

# SMART

Fall / Winter seminar series  
2012, Singapore

Singapore-MIT Alliance for Research and Technology



Event #1: September, 13

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**Prof. Martin Pumera**

## GRAPHENE ELECTROCHEMISTRY, NANOTOXICITY, NANOROBOTS AND BEYOND

In this talk, I will focus on main research directions of our research group. i) First of all, I will discuss the role of impurities on redox properties of carbon nanomaterials. Carbon nanomaterials, such as carbon nanotubes and graphene-related materials are currently being heavily researched and widely proposed for numerous applications. Carbon nanomaterials have often been under understood as materials when in fact they are of complex nature, often containing impurities. These impurities can dramatically influence, or even dominate various properties of carbon nanotubes and graphenes. Herein, we will show that impurities in such carbon nanomaterials are capable of exhibiting a striking effect on their redox properties. The impurities being discussed include metallic, nanographitic and amorphous carbon-based impurities presented in carbon nanotubes; and metallic, nanographitic, and carbonaceous debris-based impurities in graphenes. We emphasize that the effects brought about by these impurities on the properties of the carbon nanomaterials can, in many cases be rather significant. As such, one needs to be cautious by clearly accounting for these effects observed for the nanomaterials before assigning any properties to the material itself. ii) In second part of my talk I will focus on micro and nanorobots. Self propelled micro- and nanosystems are in the center of research interest in nanotechnology. It is envisioned that these nano and microdevices will be employed in various tasks, such as biomedical application, resource discovery and environmental clean-up. The key element of operation of these devices is, in addition to "self-propulsion", its autonomy. The devices should sense-and-act in response to its environment. Such response can be to the temperature, magnetic field, light or chemicals; the resulting behavior is correspondingly called thermotaxis, magnetotaxis, phototaxis or chemotaxis. Here I describe interactions of these selfpropelled nano and microdevices.

**Location:** BioSym seminar room

BioSystems & Micromechanics (BioSyM)  
Singapore-MIT Alliance for Research and  
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Singapore 117543

**Date:** Thursday 13 Sep 2012

**Time:** 2 – 3:30 PM

