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Helium Droplet Mediated Cluster Assembly as a Tool to Probe the Limits of Energy Storage in Metastable Nanomaterials CLARON RIDGE, KYLE OVERDEEP, Air Force Research Lab/University of Dayton Research Istitute, ROBERT BUSZEK, JERRY BOATZ, MICHAEL LINDSAY, Air Force Research Lab — The recent efforts of our laboratory have been focused on helium droplet mediated deposition as a tool to synthesize novel materials in a pre-reactive, metastable state. We have fabricated a range of materials by varying the composition, cluster size, stoichiometry, and cluster film thickness. Cluster films have been characterized via transmission electron microscopy (TEM), X-ray photoelectron spectroscopy (XPS), and temperature programed desorption/reaction (TPD/R). The results have been surprising and raise questions about the fundamental behavior of cluster behavior during and after deposition onto a surface. In particular the unusual inversion of core/shell Mg/Cu clusters, which has motivated further density functional theory (DFT) calculations investigating the formation and stability of composite nanoclusters. [1,2] While Helium droplet deposition has proved to be an attractive technique for investigating a wide variety of research areas, from catalysis[3] to quantum superfluidity,[4] our goal remains probing the limits of metastability in reactive nanomaterials (e.g. nanothermites). [1] J. Chem. Phys., 2015, 142 (8) 084307 [2] J.Phys.Chem.A, 2016, 120 (48), 9612 [3] J.Phys.Chem.Lett., 2016, 7 (15), 2910 [4] Phys.Rev.Lett., 2012, 108, 155302

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