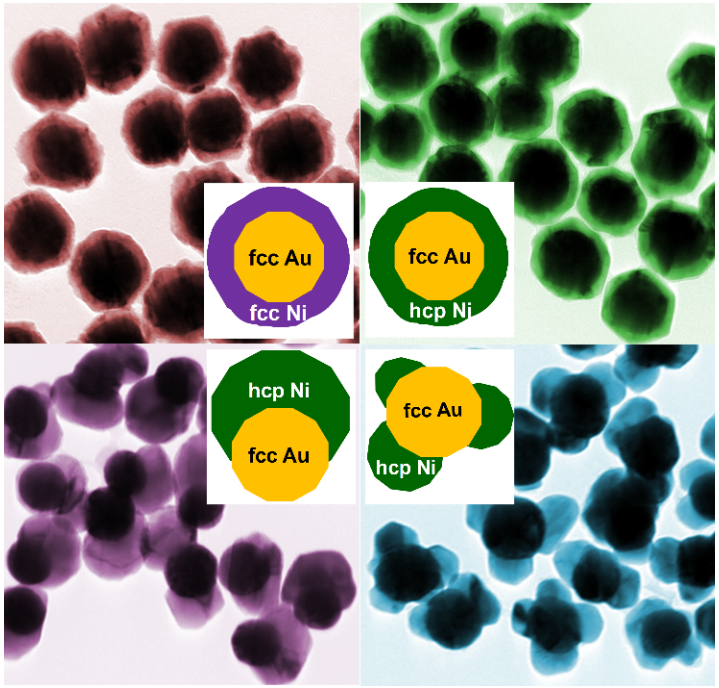
Geometry Control of Lattice-Mismatched Au-Ni Heteronanostructures



Transmission electron microscopy images of geometry-controlled Au-Ni bimetallic heteronano-structures: (*upper left*) Au@fcc Ni core-shell nanocrystals; (*upper right*) Au@hcp Ni core-shell nanocrystals; (*lower left*) Au@hcp Ni asymmetric heterodimers; (*lower right*) Au@hcp Ni multibranched nanoparticles.

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Work was performed at University of South Carolina.

Scientific Achievement

Precise geometry control of lattice-mismatched Au-Ni bimetallic heteronanostructures has been achieved through seed-mediated heteroepitaxial growth in polyols.

Significance and Impact

This work provides an insightful knowledge framework that guides the rational design of synthetic approaches that extend interfacial heteroepitaxy from lattice-matched to lattice-mismatched bimetallic nanocrystal systems.

Research Involved

- Metallic Ni adopting either face center cubic (fcc) or hexagonal close-packed (hcp) crystalline phases can be epitaxially deposited on fcc Au nanocrystals despite the large lattice mismatch between Ni and Au.
- Seed-mediated epitaxial growth enables precise geometry control of a series of Au-Ni bimetallic heteronanostructures.
- The Ni domains in Au-Ni bimetallic heteronanostructures are significantly more stable against etching than monometallic Ni.