University of Minnesota
Driven to Discover℠

Department of Chemistry

Seminar

9:45 a.m. Thursday, February 16 • 331 Smith Hall

Garry Rumbles

Professor
Department of Chemistry & Biochemistry, University of Colorado
Research Fellow
National Renewable Energy Laboratory

Comparing the Primary Electron Transfer Process in Photosynthetic Reaction Centers with Organic Photovoltaic Heterojunctions

Research interests are in solar energy with a focus on the basic science of solar photo-conversion processes and photoinduced electron transfer processes in polymer-based nanostructured interfaces. However, primary research expertise lies in photochemistry and photophysics, with a specialty in kinetics.

Websites: http://www.nrel.gov/research_fellows/rumbles.html
http://chem.colorado.edu/index.php?option=com_content&view=article&id=428:catid=41:faculty&Itemid=93

Abstract

This presentation will focus on some of the fundamental science associated with the rapidly emerging field of organic photovoltaics (OPV). It will include a discussion of how the OPV field is evolving, examine some of the fundamental scientific issues that underpin the subject, and will discuss how spectroscopy can help to understand these issues. The goal is to enable both a better understanding of how these systems function and consequently help to advance solar energy conversion efficiencies of future OPV devices.

So-called organic photovoltaic devices have seen certified power conversion efficiencies increase from 2.5% in 2001 to ~9% in 2011. Close inspection of the strategies employed to realize this impressive improvement in performance reveal a common approach of synthesizing new donor polymers, fullerene acceptors and, in some cases, new device architectures. It is questionable as to whether this approach will result in a similar four-fold level of improvement over the next ten years. And it is the answer to this question that motivates the work that will be described.

At the heart of all OPV devices is the donor-acceptor interface, where photogenerated excitons are dissociated into separated charge carriers. Using flash photolysis, time- resolved microwave conductivity (fp-TRMC) as a tool for detecting mobile carriers, a number of recently-studied systems will be described. This particular presentation will focus on systems that contain new conjugated polymers and novel derivatives of fullerenes. These studies will serve to highlight a fundamental issue that we have yet to fully understand: how are these carriers created with such efficiency and yield, and in a system that does not immediately suggest that this is possible? The talk will include a speculative discussion about how we might better understand this process by looking at the function of nature's photosynthetic reaction centers.

Host: Professor David Blank
Refreshments will be served prior to the seminar.