Seminar

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Institute for Plasma Research

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Title: Graphene's response to ion-beam–induced glass rippled substrates: Insights into Strain Modulation and Property Evolution

Speaker: Dr. Rohit Sharma
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Date: 07th November 2025 (Friday)

Time: 11:30 AM

Venue: Seminar Hall, IPR

Abstract

Investigation of interfacial interaction between graphene and nanostructured substrates is crucial for tailoring its electronic, mechanical, and optical properties of graphene. In this study, we investigate the transfer of monolayer graphene onto a glass substrate patterned with self-organized nanoscale ripples of different wavelength formed via low-energy ion beam irradiation (> 1 KeV). The aim is to explore how graphene accommodates nanoscale surface undulations and how this affects its structural integrity. Graphene grown on copper foil through chemical vapor deposition (CVD) was transferred onto the rippled glass ripples using a PMMA-assisted method. Raman spectroscopy revealed the presence of characteristic G and 2D modes, with variations in the ID/IG ratio and peak broadening indicating localized strain and disorder induced by the underlying ripple morphology. Atomic force microscopy (AFM) further confirmed conformal coating of the graphene over the ripple pattern, while also identifying residual PMMA on the surface. These findings suggest that the ripple-induced modulation of the graphene layer significantly influences its local structure and could be leveraged to tune its properties for future applications in strain engineering, flexible electronics, and nanoscale sensors.

Apart from that the surface modification of jute fabrics using RF plasma etching and HDTMS coating to achieve durable superhydrophobicity. Plasma treatment enhances surface reactivity and removes impurities, enabling effective HDTMS bonding. The optimized sample (90 W, 10 min + HDTMS) showed ~220-fold improvement in de-wetting time and a 50% reduction in adhesive force, confirming the synergistic effect of plasma and chemical treatment in enhancing water-repellent properties.

Reference

1. P. Luo, C. Jaramillo, A. M. Wallum, Z. Liu, R. Zhao, L. Shen, Y. Zhai, J. C. Spear, D. Curreli, J. W. Lyding, M. Gruebele, W. Wang, J. P. Allain, and Y. Zhyang, ACS Appl. Nano Mater. **3**, 12025 (2020).

2. G. S. Bumbrah and R. M. Sharma, Egypt. J. Forensic Sci. **6**, 209 (2016).