applied Physics, the Univ. of Tokyo

Date submitted: 27 Nov 2012 Electronic form version 1.4