PURDUE UNIVERSITY

Birck Nanotechnology Center

Bernard Kippelen is the Joseph M. Pettit Professor of Electrical and Computer Engineering at the Georgia Institute of Technology, located in Atlanta, GA, USA. His research interests range from the investigation of fundamental physical processes (nonlinear optical activity, charge transport, light harvesting and emission) in organic-based nanostructured thin films, to the design, fabrication and testing of light-weight flexible optoelectronic devices based on hybrid printable materials. He is a co-founder and co-President of the *Institut Lafayette*, an innovation platform located on Georgia Tech's European campus Georgia Tech Lorraine (Metz, France), and serves as Director of the Center for Organic Photonics and Electronics on the Georgia Tech campus in Atlanta.

Organic Photonics and Electronics: the Endless Frontier

Bernard Kippelen

Monday, December 3rd, 2018
11:00am – 12:00pm
BRK 1001

We live in a world in flux with technology changing at a pace unprecedented in human history. Over the past decade, a powerful wave of innovation based on digital platforms and apps has arisen due to their wider dissemination in our hyper-connected world. In the next decade, *"deep"* technologies will play a major role in pushing further the technological frontier. Deep-tech innovations lie at the crossroads of massive shifts in demand led by megatrends (such as global climate change, demographic shifts, resource scarcity) and scientific progress (such as the fusion of the physical, digital and biological domains). Deep technologies are disruptive solutions built around unique, protected or hard-to-reproduce technological or scientific advances. In that next wave of innovation, advances in new materials and processing methods will continue to play a central role.

In this talk, we will discuss how printable organic conjugated semiconducting molecules and polymers are creating new disruptive technologies that are impacting all industries. We will present recent advances in various solid-state device platforms including, organic light-emitting diodes (OLEDs), organic photodetectors (OPDs), organic photovoltaic devices (OPVs), and organic thin-film transistors (OTFTs). We will emphasize the importance of interfaces in devices and show examples on how to engineer their electrical properties. We will present a simple processing technique for the electrical doping of organic semiconductors over a limited depth near the surface of the film that is based on immersing the film into a polyoxometalate solution [2]. Such approached can drastically reduce the fabrication cost of such devices, simplify device architecture, and lead to all-organic devices fabricated by all-additive printing techniques. As an illustration of the simplicity and versatility of this process we will discuss how high-performance organic solar cells with simplified architecture can be implemented. Finally, we will resent the results of a detailed operational lifetime study of OTFTs showing that organic photonics and electronics can yield a stability level superior to that of amorphous silicon [3].

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