

COVALENT AND NONCOVALENT INTERACTIONS BETWEEN BORON AND ARGON: AN INFRARED PHOTODISSOCIATION SPECTROSCOPIC STUDY OF ARGON-BORON OXIDE CATION COMPLEXES

JIAYE JIN, WEI LI, GUANJUN WANG, MINGFEI ZHOU, *Fudan University, Department of Chemistry, Shanghai, China.*

Although a wide range of compounds of the heavy rare-gas elements are experimentally known, very few chemically bound molecules have been experimentally observed for the lighter noble gases. Here we report a combined infrared photodissociation spectroscopic and theoretical study on a series of argon-boron oxide cation complexes prepared via a laser vaporization supersonic ion source in the gas phase. Infrared spectroscopic combined with state-of-the-art quantum chemical calculations indicate that the $[\text{ArB}_3\text{O}_{4,5}]^+$, $[\text{ArB}_4\text{O}_{5-7}]^+$ and $[\text{ArB}_5\text{O}_7]^+$ cation complexes have planar structures each involving an aromatic boroxol ring and an argon-boron covalent bond formed between the in-plane 2p atomic orbitals of Ar and boron. In contrast, the $[\text{ArB}_3\text{O}_4]^+$ cation complex is characterized to be a weakly bound complex with a BO chain structure.