

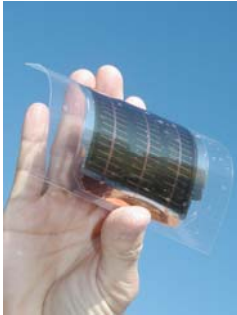
Organic photovoltaics: status and promise

Bernard Kippelen

Center for Organic Photonics and Electronics,

School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332

kippelen@gatech.edu



In recent years, organic solid-state approaches to photovoltaic cells have emerged. Laboratory small-area plastic solar cells have already demonstrated power conversion efficiencies of 6 percents and their low temperature processing makes them compatible with highly flexible and conformable substrates. Hence, this technology has the potential to lead to a new generation of solar panels that are low cost, light weight, and highly flexible. However, to challenge existing photovoltaic technologies such as crystalline silicon and thin-film technologies (such as CdTe, amorphous silicon, or CIGS) their power conversion efficiency needs to be significantly increased through the design of novel materials and device architectures.

In this talk, we will discuss the optics and engineering of organic solar cells with an emphasis on how the excitonic nature of excited states in organic molecules and polymers has influenced their design and how it is challenging the understanding of their operation. Physical models based on optical interference and exciton diffusion will be applied to model the photocurrent. Equivalent circuits will be used to parameterize the current-voltage characteristics and to identify the critical factors that limit the open-circuit voltage in organic solar cells. Examples of molecular and polymeric cells will be described and design trade-offs for future improvements of the power conversion efficiency of future cells will be discussed.

About the Speaker:



Bernard Kippelen is a professor at the School of Electrical and Computer Engineering at the Georgia Institute of Technology where his research ranges from the investigation of fundamental physical processes (nonlinear optical activity, charge transport, light harvesting and emission) in organic nanostructured thin films, to the design, fabrication and testing of light-weight flexible optoelectronic devices based on organic-based materials. He serves as Associate Director of the Center for Organic Photonics and Electronics and as Associate Director of the NSF Science and Technology Center MDITR. He is a Fellow of OSA and SPIE.