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Transitioning the Superfluid Helium Droplet Assembly into a Technology: Synthesis of Nanometer Scale Energetic Films using SHeDA S.B. EMERY, K.B. RIDER, B.K. LITTLE, R. CLEAVER, C.M. LINDSAY, Air Force Research Laboratory Energetic Materials Branch — Since the pioneering work of the Toennies, Scoles, and Northby groups in the early 1990's, dozen of instruments around the world have been constructed to produce and study beams of superfluid helium nanodroplets. The technique has been exploited to shed light on a wide range of topics in chemical physics such as atomic scale manifestations of superfluidity, chemistry at ultra-low temperatures, and the assembly of exotic Van der Waals complexes to name a few. The helium droplet method has been considered for more applied use as a tool for isotope enrichment, low-fragmentation ionization mass spectrometry, and synthesizing/depositing core-shell spintronic nanoparticles. Indeed, the helium droplet methodology is in the midst of transitioning from a novel cryogenic nano-scale matrix in which to perform fundamental research into a technology for synthesizing, characterizing, and manipulating material. This talk describes our efforts to engineer a robust, user-friendly, broadly-tunable helium droplet apparatus capable of synthesizing composite nanoparticles and depositing them into films. This device is now being used to assemble and deposit metallic nanoparticles, and the efficiency of the process is being investigated. The physical details of the design, performance of the instrument, and our progress at understanding the deposition process will be presented. Distro 96ABW-2011-0266.

Samuel Emery
Air Force Research Laboratory Energetic Materials Branch

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