Workshop Agenda

Thursday, September 25th.

15:00 – 17:00 Controlled Intensity Modulated Photo Spectroscopy In Action. (Demonstration). Dr. Carl-Albrecht Schiller, ZAHNER-elektrik GmbH & Co. KG. CNMS Building. room J251. Sign up (limited sitting)

Friday, September 26th.

8:30- 8:45 Introduction
8:45- 9:45 Prof. Niyazi Serdar Sariciftci "**Organic Nanostructures for Optoelectronic Devices**"
9:45- 10:45 Dr. Marie Mapes "**Overview of Next Generation Photovoltaic Device and Processes Projects at the U.S. Department of Energy Solar Program**"
10:45- 11:45 Prof. Bin Hu "**Magnetic Investigation of Singlet and Triplet Photovoltaic Processes in Organic Solar cells**"
11:45 13:00 Lunch
13:00- 14: 00 Prof. David Carroll "**Novel Nanocomposite Approaches to High Efficiency Organic Devices**"

14:00-15:00 Dr. C-A Schiller "**Dynamic EIS- and Photo-electrochemical Measurements on TiO2-Nanotube Based Photo-anodes for Dye Sensitized Solar Cells -The Influence of the Annealing Temperature**"
15:00-15:30 Dr. Yue Wu "**Towards the commercialization of organic solar cells**"
15:30-16:00 Dr. Ilia Ivanov "**Nano engineered Transparent Conductive Electrodes** "

Controlled Intensity Modulated Photo Spectroscopy In Action.

Dynamic photo-electrical measurements like IMPS and Intensity Modulated Voltage Spectroscopy IMVS together with EIS give a deep insight into the nature of SC processes.

Demonstration

Who: Dr. Carl-Albrecht Schiller, ZAHNER-elektrik GmbH & Co. KG
When: September 25th at 3 pm.
Where: Electro-optical characterization laboratory J 251 (CNMS)

Please sign up: Limited space available

Nanomaterials for Sustainable Energy Future:
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Friday, September 26, 2008

Prof. David Carroll
(photo from www.wfu.edu/)

Prof. Niyazi Serdar Sariciftci
(photo from www.ipc.uni-linz.ac.at)

The goals of this workshop are to:
• Review the current state of research activities in nanomaterial-based organic photovoltaics
• Introduce in-house capabilities for synthesis and measurements at CNMS and its current R&D efforts
• Facilitate discussions of user research proposals and opportunities for collaboration among attendees

Keynote speakers:

Prof. ***David Carroll*****,** Director of the Center for Nanotechnology and Molecular Materials (Wake Forest University, USA)
Prof. ***Niyazi Serdar Sariciftci***, Director of Linz Institute for Organic Solar Cells (LIOS) AUSTRIA
Dr. ***Marie K. Mapes***, Solar Energy Technologies Program, EERE DOE
Dr. ***Carl-Albrecht Schiller*** , ZAHNER-elektrik GmbH & Co. KG

A full day of lectures, demonstrations, and structured discussions is being planned. Instrument demonstrations by Dr. Schiller is scheduled for 09/25/08.

Workshop contact Info:
Ilia Ivanov (ivanovin@ornl.gov) and Bin Hu (bhu@utk.edu]   Registration (http://cnms.ornl.gov) Closes on September 12th 2008

JOHANNES KEPLER UNIVERSITÄT LINZ
Netzwerk für Forschung, Lehre und Praxis

Organic Nanostructures for Optoelectronic Devices

Niyazi Serdar Sariciftci
Linz Institute for Organic Solar Cells (LIOS), Physical Chemistry, Johannes Kepler University Linz, A-4040 Linz, Austria www.lios.at
E-mail address: serdar.sariciftci@jku.at

Recent developments on organic nanostructures used in organic light emitting diodes (OLEDs), photovoltaic diodes (OPVs) and photoactive organic field effect transistors (photOFETs) are discussed. Furthermore, organic/inorganic nanoparticle based “hybrid” devices will be discussed. In all these optoelectronic devices the performance is critically dependent on the nanomorphology of the composite film. This talk gives an overview of materials’ aspect, charge-carrier-transport, and device physics of organic diodes and field-effect transistors.

Wake Forest University

Novel Nanocomposite Approaches to High Efficiency Organic Devices

David L. Carroll PhD. FSNN
Director Center for Nanotechnology and Molecular Materials
Associate Professor Department of Physics
Adjunct Department of Biomedical Engineering
Wake Forest University
Winston-Salem NC 27109

Nanocomposites made from conducting polymer – nanophase materials blends have generated significant interest in the organic device community due to the unusual properties they may exhibit. In the limit of fast charge transfer from host to nanophase, such as in the case of nano-allotropes of carbon, such as nanotubes and fullerenes, composites have already been shown to exhibit important differences in mobility and absorption properties from the pristine polymer host. However, recently, we have also shown that an important link between the oscillator strength of the nanophase and the opto-electronic nature of the composite exists. Indeed, energy partitioning within the matrix can be modified dramatically and lead to modifications in the performance of device fabricated from these composites. As an example of how to make use of these modifications, we have shown, using Poly(3-hexylthiophene) and 1-(3-methoxycarbonyl)-propyl-1-phenyl-(6,6)C61 bulk-heterojunction blends, thin film organic photovoltaic architectures can generate device efficiencies approaching 6%. We have shown that meso-phase formation in the nanocomposite through annealing allows for a systematic tailoring of charge balance as well as lowering of thermal activation barriers to improve charge mobility.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

Solar Energy Technologies Program

Overview of Next Generation Photovoltaic Device and Processes Projects at the U.S. Department of Energy Solar Program

Marie K. Mapes, Ph.D.
Presidential Management Fellow
Solar Energy Technologies Program
Energy Efficiency and
Renewable Energy (EERE)

Through the President's Solar America Initiative, the U.S. government will realize the full value of 30-years of research, development, and deployment in photovoltaics by making PV cost-competitive by 2015 across the United States. In the U.S., achieving grid parity will require system prices to come down another 50-70%. The R&D strategy to accomplish this goal, and eventually surpass it, consists of investments in an R&D pipeline of technologies at various stages of market readiness. DOE's funding for the earliest stage of this pipeline primarily resides in its Next Generation Photovoltaic Device and Processes applied research projects. Universities and businesses conducting the device and manufacturing process research that was targeted by this opportunity will be expected to produce prototype cells and/or processes by 2015, with full commercialization coming to fruition in the 2020-2030 time-frame.

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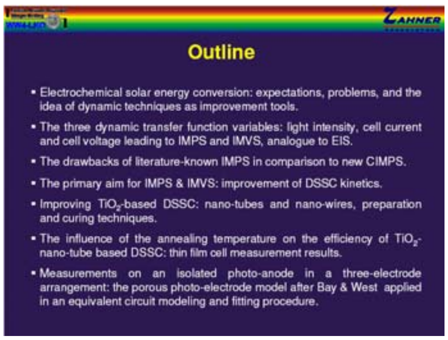
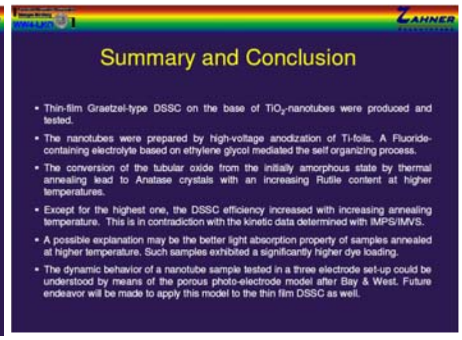
With the best Solutions in Electrochemical Applications

Dynamic EIS- and Photo-electrochemical Measurements on TiO2-Nanotube Based Photo-anodes for Dye Sensitized Solar Cells -The Influence of the Annealing Temperature.

Carl-Albrecht Schiller ,
ZAHNER-elektrik GmbH & Co. KG





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Materials Science & Engineering

Magnetic Investigation of Singlet and Triplet Photovoltaic Processes in Organic Solar Cells

Bin Hu
Department of
Materials Science and Engineering
University of Tennessee, Knoxville,
Tennessee

This presentation discusses singlet and triplet photovoltaic processes in organic solar cells based on the studies of magnetic field dependence of photocurrent. We found that magnetic field dependence of photocurrent can be used to experimentally visualize the singlet and triplet photovoltaic processes in polymer bulk-heterojunction solar cells based on poly[3-methylthiophene] (P3HT) and surface-functionalized fullerene 1-(3-methyloxycarbonyl)propy(1-phenyl [6,6] C61 (PCBM). We observed that singlet and triplet excitons undergo two different channels: dissociation and charge reaction, respectively, in the generation of photocurrent in organic semiconductors. When bulk-heterojunctions are formed between donor and acceptor molecules in organic solar cells, the weak donor-acceptor interaction mainly affects the dissociation channel but has little influence on charge reaction channel. Moreover, the strong donor-acceptor interaction can directly separate the electrons and holes in singlet and triplet excitons to generate photocurrent before they experience dissociation and charge reaction. Furthermore, the magnetic field dependence of photocurrent can visualize the formation of electron-hole pairs from separated electrons and holes at the donor-acceptor intermolecular interfaces. Based on the understanding of singlet and triplet photovoltaic processes, we further adjusted singlet/triplet ratio as well as the donor-acceptor interaction and consequently improved the photovoltaic efficiency.

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Towards the commercialization of organic solar cells

Yue Wu, Ph.D.
Researcher III
Solarmer Energy, Inc.
El Monte, CA 91731

Great progress has been made in the field of organic solar cells; however the efficiency of organic solar cells is still quite low compared with that of inorganic counterparts. Therefore, to successfully commercialize this technology, it is necessary to either further improve the efficiency or explore and indentify unique applications. This presentation will introduce Solarmer's efforts to achieve higher efficiency for organic solar cells through device engineering and materials development. In addition, we will also report our progress in the fabrication of efficient and transparent organic solar cells for special markets.

Center for Nanophase Materials Sciences
A Highly Collaborative and Multidisciplinary
U.S. DOE Nanoscale Science Research Center

Nano engineered Transparent Conductive Electrodes

Ilia Ivanov
Center for Nanophase Materials Sciences
Oak Ridge TN

The unique multifunctionality of nanomaterials makes them very attractive materials for many applications relevant to the DOE mission. An example of such applications include transparent conductive electrodes, charge transport layers in for Photovoltaics and Solid State Lighting systems. The research and development efforts at the Center for Nanophase Material Sciences (CNMS) in collaboration with UTK targets both understanding the origins of these enhancements as well as maximizing positive effects in a single opto-electronic structure.

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