Glenn T. Seaborg Center Postdoctoral Candidate Seminar

Matrix Isolation Infrared Spectroscopic and Theoretical Investigations on Transition, Lanthanide and Actinide Metal Reaction Products

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Building 70A, Room 3377

Matrix isolation infrared spectroscopy combined with the laser ablation technique is a powerful tool to prepare and characterize transient metal containing species. With the identification of the products, it is also possible to probe the reaction mechanisms of metal atoms and small molecules. Comparisons with theoretical results provide further confirmation to our experimental observations. In this talk, I will discuss my recent work on the reactions of transition, lanthanide and actinide metal atoms with small molecules. For transition metals, I will focus on the structures and formation mechanisms of oxygen rich species such as transition metal superoxide, peroxide and ozonide complexes. Reactions involving actinide atoms are limited to uranium and thorium. These two metal atoms react with methanol and dimethyl ether to give the association complexes and insertion products. Tetravalent product molecules with M=O double bonds are also formed. The lanthanide results will include reactions with methanol and fluoroform, which exhibit unique trends in their reaction mechanisms and vibrational frequencies across the whole lanthanide series. Our latest studies on a series of metal oxyfluoride molecules will also be presented, which reveal interesting structures.

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