

Actinide Chemistry in the Gas Phase

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Gas-phase reactions between metal ions and molecular reagents offer a powerful approach for probing fundamental chemistry. Studies with the d-block transition and 4f lanthanide metals have been reported extensively, whereas previous work with 5f actinides has been limited to Th and U. Metal ion-molecule reactions are well suited for systematically studying radioactive and scarce actinides in regards to their electronic structures and energetics. Of special interest are the direct and indirect roles of the quasi-valence 5f electrons in bonding. With recent work employing Pa-231 and Es-253, we have now examined essential aspects of gas-phase chemistry of the first ten transactinium elements, Th through Es. Our recent results, the systematic relationships among the actinides, and their relevance to condensed-phase f-element chemistry will be discussed. [Research sponsored by the Division of Chemical Sciences, Geosciences, and Biosciences, U. S. Department of Energy, under contract DE-AC05-00OR22725 with Oak Ridge National Laboratory, managed and operated by UT-Battelle, LLC.]

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