INORGANIC SEMINAR

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Pushing the Limits of the Uranium$^{4+/5+}$ Redox Couple

Air- and moisture-free uranium chemistry alleviates the undesired ligand rearrangements and spontaneous oxidation state changes observed frequently in aqueous environments. This finer control over the coordination behavior of uranium coordination complexes afforded by inert environments can be harnessed to better understand and manipulate uranium's properties to induce a desired effect. One of our research goals is to better control the redox potential between neighboring oxidation states, and here, we are expressly searching to meaningfully effect the $U^{4+/5+}$ redox couple and stabilize the U^{5+} oxidation state. We will present our synthetic efforts towards accessing coordination compounds bearing the U^{5+}, $5f^1$ nucleus using a combination of rational ligand design and chemical reactivity. This talk will discuss the importance of hard donating ligands, chemical reactivity induced by U^{4+} centers, and the benefits of including novel metalloligands in synthesis, to further stabilize high-valent uranium. An array of characterization techniques was employed for all compounds, including solid-state X-ray crystallography, absorption and IR spectroscopy, cyclic voltammetry, as well as computational validation for some of the more exotic systems.

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