MONASH University

MONASH CENTRE FOR ELECTRON MICROSCOPY

SEMINAR

(Featuring 3 International Speakers)

3.00 to 5.00pm, Wednesday 6 August 2008
Science Lecture Theatre S11, Bldg 25

Stepwise current-driven release of attogram quantities of copper iodide encapsulated in carbon nanotubes

(3.00 – 3.40pm)

Dr Pedro M.F.J. Costa
CICECO, University of Aveiro, Portugal

Abstract

Carbon nanotubes (CNT) have been proposed as ideal tools to deliver substances at the nanoscale level with potential applications ranging from nanopipettes to targeted drug delivery[1, 2]. In particular the latter would require the pulsed release of small drug amounts with parallel reading of the system properties under soft physiological conditions. Towards this aim a vast amount of materials have been successfully encapsulated within CNT[3, 4] but there is still a lack of reliable mechanisms to controllably release the filling contents on-demand and to completion. In this talk, it will be shown how encapsulated nanograins of copper iodide have been sequentially discharged from individual carbon nanotubes. Using a high resolution electron microscope equipped with a two-terminal electrical measurements unit, it was possible to manipulate the filling contents with precisions of a few attograms at a time. Changes in electrical resistance and filling ratio were followed *in-tandem* and in real-time. It is further confirmed that the pulsed-release of the halide is directly related to the overall conductance of the filled nanotube.

One-dimensional (1D) ZnS Nanostructures: From Synthesis to Application

(3.40 – 4.20pm)

Dr Xiaosheng Fang
ICYS-MANA Research Fellow
National Institute for Materials Science
Tsukuba, Japan

Abstract

Zinc sulfide (ZnS), is one of the first semiconductors discovered and probably one of the most important materials in the electronics with a wide range of applications, including nonlinear optical devices, LEDs, electroluminescence, flat panel displays, infrared windows, sensors, lasers, and biology etc. One-dimensional (1D) nanostructures, such as nanotubes, nanowires and nanobelts, have opened up new frontiers in materials sciences. Recent advances in their synthesis, processing, and characterization indicate that some of their enormous potential is slowly being realized. In this talk, we will present our latest progresses on 1D ZnS Nanostructures: from synthesis to application.

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One-dimensional heterostructures of ZnS: Synthesis, Properties and Possibilities

(4.20 – 5.00pm)

Dr Ujjal K. Gautam
ICYS-MANA Research Fellow
National Institute for Materials Science
Tsukuba, Japan

Abstract

One dimensional (1D) heterostructures of two different materials harbors immense potential for applications of nanomaterials because of two reasons. Firstly, it provides a single system of two different materials; secondly it has a combination of properties from its constituents along with an interfacial region having markedly different behavior which is not negligible at this length scale. This talk will feature two such ZnS based hetero nanostructures, one with high conductivity carbon, the other with superconducting indium. ZnS is an important semiconductor with a band gap of 3.7 eV. Carbon has a high stability, conductivity and chemical inertness at elevated temperatures. In is a type-1 bulk superconductor. We have investigated the 1D

heterostructures of carbon and ZnS core-shell structures, wherein the carbon forms the shell structure and the ZnS forming the core nanowire. We established that the carbon shell can be a potential photo-protective layer. In-situ current transport measurements showed that the optical properties of the system arise from the core ZnS while electrical transport properties arise from the shell CNT. In the case of In-ZnS heterostructures, the core In nanowires are single-crystalline and can indeed retain bulk superconducting properties even in reduced dimensions. Field emission properties, on the other hand arise from the shell ZnS nanotube. Thus these systems have interesting properties contributed from each constituting components and show interesting prospects for possible applications of nano heterostructures.

Convenor: Dr. Joanne Etheridge

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Visitors are most welcome: Please note that there is a designated Visitors Car Park (N1) clearly ground-marked by white paint and tickets, at a cost of $1.4/hour for up to 3 hours, available from a dispensing machine. This high-rise carpark is located on the following Clayton Campus Map, Ref. B2.

Printable version of the Clayton campus map (pdf 833 kb) (Please right click to open link)