INORGANIC CHEMISTRY SEMINAR

Prof. Robert J. Gilliard

Department of Chemistry, University of Virginia

"Beryllium, Boron, and Bismuth: From Fundamental Redox Chemistry to Luminescent Materials"

Abstract: Research efforts in the Gilliard laboratory span diverse areas of chemical synthesis. While the redox chemistry of transition metals is established, the development of main-group element-mediated redox cycles remain a major challenge. This is in part due to inherent differences in electronic structure and the highly reactive nature of main-group elements in low oxidation states. Thus, we have been interested in the design and isolation of low-valent and cationic main-group compounds that impact energy-relevant molecular transformations, including reactions with small molecules (e.g., carbon dioxide, dihydrogen). Our work has mostly centered around establishing bonding and reactivity trends among the alkaline earth metals (Be, Mg) and heavy pnictogens (Sb, Bi). Recently, we have begun to study heterocycles "doped" with boron for the development of new π-electron materials with unusual bonding and photophysical properties. This has led to the first examples of pyrene-fused N-heterocyclic boranes, thermochromic and thermoluminescent borafluorenes, and stable boracyclic radicals. Our primary goal has been to isolate molecules in rare electronic states and to provide a link between structure and function. This presentation will highlight our most recent results in these research areas.

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More information: jzabala@chem.ucla.edu

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