Materials Science and Engineering Department

Winter Seminar Series

Light-Matter Interactions at the Nanoscale in Thin-Film Optoelectronic Materials and Devices

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11AM-12PM | Hill Seminar Room (LeBow 240)

In thin-film optoelectronic devices, manipulation of light below the diffraction limit in a two-dimensional plane is necessary for efficient light utilization within the semiconductor active layer. Metasurfaces are emerging as promising materials for this purpose because of their extreme thinness and their ability to localize the electric field of light at their surface. In this talk, our research on improving light trapping and light extraction in organic semiconductor thin films using plasmonic metasurfaces will be presented. Interactions between localized and propagating surface plasmon polaritons and the excitonic transitions of a variety of organic semiconducting materials will be discussed and ways in which these interactions may be optimized for particular optoelectronic applications will be presented. In addition, fundamental research on the interaction of light with nanostructures will be presented including studies of nanoscale optical antennas, plasmonic nanolasers and luminescent carbon dots.

Dr. Diedre O'Carroll is an Associate Professor in the Departments of Materials Science & Engineering and Chemistry & Chemical Biology at Rutgers University. She obtained her B.E. in Electrical Engineering in 2002, and a PhD in Microelectronics in 2008 at University College Cork and the Tyndall National Institute, Ireland. Prior to joining Rutgers in 2011, she conducted postdoctoral research in plasmonics at California Institute of Technology in the US and at the University of Strasbourg and CNRS in France. She has published more than 80 papers and 3 patents in the areas of nanophotonics, thin-film optoelectronic materials, nanofabrication and metasurfaces. She is a recipient of a Marie Curie International Fellowship (2009), National Science Foundation CAREER Award (2016), an ACS Young Investigator Award in Polymer Material Science and Engineering (2017) and a SFI Future Research Leaders Award (2018). She also serves as an associate editor for the journal ACS Applied Optical Materials and as a founding member of PhotonicsNJ.

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