NANOHOUR

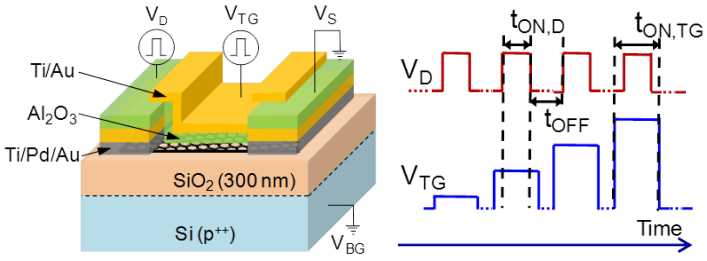
Wednesday, March 13, 2013 at 3:00 pm
Beckman Institute - Room 3269

Variability of Graphene Transistors: Roles of Contacts and Enhanced Characterization Techniques

Enrique Carrion, Electrical and Computer Engineering

Graduate Student with Professor Eric Pop

Graphene devices are promising candidates for nanoelectronics due to excellent electrical properties, such as high carrier mobility and high saturation velocity. In addition, the transparent and flexible attributes of graphene also make it appealing for bendable, conformal electronics and circuits. In the past few years, analog high frequency circuits, such as amplifiers, inverters and mixers have been demonstrated using graphene field effect transistors (GFETs). However, challenges such as contact resistance, variability, material quality, and interface interactions limit GFET performance well below theoretical predictions. In this work, we describe our recent progress in high-speed metrology, contacts, and dielectric interfaces by analyzing variability across hundreds of GFETs prepared from CVD graphene.



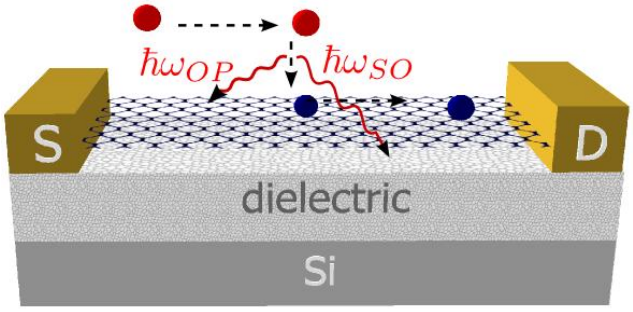
High-Field Transport in Supported Graphene

Andrey Serov, Electrical and Computer Engineering

Graduate Student with Professor Eric Pop

Graphene is a promising material for electronic applications due to outstanding electrical, mechanical and thermal properties. At high electric field, it is often assumed that the graphene saturation velocity is limited by substrate optical phonon scattering. However, a deeper understanding of high-field transport is presently lacking.

In this study, we discuss how substrate affects electrical characteristics of graphene at high electrical field. In our simulation framework we self-consistently include scattering with interface phonon modes and take into account dynamic screening by charge carriers in graphene. Based on our simulation calibrated to experimental data on SiO_2, we analyze the role of self-heating, charge impurities, intrinsic and substrate phonons on high-field transport and velocity saturation in graphene. Finally, we benchmark several high-k dielectrics, such as SiO_2, HfO_2, BN and Al_2O_3 which vary in terms of impurity density and phonon modes.



Coffee and cookies will be served

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