Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Geometrical and Electronic structures of Planar and Buckled Silicene on Ag(111) CHUN-LIANG LIN, Department of Advanced Materials Science, The University of Tokyo, RYUICHI ARAFUNE, International Center for Materials Nanoarchitectonics, National Institute for Materials Science, NORIYUKI TSUKAHARA, Department of Advanced Materials Science, The University of Tokyo, KAZUAKI KAWAHARA, Department of Applied Chemistry, The University of Tokyo, NORIAKI TAKAGI, MAKI KAWAI, Department of Advanced Materials Science, The University of Tokyo — Silicene grown on the Ag(111) surface was investigated by scanning tunneling microscopy / spectroscopy (STM / STS). Two atomic arrangements of honeycomb lattice, planar and buckled, were found. The planar silicene is consisted of Si atoms in the same height while the buckled one shows slightly twisted structure in the vertical direction. Compared to the planar silicene, the lateral distance between two neighboring atoms in the buckled silicene is reduced with about 7%. Assuming that there is no change in the length of Si-Si bond, the angle between the Si-Si bond and the axis normal to the surface is 110 degrees, which is close to the bond angle of 109 degrees in the sp^3 hybridization. This might suggest that the Si-Si bonding in the buckled silicene is formed mainly by sp^3 hybridization rather than sp^2 However, our STS observations certainly showed a Dirac cone feature at the Fermi level for both types of silicene. Thus, we conclude that the electronic configuration of buckled silicene partially remains in sp^2 hybridization and the charge carriers still behave as the massless Dirac fermions.

Chun-Liang Lin
Department of Advanced Materials Science, The University of Tokyo

Date submitted: 12 Nov 2011 Electronic form version 1.4