

INORGANIC SEMINAR

Rare-Earth Element Separations through Molecular Approaches Leveraging Thermodynamic, Kinetic, and Magnetic Properties

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Technological advances in recent years have continued to increase demand and dependence on rare-earth (RE) metals, La-Lu, Sc, and Y. Despite their name, challenges in obtaining these relatively common metals arise from difficulties in separations rather than their abundance. Current industrial methods of RE separations utilize counter-current solvent-solvent extraction which is both energy and solvent intensive. The negative environmental impact of this method limits its use in the United States. To increase domestic production of RE metals, greener methods must be developed. Molecular approaches to RE separations have been garnering more attention in recent years with a focus on reducing waste produced. The TriNOx ligand system has shown great versatility allowing for determination of speciation in solution and subsequent ligand tuning to optimize relevant separations. Separations based on variations in thermodynamic, kinetic, and magnetic properties will be discussed.

Seminar time will be shared with Stephen Yachuw



Tuesday, April 1, 2025



12:30 pm



BRWN 4102

INORGANIC SEMINAR

CEST Contrast Agents: Exploring Recent Efforts to Replace Gadolinium in the MRI Contrast Process

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MRI imaging is a powerful diagnostic tool to map the soft matter of the body. Contrast agents can be used to better visualize ailments which may be hard to identify in a standard MRI image. Traditional contrast agents work by shortening relaxation times, amplifying MRI signal in the body surrounding these ailments. Most contain a Gadolinium (Gd^{3+}) ion, favored for its high paramagnetism ($S=7/2$, $4f^7$) and stable binding to acyclic, EDTA-like scaffolds. In the past 20 years, however, concerns regarding toxic Gadolinium accumulation have necessitated a shift in focus towards alternative contrast strategies. One such strategy is Chemical Exchange Saturation Transfer (CEST), in which ligand amide and hydroxide hydrogens are exchanged for hydrogens from bodily sources of water. This overview will cover the theory of such CEST processes as well as early representative examples of both organic and inorganic CEST agents.

Seminar time will be shared with Andrew Mitchell



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