Graphene Based 2D-0D Transition Metal Hybrids and Fabrication of 2D-1D Semiconducting Nanowire Heterostructures with Improved Optoelectronic Properties: A New Class of 2D-1D Hybrid Photodetectors

Ravi K. Biroju[1], P. K. Giri[2]

[1]Center for Nanotechnology and [2]Department of Physics
Indian Institute of Technology Guwahati, Assam 781039, India.
birojuravi@gmail.com

Abstract: Fabrication of Graphene based semiconductor hybrid nanostructures (NSs) for optoelectronic device applications, especially for the photodetectors has received considerable attention due to its constant optical absorption coefficient over the visible to NIR wavelength and it can multiply the photo excited carriers for the enhanced spectral response.[1-2] In this respect, understanding optical and optoelectronic properties of graphene-transition metal (TM) and graphene-ZnO semiconductor nanostructures are important aspect for the ultrafast 2D-1D hybrid photodetectors.[1-3] In this work, we present our recent results on functionalization of CVD graphene with various TM layers/nanoparticles (NPs) by a physical approach and the role of intrinsic defects using resonance Raman spectroscopy, high resolution electron microscopy and localized surface plasmon resonance absorption in the wide range of UV-vis- NIR region. Further the vertical ZnO nanorods /nanowires have been grown on graphene-TM and graphene-ZnO hybrid interfaces. Enhanced photoluminescence (PL) and Photocurrent (PC) were achieved for these graphene-ZnO 2D-1D integrated hybrid NSs.

References:

[1]. Biroju R.K., Giri P.K., Dhara S., Imakita K., Fujii M., ACS Appl Mater Interfaces, **1** (2013) 377-387.
[2]. Biroju R.K., Giri P.K., J Nanosci Lett, (2013) 34.
[3]. Biroju R.K., Giri P.K., J Phys Chem C, **25** (2014) 13833-13843.

Figures: