

Organic/Inorganic Hybrid Nanocomposites for Optoelectronic Devices

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Organic/inorganic hybrid nanocomposites comprising conducting polymers and inorganic nanoparticles have the potential to enable optoelectronic devices with lower manufacturing costs compared to compound semiconductor materials. In addition, the ability to combine different nanoparticles without limitations due to strain or contamination could broaden the functionality of a given device. A widely acknowledged, fundamental challenge to using these materials is controlling nanoscale morphology in thin films deposited by solution-based techniques. Such control is critical to improving charge transport, for example, which is directly related to overall device efficiency and depends on factors such as interchain packing of polymer films and nanoparticle distribution within polymer films.

This talk will present research in progress to apply hybrid nanocomposites to infrared photodetection. In addition, a relatively new thin-film deposition technique known as matrix-assisted pulsed laser evaporation (MAPLE) will be presented. MAPLE is very promising in that it can address the nanoscale morphology challenge and it has the potential to revolutionize conducting-polymer-based devices by enabling device heterostructures analogous to those achieved using semiconductor epitaxy. Recent results demonstrating the potential of this approach will be presented.

Bio:

Adrienne D. Stiff-Roberts is an Assistant Professor in the Department of Electrical and Computer Engineering at Duke University. Dr. Stiff-Roberts received both the B.S. degree in physics from Spelman College and the B.E.E. degree in electrical engineering from the Georgia Institute of Technology in 1999. She received an M.S.E. in electrical engineering and a Ph.D. in applied physics in 2001 and 2004, respectively, from the University of Michigan, Ann Arbor. Dr. Stiff-Roberts is a recipient of the National Science Foundation CAREER Award (2006), the Office of Naval Research Young Investigator Award (2007), the IEEE Early Career Award in Nanotechnology of the Nanotechnology Council (2009), and the Presidential Early Career Award in Science and Engineering (2009).