11th International Conference
on Advanced Materials

Rio de Janeiro Brazil
September 20 - 25

ICAM2009

Graphene Structures, Fabrication and Characterization with Corrected Microscopy

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Since the discovery of graphene, attempts have been made to fabricate nanometer scale graphene using lithography based on ion-beams [1], e-beam [2], scanning tunneling microscopy [3] and transmission electron microscopy [4]. Graphene devices remain stable when approaching molecular scale and the resulting devices start showing interesting propeties due to quantum confinement. On the other hand, theoretical works have predicted various interesting electronic and magnetic properties of nanoscale graphene structures such as topological frustration induced magnetism in arbitrary graphene nanoflakes [5] and the half-metalicity of graphene nanoribbon [6]. Aberration corrected electron microscopy is invaluable for fabrication and further detailed examination of graphene based strcutures at the atomic scale. Thin films are suspended across structures or contact electrodes predefined using photolithography. The transport properties can be measured either in situ or outside of (S)TEM vacuum with an option of cryo-cooling. The imaging, configuration and properties of the sculpted devices are simulated with DOS, density functional theory and non-equilibrium Green's functional theory.

References

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