

Abstract Submitted
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Reversed Nanoscale Kirkendall Effect in Au–InAs Hybrid Nanoparticles¹ JING LIU, ANATOLY FRENKEL, Dept of Materials Science and Chemical Engineering, Stony Brook University, YORAI AMIT, URI BANIN, The Institute of Chemistry and The Center for Nanoscience and Nanotechnology, Hebrew University — Metal-semiconductor hybrid nanoparticles (NPs) have synergistic properties that have been exploited in photocatalysis, electrical, and optoelectronic applications. Rational design of hybrid NPs requires the knowledge of the underlying mechanisms of diffusion of the metal species through the nanoscale semiconductor lattice. The importance of understanding and controlling the co-diffusion of different constituents is demonstrated in the synthesis of various hollow-structured NPs via the Kirkendall effect. We used time-resolved X-ray absorption fine structure spectroscopy, X-ray diffraction and electron microscopy to monitor the diffusion process of Au atoms through InAs nanocrystals in real time. In this system the diffusion rate of the inward diffusing species (Au) is faster than that of the outward diffusion species (InAs), which results in the formation of a crystalline metallic Au core surrounded by an amorphous, oxidized InAs shell. These observations indicate that in hybrid Au-InAs NPs the rarely observed “reversed nanoscale Kirkendall effect” is in play. It presents a potentially new way to synthesize unique nanoscale core-shell structures.

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Jing Liu
Dept of Materials Science and Chemical Engineering, Stony Brook University

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