

INORGANIC CHEMISTRY SEMINAR



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“f-Block metal-arene interactions: from inverse sandwiches to redox chemistry”

Abstract: Recent years have witnessed the breakthrough of identifying unusual oxidation states of f-block elements in molecular compounds such as divalent rare earth metals and actinides, as well as tetravalent terbium and praseodymium. By taking advantage of the symmetry and energy match between the f/d orbitals of low-valent f-block ions and π^* orbitals of arenes, we synthesized a series of metal arene complexes featuring an inverse-sandwich structure. We found that δ bonds are responsible for the unusual stability of the tetranionic arene anions in such compounds. Moreover, f-block ions show a significant covalent character, and the extent of covalent interaction increases according to the order: rare earth metals < thorium < uranium. Inspired by these metal-arene δ bonding interactions, as well as the traditional π -donor character of arene ligands, we designed a tripodal-type tris(amide) ligand system featuring an arene anchor. We anticipated that the amphiphilic nature of the arene backbone may support both low and high valent f-block metal centers. This strategy allowed us to stabilize multiple oxidation states of f-block metals with a single ligand and opened up new avenues in the redox chemistry of these ions.

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