



TiO₂ coated ZnO nanoparticles for dye-sensitized solar cells

by Miss Li Hui

Date: 13th August 2009 (Thursday)

Time: 12:30pm to 1:00pm

Venue: EA-02-11 (Executive Seminar Room)

Abstract

ZnO has a wide direct band gap of 3.37eV, large exciton binding energy of 60meV, and large electron mobility about 115-155cm²V⁻¹S⁻¹, making it the material-of-choice for solar cells applications. We have fabricated ZnO aggregates via a hydrolysis route using zinc acetate dehydrate and diethylene glycol (DEG) as the precursors under carefully controlled conditions. And the ZnO/TiO₂ core/shell structure was formed through deposition of a TiO₂ coating layer on the ZnO nanoparticles through atomic layer deposition (ALD) system. The phases and crystalline structures of the core and shell can be confirmed by the high resolution transmission electron microscopy (HRTEM). The effects of the TiO₂ shell's characteristics on the current-voltage behaviors of the core/shell-based dye-sensitized solar cells were investigated. Here, electrochemical impedance spectroscopy (EIS) was applied to investigate the electronic process in the cells, using an appropriate equivalent circuit, the electron transport resistance and recombination resistance in the ZnO and ZnO/TiO₂ core/shell have been derived. As the rate of transfer of electrons was enhanced in the ZnO/TiO₂ core/shell structure and was affected significantly by the crystallization, and morphology of the TiO₂ shells, the photovoltaic efficiency was accordingly varied. In addition, the energy conversion efficiency can be further improved by controlling the annealing condition.

Miss Li Hui Speaker

Miss Li Hui received her Bachelor Degree in Materials Science and Engineering Department at Anhui University of Science and Technology in 2005. She received her Master degree in Materials Science and Engineering Department at University of Science and Technology of China in 2008.

She is currently pursuing her PhD degree in the Advanced Ceramic Lab under the supervision of Professor John Wang in the Department of Materials Science & Engineering, NUS. Her research interests focus on the properties of ZnO nanostructures, such as photovoltaic property.

Dr Xue Jun Min Host

All are Welcome!