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Photoelectron Spectroscopy of Mixed-Metal Clusters CHARLES JONES, UJJWAL GUPTA, JOSHUA MELKO, The Pennsylvania State University, PENE CLAYBORNE, J. ULISES REVELES, SHIV KHANNA, Virginia Commonwealth University, A. WELFORD CASTLEMAN, The Pennsylvania State University — The eventual synthesis and characterization of nanoscale materials requires an understanding of their growth mechanisms, electronic characteristics, and the dynamics of excitation and relaxation. We study the evolution of electronic and geometric stability with cluster size. The techniques of magnetic bottle photoelectron spectroscopy and velocity map imaging are employed to characterize the electronic properties of mixed-metal clusters. One direction of the studies in our laboratory focuses in on all-metal aromatic clusters (Al_3M where $\text{M} = \text{As}, \text{Sb}, \text{and Bi}$). These clusters have delocalized electron orbitals reminiscent of aromatic molecules like benzene. The data additionally show that these all-metal aromatics have low electron affinities, high ionization potentials, and large HOMO-LUMO gaps. Additionally, we are trying to correlate the stability of solution phase synthesized Zintl ions in the gas phase using the well-known Jellium model and 3-D aromaticity concepts. A recent example includes the presence of highly stable BiSn_4^- , BiSn_8^- and BiSn_9^- clusters in the gas phase, which can be represented by Sn_5^{2-} , Sn_9^{2-} and Sn_{10}^{2-} Zintl ions, respectively.

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