Revealing the Growth Behavior of New Nanoparticle Catalysts

Scientific Achievement

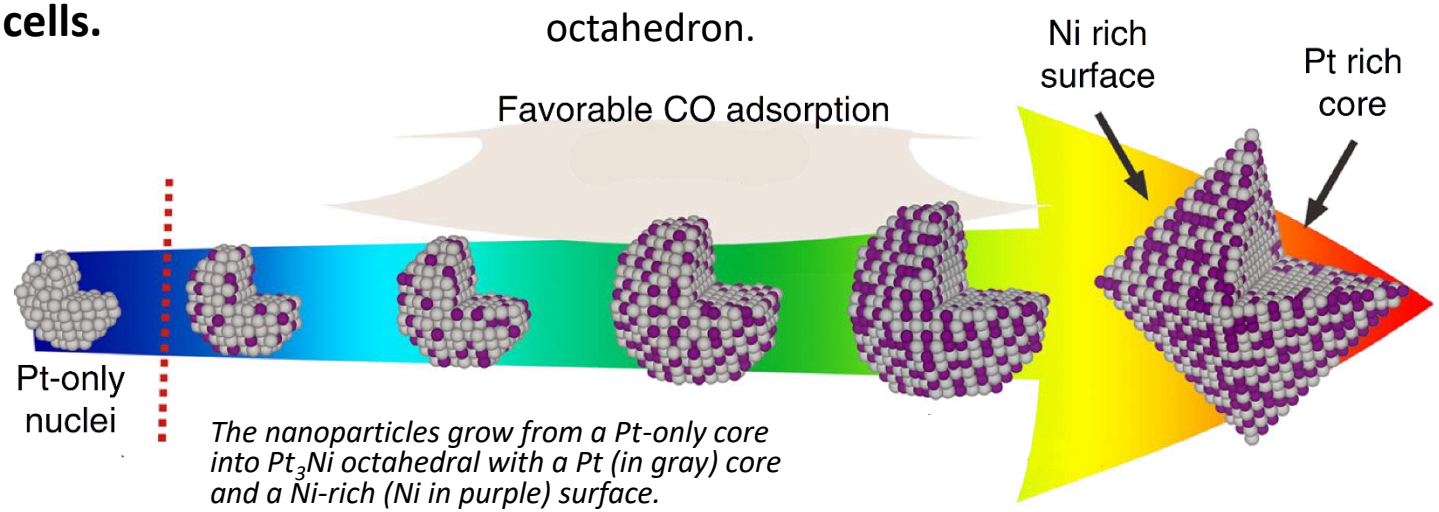
Scientists discovered that carbon monoxide drives the growth of new platinum nickel nanoparticle catalyst.

Significance and Impact

Understanding the growth pathway of faceted alloy nanoparticles at the atomic level is crucial to controlling their properties as a future catalyst for hydrogen fuel cells.

Research Details

- Using a combination of aberration corrected scanning transmission electron microscopy, ambient pressure X-ray photoelectron spectroscopy, X-ray absorption spectroscopy, and first principle computer simulations, a clear pathway for the particle growth and facet formation was revealed.
- Carbon monoxide molecules serve as a *facet formation modulator* and cause the nanoparticle shape to evolve from a spherical cluster to an octahedron.



The nanoparticles grow from a Pt-only core into Pt_3Ni octahedral with a Pt (in gray) core and a Ni-rich (Ni in purple) surface.

X. Shen, C. Zhang, S. Zhang, S. Dai, G. Zhang, M. Ge, Y. Pan, S. M. Sharkey, G. W. Graham, A. Hunt, I. Waluyo, J.T. Miller, X. Pan, Z. Peng,. *Nat Comm* 9:4485 (2018).

Work was performed in part at Brookhaven National Laboratory