



THE SALZBERG CHEMISTRY SEMINAR SERIES



The City College
of New York



Monday, November 7, 2022 @ 12:00 noon – MR1027

Light-Matter Interactions at the Nanoscale in Thin-Film Organic Optoelectronics and Carbon Nanomaterials

Deirdre M. O'Carroll
Department of Chemistry
Rutgers University



Abstract: 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, recent work 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 polymer materials will be discussed and ways in which these interactions may be optimized for particular optoelectronic applications will be presented.

In addition, our recent research on the synthesis, structural and optical characterization of luminescent carbon-based nanomaterials will be presented. Carbon dots (CDs), are an emerging class of nanomaterial that exhibit strong photoluminescence that is tunable based on their structure and surface functional groups. Light-emitting applications of CDs rely on their optical properties in the solid state, which are often overlooked. Here, we investigate the structure and optical properties of CDs, not only in different solvents, but also in several solid matrices, and the suitability of CDs for use as color-converting layers in light-emitting applications is examined.

Biography: Deirdre O'Carroll is an Associate Professor in the Departments of Materials Science & Engineering and Chemistry & Chemical Biology at Rutgers University. Her research areas include nanophotonics, organic optoelectronics and energy materials. 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 is a recipient of a National Science Foundation CAREER Award (2016), an American Chemical Society Young Investigator Award in Polymer Material Science and Engineering (2017) and a Science Foundation Ireland Future Research Leaders Award (2018). She is an associate editor for the journal ACS Applied Optical Materials and a member of the editorial advisory board for APL Photonics.

Join Meeting in-person at MR-1027 or on Zoom at:

<https://ccny.zoom.us/meeting/register/tZYuf-2orDorG9EdR3m8V2yHJsoO9O4cusPY>