Scientists capture live, atomic-level detail of nanoparticle formation

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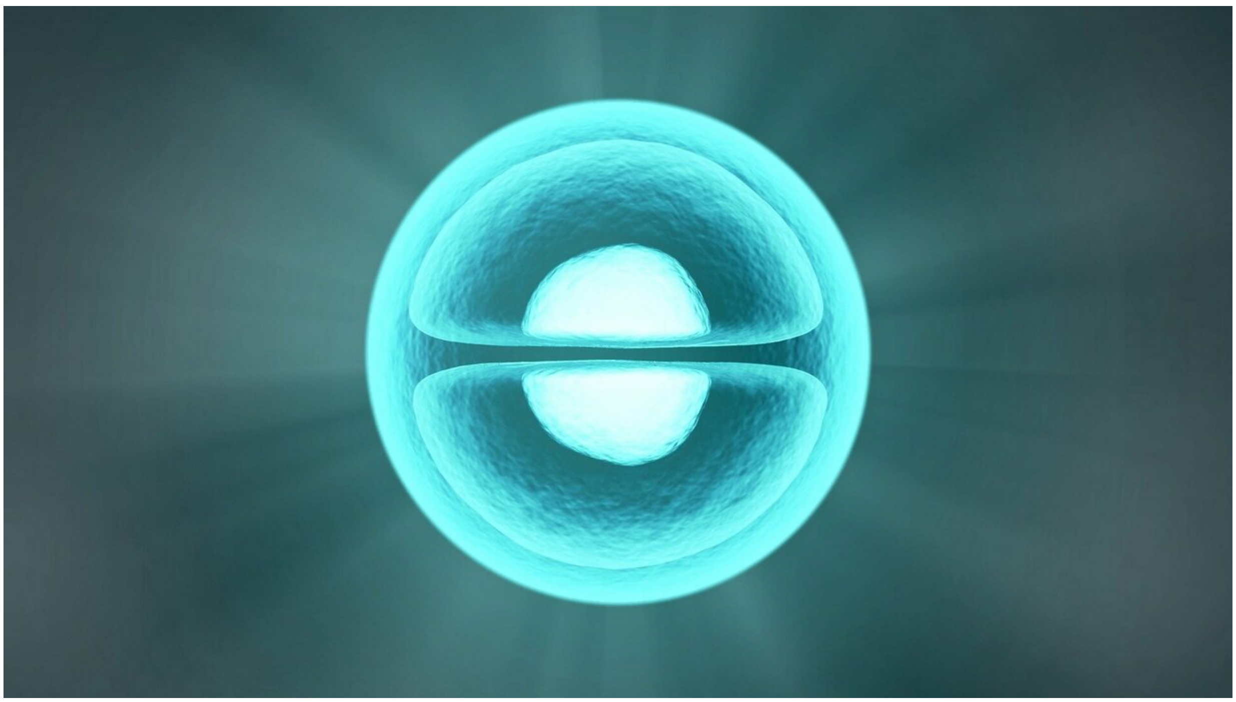

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Scientists at the Sensitive Instrument Facility of the U.S. Department of Energy's Ames Laboratory achieved real-time atom rearrangement monitoring using aberration-corrected scanning transmission electron microscopy during the synthesis of intermetallic nanoparticles (iNPs).

In collaboration with Wenyu Huang, an associate professor in the

Department of Chemistry at Iowa State University and a scientist at Ames Laboratory, they examined nanoparticles made of a platinum-tin alloy. These unique iNPs have applications in energy-efficient fuel conversion and biofuel production, and are one focus of Huang's research group.

"In the formation of these materials, there was a lot of information missing in the middle that is useful to us for optimal catalytic properties tuning" said Huang.

By tracking the movement of metal atoms of platinum and tin during formation of iNPs using advanced microscopy at high temperature, intermediate phases were discovered with their own unique set of catalytic properties.

"Conventional material synthesis focuses on the beginning and the end of a reaction, without much understanding of the pathway. Atomic-level observation of the alloying process led to the discovery of the reaction route," said Lin Zhou, a scientist in Ames Laboratory's Division of Materials Sciences and Engineering. "Once we knew intermediate states in between, we could control the reaction to 'stop' at that point. That opens up a new way to predict and control our discovery of new materials."

The research is further discussed in the paper, "Toward Phase and Catalysis Control: Tracking the Formation of Intermetallic Nanoparticles at Atomic Scale."

More information: Tao Ma et al. Toward Phase and Catalysis Control: Tracking the Formation of Intermetallic Nanoparticles at Atomic Scale, *Chem* (2019). DOI: 10.1016/j.chempr.2019.02.026