NANOHOUR

Wednesday, February 9, 2011 3:00 pm
Beckman Institute - Room 3269

Three Dimensional Microvascular Fiber-Reinforced Composites

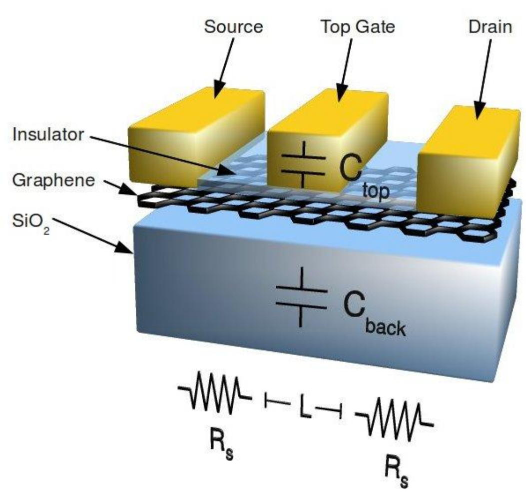
Dr. Aaron Esser-Kahn, Chemistry
Postdoctoral Research Associate with Professor Jeff Moore

The rearrangement of atoms during ion bombardment of solid surfaces is known to lead to the formation of regular nanometer-scale surface patterns. The nature of these patterns depends on a combination of ion energy, the types of target material and ion, and the angle of incidence. A variety of surface morphologies, such as ripples oriented parallel or perpendicular to the ion direction or dots, are observed experimentally. However, the fundamental mechanisms governing the orientation of ripples; and how the ion energy, ion type, and angle of incidence affect their formation remain unclear. Invoking a multiscale approach, we study the femtosecond atomistic mechanisms during ion bombardment of single impacts and use a diffusion-based continuum description to examine their role on the evolution of long timescale surface morphologies. In contrast to existing theories, which are mostly based on the Bradley-Harper sputter-erosion instability, a simple moment-based hypothesis is developed for characterizing the transitions between different surface morphologies. The results are compiled in a phase diagram that shows the transition boundaries between different classes of surface morphologies as a function of the different crater moments.

Modeling of the Output and Transfer Characteristics of Graphene Field-Effect Transistors

Brett Scott, Electrical and Computer Engineering
Graduate Student with Professor Jean-Pierre Leburton

In recent years, graphene has emerged as a novel mono-layer material with exotic physical properties for applications in high performance electronic devices. Namely, the relation between the charge carrier energy and the 2D wave vector is linear. In this framework all carriers have a velocity with the same absolute value that is one order of magnitude larger than in conventional III-V materials, making graphene a promising candidate for high-speed nanoelectronics. Recently, graphene field-effect transistors (GFETs) were successfully fabricated and exhibited I-V characteristics similar to conventional silicon MOS transistors. We obtain the output and transfer characteristics of GFETs by using the charge-control model for the current, based on the solution of the Boltzmann equation in the field-dependent relaxation time approximation. Closed expressions for the conductance, transconductance and saturation voltage are derived. We found good agreement with the experimental data of Meric et al. [Nature Nanotechnology 3, 684 (2008)] without assuming carrier density-dependent velocity saturation.



Coffee and cookies will be served
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