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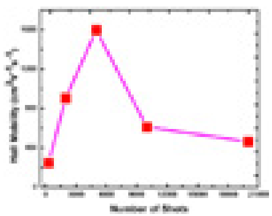
Electrical and magneto transport properties of reduced graphene oxide thin films

Kartik Ghosh[1], **Ariful Haque**[1,2], **Md Abdullah-Al Mamun**[1], **Mohammad F N Taufique**[1], **Priyanka Karnati**[1] and **Anagh Bhaumik**[1,2]
[1]Missouri State University, USA
[2]Carolina State University, USA

Our goal is to follow a completely novel route to fabricate large area reduced graphene oxide (RGO) thin film using physical vapor deposition technique to achieve high charge carrier mobility with better conductivity. In order to avoid the chemical reagent based reduction path which often uses toxic reducing compound such as N_2H_4 and $NaBH_4$, we used the pulsed laser deposition (PLD) technique. Large area uniform thin films of RGO were synthesized by PLD. A number of structural properties including the defect density, average size of sp2 clusters and degree of reduction have been investigated by Raman spectroscopy, X-ray photoelectron spectroscopy and x-ray diffraction. Temperature dependent (5K - 350K) four terminal electrical transport property measurements confirms variable range hopping and thermally activated transport mechanism of the charge carriers at low (5K - 210K) and high temperature (210K - 350K) regions, respectively. The calculated localization length, DOS near Fermi level (EF), hopping energy, and Arrhenius energy gap provide significant information to explain excellent electrical properties in the RGO films. Hall mobility measurement confirms p-type characteristics of the thin films. The charge carrier Hall mobility can be engineered by tuning the growth parameters, and the measured maximum mobility was 1596 cm2v-1s-1. The optimization of the improved electrical property is well supported by Raman spectroscopy. The transport properties of RGO samples are dependent on a number of factors including the density of the defect states, size of the sp2 clusters, degree of reduction, and the morphology of the thin film.



Biography

Kartik Ghosh has completed his PhD from Tata Institute of Fundamental Research and Post-doctoral studies from the University of Maryland at College Park and Argonne National Laboratory. Currently, he is a Professor of Physics and Materials Science at Missouri State University. Over the last 25 years in his research career, he has been developing organic and inorganic thin films, nanomaterials, and their heterostructures for potential applications in the field of Spintronics, Renewable Energy, and Nano Biotechnology and has made important contributions to these fields. He has published over 150 peer-reviewed articles in highly cited journals and has been serving as a reviewer in many reputed journals..

kartikghosh@missouristate.e

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