

Abstract Submitted  
for the MAR15 Meeting of  
The American Physical Society

**Electron confinement at the Si-MoS<sub>2</sub> heterosheet junction**

ALESSANDRO MOLLE, DANIELE CHIAPPE, CNR-IMM, Laboratorio MDM, DAVIDE ROTTA, CNR-IMM, Laboratorio MDM & Università degli studi di Milano Bicocca, ALESSIO LAMPERTI, CARLO GRAZIANETTI, EUGENIO CINQUANTA, CNR-IMM, Laboratorio MDM, MARCO FANCIULLI, CNR-IMM, Laboratorio MDM & Università degli studi di Milano Bicocca — Two dimensional (2D) elementary materials such as silicene, germanene or phosphorene are emerging alternatives to graphene which adds to the consolidated class of layered metal dichalcogenides. In particular, 2D silicon nanosheets would benefit from the potential integration with the quite ubiquitous Si technology thus opening new scaling perspectives of the conventional electronic devices. In this framework we report here on the 2D epitaxy of a Si monolayer onto a MoS<sub>2</sub> template with a locally hexagonal registry [1]. The experimental data are consistent with an ab initio calculated highly stretched silicene lattice [2]. High resolution photoemission spectroscopy investigations evidence a nearly metallic character of the Si nanosheet and a significant band bending on the MoS<sub>2</sub> side which claims for a Si-induced electron accumulation. Integration into a bottom gated field effect transistor results in the effective transport at the Si/MoS<sub>2</sub> heterosheet interface which is rationalized in terms of an electronic confinement.

[1] Chiappe et al, Adv. Mater. 26, 2096 (2014);

[2] Scalise et al, 2D Materials 1, 011010 (2014).

Alessandro Molle  
CNR-IMM, Laboratorio MDM

Date submitted: 13 Nov 2014

Electronic form version 1.4