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Stress-induced Controlled Fabrication of Graphene Nano Ribbons and Carbon Nanotubes via Electrostatic force and electrical transport properties of freely suspended graphene monolayers and bi-layers. ANTON SIDOROV, DAVID MUDD, VLADIMIR DOBROKHOTOV, C.S. JAYANTHI, SHI-YU WU, GAMINI SUMANASEKERA — A simple electrostatic technique to transfer loosely bound graphene sheets from a freshly cleaved highly oriented pyrolitic graphite (HOPG) to a desired substrate has been recently reported (Sidorov *et al.*, Nanotechnology, 2007). Here we demonstrate that this technique can be further extended to roll/scroll graphene sheets in a controllable manner by changing the environment during this electrostatic deposition. Deposition under high vacuum (10^{-7} Torr) is observed to deposit extremely flat graphene monolayers on a substrate. In contrast, high density of completely scrolled graphene layers are observed in hydrogen atmosphere and in the presence of an electrostatic field. No scrolling was seen in He atmosphere; but partial scrolling is seen in nitrogen atmosphere under the influence of an electrostatic force. It is believed that in addition to the stress induced due to the adsorption of hydrogen, an additional electrostatic field is necessary to scroll the graphene layers loosely bound to HOPG. Also electrical transport properties of monolayers and bi-layers of graphene layers freely suspended between two electrodes and deposited between trenches on a substrate will be presented and compared.

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