В среду 17/06/15 в аудитории 446 в 10-30 состоятся доклады ведущих ученых в области материаловедения и электрохимической энергетики

Prof. Ze Xiang Shen

Nanyang Technological University, Singapore

Dr. Ze Xiang Shen is a Professor in the School of Physical and Mathematical Sciences, and the School of Materials Science and Engineering, Nanyang Technological University (NTU). He is also the Program Chair of the Interdisciplinary Graduate School. He concurrently holds the position of Co-Director, Centre for Disruptive Photonics Technologies. His main research areas include carbon related materials, especially graphene. His work involves spectroscopic and theoretical study of few-lay graphene and folded graphene, graphene intercalation study, growth of large area graphene for energy harvesting (batteries, H storage, electrodes) and nano electronics applications; fundamental study of graphene such as electronic structures, doping, energy band gaps. He also works on developing near-field Raman spectroscopy/imaging techniques and the study of plasmonics structures where some very fundamental questions remain to be answered.

He was awarded the NTU Nanyang Award for Research and Innovation 2009 as well as the Gold Medal for Research Excellence by Institute of Physics Singapore in 2011. Shen authored over 400 peer reviewed journal papers, 3 book chapters, edited one book and over 200 conference papers.

Graphene-based composite materials for electric energy storage

Lithium-ion battery (LIB) is currently the fastest growing and most popular type of rechargeable batteries. Great market demands of LIBs which will rapidly expand from US$11.7 million in 2012 to 5 billion in 2015 and 33.11 billion in 2019 provide great opportunities for advanced LIB materials. With billions of new devices requiring electrical storage, battery technology is due for a renaissance in the near future on high power (fast charging) batteries with high capacity. Supercapacitors (SC) currently fill the gap between batteries and conventional solid state electrolytic capacitors. They store hundreds or thousands of times more charge than the latter due to a much larger surface area available for charge storage in SC. Global supercapacitor market analyses, which were prepared based on in-depth market analysis by Lux Research and by TechNavioindicate that supercapacitors will drive $5.75 billion in energy storage revenues in 2020. Graphene which consists of atom-thick sheets of carbon has attracted tremendous attention due to its extraordinary electrical, mechanical, chemical and thermal properties. It also has the ultimate surface to volume ratio. All these are critical materials properties that best suited for electric energy storage. In this talk, I will present our recent work on the 3D graphene and Graphene/CNT based composite materials for applications as electrodes for Li ion and Na ion batteries as well as application in supercapacitor. Typically, the graphene/CNT substrates are loaded with active materials such as metal oxides, conducting polymers or 2Dimensional materials. The graphene based substrates provide the electric conduction and the mechanical strength for the electrode and increase substantially their high rate capability and cycle life. The underlying physical mechanism is discussed.