

Abstract Submitted
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Nano-Assemblies using Designer Clusters A.C. REBER, M. QIAN, S.N. KHANNA, Virginia Commonwealth University, A.W. CASTLEMAN JR., A. SEN, K.M. DAVIS, S.J. PEPPERICK, A. UGRINOV, M.D. MERRITT, Penn State University — It is shown that a new procedure that combines studies on clusters in gas phase, theoretical investigation of the stability patterns, and the directed assembly in solutions can enable synthesis of nano-assemblies where the building blocks are designer clusters identified in gas phase. As a demonstration of its viability, we first examine As_7K_3 as a potential building block through gas phase molecular beam experiments starting from a dispersed mixture of bulk arsenic and potassium. Combining the experimental results with first principles electronic structure calculations, we identify As_7K_3 species as a uniquely stable Zintl entity that could affect self-assembly. Through directed assembly, we report success in synthesizing and characterizing a lattice of analogous super-cluster assembled material crystallized from the liquid phase. Electronic structure calculations on the nanoassembled material indicate that it is a wide band gap semiconductor.

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