UC San Diego
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SEMINAR SERIES

Wednesday, October 9, 2019
Seminar Presentation: 11:00am – 12:00pm
SME room 248

"Infrared plasmonic metal oxide nanocrystals"

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Abstract: Metal oxide nanocrystals doped with a few percent of aliovalent dopants become electronically conducting and support strong light-matter interactions in the infrared due to localized surface plasmon resonance (LSPR). I will discuss our efforts to quantitatively characterize the optical properties of doped metal oxide nanocrystals, focusing on the the prototypical material, tin-doped indium oxide ($Sn:In_2O_3$). Both the far-field optical properties (i.e., absorption spectra) and near-field optical properties (i.e., near-field enhancement of the electric field of incoming light) depend non-trivially on nanocrystal doping and size. This dependence is due in part to the presence of a thin depletion layer at the nanocrystal surface where the free electron concentration is strongly depressed compared to the core of the nanocrystal. I will present results that inform our understanding of depletion and how it affects optical and electronic properties of nanocrystals and their assemblies, concluding with chemical strategies that can mitigate, or even eliminate, depletion effects and thereby enhance optical and electronic properties.

Biosketch: Delia J. Milliron is a Professor in the McKetta Department of Chemical Engineering at the University of Texas at Austin. She also serves as an Associate Editor for the journal *Nano Letters*. Dr. Milliron received her PhD in Chemistry from the University of California, Berkeley, in 2004. From 2004 to 2008 she worked for IBM's research division, initially as a postdoctoral researcher and subsequently as a member of the research staff. In 2008, she joined the research staff at the Molecular Foundry, Lawrence Berkeley National Lab, where she served as the Director of the Inorganic Nanostructures Facility and later as the Deputy Director. Dr. Milliron's research involves nanocrystal-based materials in which abundant interfacial area and confined volume produce drastically different properties than those of homogeneous bulk materials. Such properties represent a growing opportunity to design materials to meet simultaneous, sometimes disparate performance requirements for applications including electronics and clean energy. Dr. Milliron's awards include a Sloan Research Fellowship, a DOE Early Career award, a Resonate Award from Caltech's Resnick Institute, the Norman Hackerman Award from the Welch Foundation, the Edith and Peter O'Donnell Award in Engineering from The Academy of Medicine, Engineering & Science of Texas, and the Inorganic Nanoscience Award from the American Chemical Society.

Dr. Milliron has experienced diverse research environments from industry to national lab to academia. She often advises students on navigating successive career decisions in accordance with their values and passions. Her own passion for mentoring and for pushing the frontier of materials knowledge has illuminated a fulfilling pathway filled with puzzle solving and personal development for herself and her colleagues. Having been fortunate to have so many opportunities to work with collaborative teams from diverse backgrounds, Dr. Milliron enjoys sharing her perspective with students starting down their own professional paths.