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Degenerately Doped Colloidal Quantum Dots: Redox and Spectroscopic Properties

Doping semiconductors transforms their physical properties and introduces new functionality that enables many powerful technologies, from transistors to solar cells. Recent years have seen growing interest in new technologies based on colloidal semiconductor nanocrystals (quantum dots), capitalizing on their low-cost synthesis and processability, and on the attractive physical properties accessed in the quantum-size regime. Whereas quantum-dot impurity doping has matured as a component of the chemist's toolbox for tuning such physical properties, electronic (n- or p-type) doping under equilibrium conditions remains a major challenge, and as a consequence many properties of degenerately doped quantum dots remain poorly defined. This talk will present some of our group's recent experiments in nanocrystal doping, redox chemistry, potentiometry, and spectroscopy aimed at transforming colloidal quantum dots from nearly intrinsic to semi-metallic semiconductor nanocrystals and elucidating the resulting unique physical properties.



Daniel R. Gamelin

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Daniel R. Gamelin received his B.A. in chemistry from Reed College, spent a year as a visiting scientist at the Max-Planck-Institut für Strahlenchemie, and earned his Ph.D. in chemistry from Stanford University working with Edward I. Solomon in the fields of inorganic and bioinorganic spectroscopies. Following a postdoctoral appointment working with Hans U. Güdel (University of Bern) studying luminescent inorganic materials, he joined the chemistry faculty at the University of Washington, Seattle (2000), where he presently holds the Nicole A. Boand Endowed Chair in Chemistry and serves as inaugural Director of the UW Molecular Engineering Materials Center

(NSF MRSEC). His research involves the development of new inorganic materials with unusual electronic structures that give rise to desirable photophysical, photochemical, magnetic, or magneto-optical properties. Prof. Gamelin has received numerous honors for his work including the ACS DIC Inorganic Lectureship Award, the Dalton Transactions Americas Lectureship Award, the ACS DIC Inorganic Nanoscience Award, and the Debye Chair Professorship at Utrecht University. He is a Fellow of the Royal Society of Chemistry, a Senior Fellow of the Zukunftskolleg at the University of Konstanz, a Fellow of the American Association for the Advancement of Science (AAAS), a Scialog Fellow of Research Corporation, and a member of the Washington State Academy of Sciences. He is presently an Associate Editor for the Royal Society of Chemistry journal *Chemical Communications*.



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