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Ultrasmall Carbide Nanospheres - Formation and Electronic Properties PETRA REINKE, EHSAN MONAZAMI, University of Virginia, JOHN MCCLIMON, University of Pennsylvania — Metallic nanoparticles are highly coveted but are subject to rapid Ostwald ripening even at moderate temperatures limiting study of their properties. Ultrasmall transition metal carbide "nanospheres" are synthesized by a solid-state reaction between fullerene as carbon scaffold, and a W surface. This produces nanospheres with a narrow size distribution below 2.5 nm diameter. The nanosphere shape is defined by the scaffold and densely packed arrays can be achieved. The metal-fullerene reaction is temperature driven and progresses through an intermediate semiconducting phase until the fully metallic nanospheres are created at about 350 C. The reaction sequence is observed with STM, and STS maps yield the local density of states. The reaction presumably progresses by stepwise introduction of W-atoms in the carbon scaffold. The results of high resolution STM/STS in combination with DFT calculations are used to unravel the reaction mechanism. We will discuss the transfer of this specific reaction mechanism to other transition metal carbides. The nanospheres are an excellent testbed for the physics and chemistry of highly curved surfaces.

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