evropský sociální fond v ČR

EVROPSKÁ UNIE

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

OP Vzdělávání pro konkurenceschopnost

INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

REGIONAL CENTRE OF ADVANCED TECHNOLOGIES AND MATERIALS

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REGIONAL CENTRE OF ADVANCED TECHNOLOGIES AND MATERIALS LECTURES

Tuesday, October 15th, 2:00 pm
Seminar room of RCPTM (room No. 314), Šlechtitelů 11, Olomouc

prof. Kwang S. Kim

Pohang University of Science and Technology

„Functional Molecules, Controlled Self-Assembly and Graphene-based Nanomaterials and Nanodevices"

Abstract: The success of experimentally viable molecule/material-design, to a large extent, depends on a comprehensive understanding of the nature of intermolecular interactions and the inherent molecular properties of the system under consideration. In addition to the static properties of materiuals in closed systems, it is of importance to utilize the transport properties in open systems. Thus, we have developed tranport perperty calcualtion programs (PosTrans), which are being utilized for the design of novel nanodevices. Here, we elaborate on how we have designed functional nanomaterials and nanodevices. These include intriguing organic, inorganic, and metallic nanostructures, ionophores/receptors, carbon-based nanostructures including ultralong and ultrathin carbon nanotubes and large-scale graphene, graphene band gap control and functionalization including energy and gas storage, water remediation, fuel cell catalysts, and molecular spintronic devices. Novel assembling phenomena of diverse nanostructures and utilization of the unusual functional characteristics as devices are discussed. Novel nano-optics phenomena are discussed based on self-assembled nano-scale lenses which show near-field focusing and magnification beyond the diffraction limit. The enhancement of micro-Raman signals for the graphene layers through nanolenses is also addressed. Electron/spin transport phenomena in molecular electronic/spintronic devices and graphene nanoribbon spin valves are discussed based on non-equilibrium Green function theory. As a highly efficient futuristic informatics device, we address graphene nanoribbon spin-valve devices which show the super magnetoresistance behavior. The device can be used as a spin filter which selectively transmits almost 100% spin-polarized current. Given that graphene nanoribbon electrodes show pristine molecular characteristics much better than Au or Ru electrodes, we find that measuring the conductance spectra of a graphene nanoribbon placed across a fluidic nanochannel leads to a powerful ultrafast DNA sequencing method.