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Synthesis and Applications of Novel Two-Dimensional Nanomaterials

In this talk, I will summarize the recent research on synthesis, characterization and applications of two-dimensional nanomaterials in my group [1]. I will introduce the synthesis and characterization of novel low-dimensional nanomaterials, such as graphene-based composites [2] including the first-time synthesized hexagonal-close packed (*hcp*) Au nanosheets (AuSSs) on graphene oxide [3], surface-induced phase transformation of AuSSs from *hcp* to face-centered cubic (*fcc*) structures [4], the synthesis of ultrathin *fcc* Au@Pt and Au@Pd rhombic nanoplates through the epitaxial growth of Pt and Pd on the *hcp* AuSSs, respectively [5], the first-time synthesis of 4H hexagonal phase Au nanoribbons (NRBs) and their phase transformation to *fcc* Au RNBs as well as the epitaxial growth of Ag, Pt and Pd on 4H Au NRBs to form the 4H/*fcc* Au@Ag, Au@Pt and Au@Pd core–shell NRBs [6], and the epitaxial growth of metal and semiconductor nanostructures on solution-processable transition metal dichalcogenide (TMD) nanoshees at ambient conditions [7], single- or few-layer metal dichalcogenide nanosheets [8] and hybrid nanomaterials [9], the large-amount, uniform, ultrathin metal sulfide and selenide nanocrystals [10], other 2D nanomaterials [11], nanodots prepared from 2D nanomaterials [12], and self-assembled 2D nanosheets [13] and chiral nanofibers from ultrathin low-dimensional nanomaterials [14]. Then I will demonstrate the applications of these novel nanomaterials in chemical and bio-sensors, solar cells, water splitting, hydrogen evolution reaction, electric devices, memory devices, conductive electrodes, other clean energy, etc.

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