



Contribution ID: 508

Type: Oral Presentation

Analysis of controlled structural disorder in few layer graphite and graphene

Wednesday, 10 July 2013 10:30 (20 minutes)

Abstract content
 (Max 300 words)

Although the electronic transport properties of graphene have been widely researched, systematic studies on the effect of structural disorder on electronic transport remain crucial to an understanding of this contemporary material and yet are still lacking. We present a comprehensive analysis of the role of defects in thin graphene-like layers grown through laser-ablation assisted chemical vapor deposition. The level of disorder, determined through Raman spectroscopy was controlled through the variation of synthesis parameters such as temperature, laser fluence, flow rate, and sample position. Transport measurements were performed at low temperatures. Combined with the Raman data these results showed the activation energy (equal to half the bandgap) to be directly related to the level of disorder, thereby demonstrating the formation of localized states due to defects. A tight binding transport model, incorporating bond length disorder in the sp^2 phase, was applied to understand the origin of the disorder induced bandgap and localization in the films. Analysis of the transmission coefficient as well as the calculated localization length as a function of the disorder parameter within this model allows for interpretation of the effects of structural disorder. Similar analysis can be applied to disordered graphene. To this end graphene has been grown by Chemical Vapor Deposition (CVD) where the process has been optimized to reduce the level of disorder. This work will provide crucial information regarding the understanding and control of disorder in graphene; a prerequisite for nano-electronic applications.

Apply to be
 considered for a student
 award (Yes / No)?

Yes

Level for award
 (Hons, MSc,
 PhD)?

MSc

Main supervisor (name and email)
and his / her institution

Somnath Bhattacharyya
 somnath.bhattacharyya@wits.ac.za
 University of the Witwatersrand

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

No

Primary authors: Mr COLEMAN, Christopher (university of the witwatersrand); Ms SANDERS, Kirsty (university of the witwatersrand)

Co-authors: Mr MCINTOSH, Ross (university of the witwatersrand); Mr BHATTACHARYYA, Somnath (university of the witwatersrand)

Presenter: Ms SANDERS, Kirsty (university of the witwatersrand)

Session Classification: DCMPPM1

Track Classification: Track A - Division for Condensed Matter Physics and Materials