In Situ Spectroscopy and Microscopy Focus Topic
Room: Hall B - Session IS-ThP

In Situ Microscopy and Spectroscopy Poster session

IS-ThP1 Scanning Tunneling Microscopy of the Topological Crystalline Insulator SnTe, ***D. Zhang***, *J. Ha*, NIST and University of Maryland, *H. Baek*, NIST and Seoul National University, Republic of Korea, *Y. Kuk*, Seoul National University, Republic of Korea, *J.A. Stroscio*, Center for Nanoscale Science and Technology, NIST

Recently, the topological classification of electronics states has been extended to a new class of matter called topological crystalline insulators. In contrast to topological insulators characterized by time reversal symmetry protected surface states with an odd number of Dirac cones, topological crystalline insulators arise from crystal symmetry and are characterized by surface states with an even number of Dirac cones. Here, we report *in-situ* low temperature scanning tunneling microscopy study of SnTe (001) surfaces grown by molecular beam epitaxy. SnTe high symmetry surfaces have been recently predicted and experimentally confirmed as hosting topological crystalline insulator surface states [1-3]. The growth of SnTe on multilayer graphene/SiC substrates is shown to produce SnTe (001) nanoplates with varying densities of Sn vacancies. The topological surface states on the SnTe (001) surface in these nanoplates were probed by scanning tunneling spectroscopic mapping. In this poster we discuss the spectroscopic mapping results in terms of scattering in Fermi surface contours of the topological surface states.

[1] T. H. Hsieh, *et al*., *Nat. Comm*. 3, 982 (2012).

[2] Y. Tanaka, *et al*., *Nat. Phys*. 8, 800 (2012).

[3] S.-Y. Xu, *et al*., *Nat. Comm*. 3, 1192 (2012).

IS-ThP2 *In Situ* Electrostatic and Thermal Manipulation of Suspended Graphene Membranes, *W. Bao,* ***K. Myhro****, Z. Zhao, Z. Chen, W. Jang, L. Jing, F. Miao, H. Zhang, C. Dames, C.N. Lau*, University of California, Riverside

Graphene is nature's thinnest elastic membrane, and its morphology has important impacts on its electrical, mechanical, and electromechanical properties. Here we report manipulation of the morphology of suspended graphene via electrostatic and thermal control. By measuring the out-of-plane deflection as a function of applied gate voltage and number of layers, we show that graphene adopts a parabolic profile at large gate voltages with inhomogeneous distribution of charge density and strain. Unclamped graphene sheets slide into the trench under tension; for doubly clamped devices, the results are well-accounted for by membrane deflection with effective Young's modulus E = 1.1 TPa. Upon cooling to 100 K, we observe buckling-induced ripples in the central portion and large upward buckling of the free edges, which arises from graphene's large negative thermal expansion coefficient.

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