# Wavelength-Selective n- and p-typed carrier transport of a graphene transistor by organic/inorganic Hybrid Doping Platform

**Po-Hsun Ho,** Yi-Ting Liou, Shao-Sian Li, Yun-Chieh Yeh, Chun-Wei Chen

Department of Materials Science and Engineering, National Taiwan University, Taipei, Taiwan

Conact email: river770323@gmail.com

**Abstract**

Recently, one promising approach to modulate the electrical properties of a graphene transistor using optical excitation has been demonstrated, resulting in controllable p- or n-doping processes by light illumination. However, most of these optically induced graphene-based electronic devices reported in literatures typically show a single-typed carrier transport under light illumination (either n-type or p-type). In this work, we propose a novel device structure based on organic/inorganic hybrid doping (OIHD) platform with a graphene transistor sandwiched with two photoactive layers with complementary absorption spectra, where one layer is only sensitized under visible light excitation and the other layer is only sensitized by UV illumination. When this graphene device is under illumination with selective wavelengths, controllable n-type or p-type doping of graphene with two opposite carriers can be achieved. The concept of this device structure based on OIHD platform enables us to control the dual carrier-typed transport of a graphene transistor simply by wavelength-selective illumination. Based on this novel device platform, we are further able to demonstrate the graphene p-n junction transistor controlled by wavelength-selective patterned illumination. This building block thus provides a great potential in the future development of large-area optically controlled graphene-based integrated circuits.