

CHEMICAL ENGINEERING

SEMINAR SERIES



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Nanocrystal electrochromic smart windows

ABSTRACT: Degenerately doped metal oxide semiconductors, like ITO, exhibit plasmonic resonance at near and mid-infrared wavelengths tunable by varying their composition. Nanocrystals of many such materials have now been synthesized and applications are emerging that leverage the responsiveness of their localized surface plasmon resonance (LSPR) to electronic charging and discharging. In this talk, I'll focus on how we are applying this concept to develop electrochromic glass that can dynamically control heat loads and daylighting in buildings. We demonstrated that dual-band electrochromism (voltage control over near infrared and visible light transmittance independently) is achievable by embedding plasmonic ITO nanocrystals in a redox-active niobium oxide glass matrix. To develop a practical technology on the basis of this concept, the component materials and their mesoscale architecture can both be optimized so that we now can modulate a large fraction of incident solar radiation on demand. To enable low-cost manufacturing, we've also developed low-temperature processing strategies and have now fabricated complete dynamic glass prototypes. The materials innovations needed to enable this progress will be emphasized.

RECEPTION 3:30 • LECTURE 4:00 – 5:00
PHYSICS ASTRONOMY BLDG. (PAA) A110



CHEMICAL ENGINEERING

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BIOGRAPHY: Delia J. Milliron is an Associate Professor in the McKetta Department of Chemical Engineering at the University of Texas at Austin and a Fellow of the Henry Beckman Professorship. 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 awards include a Sloan Research Fellowship, a DOE Early Career award and a Resonate Award from Caltech's Resnick Institute.