



**Seminar Topic:
Significant Performance Improvement of Nanostructures Tailoring by
Hybrid and Perfect Ordering**

Associate Professor Huang Yizhong

Abstract

Hybrid nanostructures consist of two or more nanostructures that allow the significant property enhancement for individual nano-components. Due to the difficulty of control during their fabrication, most available hybrid nanostructures, at present, are generally arranged in a random order leading to significant degeneration of performance in comparison with perfectly-ordered hybrid nanostructures. In this talk, two special Si-based ordered hybrid nano-structured arrays in terms of their fabrication and properties including gas sensing and photocurrent response will be presented. One is a unique hybrid nanoneedle structure, consisting of a nanorod with a small nanodot sitting on the top. The sharp tip of the nanoneedles with a small radius, for instance, is an ideal design of field ionizer for gas sensing. The measurements show that the nanoneedle gas sensor not only is capable of differentiating the type of gas but also has a high sensitivity of resolving the gas quantity with a small breakdown applied voltage. Ordered ZnO/Si nano-heterojunction is the other hybrid nanostructured array, where ZnO nanorods are grown on top of ordered Si (p-type) nano-needles. Each nano-heterojunction is examined to be a p-n junction and shows better diode characteristic after heat treatment. A number of such individual nano-heterojunctions that are perfectly arranged across the Si substrate surfaces can provide a building block to fabricate various types of optoelectronic nanodevices, such as photovoltaic solar cells and light emitting diodes with significantly enhanced properties.

Biography

Dr Huang Yizhong is currently an Associate Professor at School of Materials Science and Engineering in Nanyang Technological University Singapore. He has been working in University of Oxford as a postdoc and then Research Fellow (faculty member) and College Fellow of Wolfson and now an Academic Visitor. Dr Huang has been honored with a few awards such as Chutian Scholar of Wuhan University of Technology in 2019 and UK-Southeast Asia Partners in Science Collaboration Development Awards in 2012. He has published over two hundred papers in journals such as Nature communications, Nano Letters, Advanced Materials and ACS Nano.

Dr Huang has developed expertise in transmission electron microscopy (TEM) and focused ion beam (FIB) system with specific research interests in nanoelectrochemistry and hybrid nanostructured materials.

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Hosted by: Assistant Professor Terry W.J. Steele**