PAP Seminar Announcement

Designing and Synthesizing Materials at the Nanoscale for Advanced Energy Applications

By

Prof. Dunwei Wang

Department of Chemistry, Boston College

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Time: 11.00am to 1.00pm
Venue: MAS Executive classroom 1 (MAS-03-06)
Host: Asst. Prof. Fan Hongjin

Abstract

How to significantly advance energy conversion and storage technologies, such as solar cells, solar fuel production from water splitting, and batteries, represents a key challenge faced by the scientific community. At the heart of the problem is our inability to tailor certain aspects of materials' intrinsic properties without adversely altering others. As a result, researchers are currently working within serious constraints. Recent advances in materials research, particularly those focusing on morphology innovations at the nanoscale, may offer solutions to this problem at a fundamental level. Here, we present our recent efforts and some positive results toward this direction. We proposed and tested the idea of forming heteronanostructures, various parts of which can be purpose-designed independently. When combined together, these different parts contribute to the overall functionality in a complementary fashion, yielding materials with properties that have not been observed on simple structures. We will introduce the research within the context of a nanonet-based design, which is enabled by a unique two-dimensional crystalline material we discovered. We show that the nanonet solves the low conductivity problem many metal oxide semiconductors and battery electrode materials have. The resulting nanostructures exhibit better performance in solar water splitting and battery applications than their non-heteronanostructure counterparts do. A new door to electrode design for improved energy applications may be opened up by this approach.

Short Biography

Dunwei Wang graduated from the University of Science and Technology of China in 2000 with a B.S. degree in chemistry. He was then trained at Stanford University (with Hongjie Dai) between 2000 and 2005, where his Ph.D. thesis was awarded the Prize for Young Chemists by the International Union of Pure and Applied Chemistry. After two years' of postdoctoral study with James R. Heath at Caltech, he joined the faculty of Boston College and is currently an Associate Professor of Chemistry there. His research concerns the development of new nanoscale materials that can be used for efficient solar energy conversion and storage. He is a recipient of an NSF CAREER award, a Sloan Research Fellowship and a Massachusetts Clean Energy Center (MassCEC) Catalyst award.

College of Science
Nanyang Technological University
SPMS-04-01, 21 Nanyang link, Singapore 637371
Fax: +65 6515 8229  Tel: +65 6513 8459