



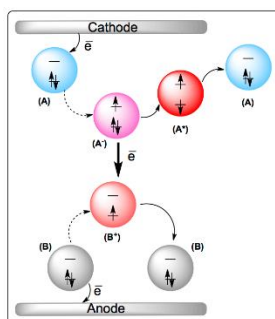
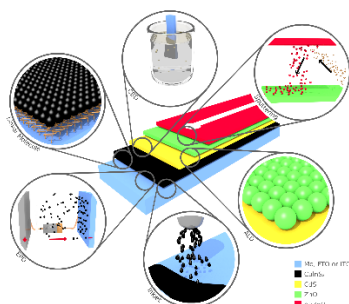
Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

COLLOQUIUM
TUESDAY, 24 MARCH 2015
11:00 AM - 12:00 NOON
KN132

Dr. Zhifeng Ding

Western University, Department of Chemistry

Analytical Insights into Photoelectrochemistry



Electrochemistry studies relations between electric work and chemical reactions, while photoelectrochemistry investigates the conversion between electrons and photons in chemical processes. Our lab at Western focuses on 4 research themes: scanning electrochemical microscopy of live cells, ionic liquids as novel electrolytes, electrochemiluminescence (ECL) and solar cells. Herein, we demonstrate our insights into two photoelectrochemical processes: photovoltaics and ECL.

The efficiency, capital investment and production cost of photoelectroactive materials for CuInGaSe_2 (CIGS) type thin film solar cells have attracted much attention to researchers. In our lab CuInS_2 (CIS) and $\text{Cu}_2\text{ZnSnS}_4$ (CZTS) films for solar cell light-absorbing layers can be easily cast from nanocrystals by one-pot solvothermal reactions. The composition, structures and photoreactivity of the prepared films have been investigated by combining electrochemistry with spectroscopy and microscopy: electron dispersive x-ray (EDX), scanning electron microscopy, transmission electron microscopy, X-ray photoelectron spectroscopy, Raman microspectroscopy, synchrotron spectroscopy as well as scanning photoelectrochemical microscopy. Intensity modulated photocurrent spectroscopy has been proved to be very powerful to characterize photochemical processes of these thin films upon light irradiation.

ECL is the process in which electrogenerated radicals form excited species that emit light without the need for an external light source. ECL is a powerful analytical technique that is fast, highly sensitive and selective, requires low quantity and is cost effective. Herein, we illustrate our investigation on ECL of Au nanoclusters in the near-infrared (NIR) region by combining conventional ECL detection with spectroscopic techniques to gain insights into thermodynamic and kinetic origins. Generating ECL light in the NIR is especially important for bioimaging applications.