

Hydrogenated Graphene

Stefan Heun

NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Pisa, Italy

On SiC(0001), epitaxial graphene is obtained by sublimation of Si from the substrate. The graphene film is separated from the substrate by a carbon-rich buffer layer which in part covalently binds to the substrate. We report scanning tunneling microscopy (STM) studies of the buffer layer and of quasi-free-standing monolayer graphene (QFMLG) that is obtained by decoupling the buffer layer from the SiC(0001) substrate by means of hydrogen intercalation [1,2].

Reversible hydrogenation of graphene has been recently reported, and it was shown that hydrogenation opens a bandgap in graphene. We report on site-selective adsorption of atomic hydrogen on monolayer graphene grown on SiC(0001) [3], and measure a band gap which increases with increasing hydrogen coverage. Therefore, hydrogenation allows for band-gap engineering in graphene. Furthermore, we have studied the topological Berry phase in graphene upon introduction of disorder induced by hydrogenation [4].

- [1] S. Goler, C. Coletti, V. Piazza, P. Pingue, F. Colangelo, V. Pellegrini, K. V. Emtsev, S. Forti, U. Starke, F. Beltram, and S. Heun, *Carbon* 51, 249 (2013).
- [2] Y. Murata, T. Mashoff, M. Takamura, S. Tanabe, H. Hibino, F. Beltram, and S. Heun, *Appl. Phys. Lett.* 105, 221604 (2014).
- [3] S. Goler, C. Coletti, V. Tozzini, V. Piazza, T. Mashoff, F. Beltram, V. Pellegrini, and S. Heun, *J. Phys. Chem. C* 117, 11506 (2013).
- [4] K. Bennaceur et al., *Phys. Rev. B* 92, 125410 (2015).