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Semi-metallic transport in ultra-thin layers of carbon films deposited by laser ablation

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Abstract content
   (Max 300 words)

We synthesize predominantly sp2-bonded thin layers of carbon films by utilizing laser assisted chemical vapor deposition. The laser ablation method is usually used to produce disordered carbon films whereas the chemical vapor deposition grown carbon films are prone to high disorder. This work is aimed at overcoming these problems to produce ordered carbon films by adjusting synthesis parameters such as temperature, carrier gas flow rate and laser beam power density. The Raman analysis, being sensitive to defect concentrations and quality of material, was used to determine these optimum synthesis conditions. The Raman spectroscopy analysis of the material showed the definite carbon peaks associated with graphite-like material. Atomic Force Microscopy was used to image the material. The as-produced material showed folding and bending of large area sheet like material. Also the height profiling measurements confirmed that the material is multilayered, ranging from 20-50nm. A low temperature electronic characterization was conducted on the material which was deposited on a micron-scale hall bar structure. The resistance of the device showed a linear T2 dependence over a large temperature range. This is a signature of semi-metallic conduction, usually seen in disordered metals. This measurement confirms that this material has a very low concentration of defects, making it comparable to highly ordered sp2-bonded carbon films. Future work with this material will be aimed at the production and characterization of nano-scale devices

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yes

Level for award
 (Hons, MSc,
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Hons

Main supervisor (name and email)
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