



## *Co-sensitization of Porous TiO<sub>2</sub> by PbS Quantum Dot and Organic Dye N719 in DSCs*

by Miss Liu Yanqiong

**Date:** 24<sup>th</sup> September 2009 (Thursday)  
**Time:** 12:30pm to 1:00pm  
**Venue:** EA-02-11 (Executive Seminar Room)

### Abstract

Quantum dots are found to exhibit multiple exciton generation (MEG) effect, which is promising for enhancing the energy conversion efficiency in solar cells. In this work, PbS quantum dots (QD) have been successfully prepared by Successive Ionic Layer Adsorption and Reaction (SILAR) method, i.e. dipping TiO<sub>2</sub> paste into solutions of Pb(NO<sub>3</sub>)<sub>2</sub> and Na<sub>2</sub>S successively. Various quantum sizes are obtained by adjusting the dipping time or dipping cycles. The PbS quantum dots are characterized by XRD, XPS, UV-visible absorption & TEM. The red-shift in absorption edge shows the increase in quantum dot size with both dipping time and cycles. Photovoltaic performances of the solar cells constructed from PbS-sensitized TiO<sub>2</sub>, N719-sensitized TiO<sub>2</sub> and PbS & N719-cosensitized TiO<sub>2</sub> have been studied. PbS QDs are shown to elevate the open circuit voltage (Voc) and also decrease the short circuit current density (Jsc). It is found that the optimum condition is able to increase the solar energy conversion efficiency from 5.9%, given by N719-sensitized TiO<sub>2</sub>, to 6.3%, given by PbS & N719-cosensitized TiO<sub>2</sub>. The presence of PbS QDs increases the dye loading which is contradictory to the decrease in Jsc. This proof-of-concept work demonstrates that it is feasible to co-sensitize TiO<sub>2</sub> with dye and QDs in order to make better use of the solar spectrum. The possible operating mechanisms involved in the co-sensitization are presented and discussed.

### Miss Liu Yanqiong Speaker

Miss Liu Yanqiong received her Bachelor's Degree from the Department of Materials Science, NUS in 2007. She is currently pursuing her PhD degree in Department of Materials Science and Engineering, National University of Singapore, under the guidance of Professor John Wang. Her current research interest is the structural dependence of working electrode in Dye-sensitized Solar Cells (DSCs) applications.

Dr Xue Jun Min Host

*All are Welcome!*