JONATHAN OWEN

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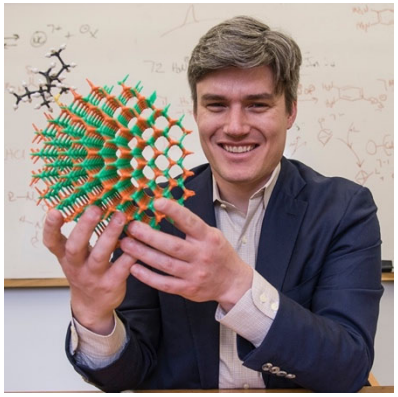

Thursday, January 25th

10:30am - 11:30am

Steele 006

"The mechanisms governing colloidal Quantum Dot size and size distributions"

Abstract: The size and shape homogeneity of modern colloidal semiconductor nanocrystals or 'Quantum Dots' (QDs) result in their characteristically narrow photoluminescence linewidths. This narrow and tunable luminescence is driving the cutting edge in display technologies and can increase the luminous efficacy of commercially viable solid state lighting devices by > 25%. These properties stem from the extraordinary size and size distributions characteristic of colloidal synthesis, properties that are optimized empirically rather than on a sound understanding of the mechanism controlling their formation. My lecture will described the history of QD development leading to the 2023 Nobel Prize in Chemistry and our mechanistic investigations of the pathways that govern size and polydispersity. Our work has demonstrated the surprising finding that size and size distributions are primarily governed by the reactivity of nanocrystals toward monomer attachment rather than the conventional "burst of nucleation" and diffusion limited growth hypothesis that has dominated synthetic design for the last 40 years. I will also describe a one pot synthesis of core-shell and graded alloy QDs whose microstructure is optimized for high flux solid state lighting applications.

Bio: Jonathan Owen obtained a BS from the University of Wisconsin-Madison in 2000, a PhD from Caltech in 2005 and was a postdoctoral researcher at UC Berkeley until 2009. In 2009 he joined the faculty at Columbia University where he is currently Associate Professor of Chemistry. His group studies the coordination chemistry of colloidal semiconductor nanocrystals, as well as the mechanism of nanocrystal nucleation and growth. He has received several awards for his work including: The 3M Nontenured Faculty Award (2010); The Early Career Award from the Department of Energy (2011); The DuPont Young Faculty Award (2011); A Career Award from the National Science Foundation (2012); The Award in Pure Chemistry from the American Chemical Society (2016); The Lenfest Distinguished Faculty Fellowship from Columbia University (2023); and the Award in Inorganic Nanoscience from the American Chemical Society (2023).