Crystal Phase-Engineering of Novel Nanomaterials

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Abstract

In this talk, I will summarize the recent research on the crystal phase engineering of nanomaterials in my group. It includes the first-time synthesis of hexagonal-close packed (*hcp*) Au nanosheets (AuSSs) on graphene oxide, surface-induced phase transformation of AuSSs from *hcp* to face-centered cubic (*fcc*) structures, alternating *hcp*/*fcc* Au square-like plates from AuSSs, ultrathin Au nanowires containing *hcp* phase, synthesis of ultrathin *fcc* Au@Pt and Au@Pd rhombic nanoplates through the epitaxial growth of Pt and Pd on the *hcp* AuSSs, respectively, the first-time synthesis of 4H hexagonal phase Au nanoribbons (NRBs) and their phase transformation to *fcc* Au RNBs, the epitaxial growth of Ag, Pt, Pd, PtAg, PdAg, PtPdAg, Rh, Ir, Ru, Os and Cu on 4H Au NRBs to form the 4H/*fcc* Au@metal core–shell NRBs, and the synthesis of 4H/*fcc*-Au@metal sulfide core-shell NRB heterostructures. In addition, the crystal phase transformation of transition metal dichalcogenide nanomaterials will also be introduced. Currently, my group focuses on the crystal phase-based properties and applications in catalysis, surface enhanced Raman scattering, waveguide, photothermal therapy, chemical and biosensing, etc., which we believe are unique and critically important not only fundamentally, but also practically. Importantly, the concept of crystal phase heterostructures of nanomaterials is proposed.