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Journal of Advanced Materials Science Research

Atom-resolved characterization on the growth and structure evolution of nanocrystals

Rongming Wang

University of Science and Technology Beijing, China

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Nanoscale characterization has enabled the discovery of many novel functional materials which started from understanding important relationships between material properties and morphologies. Therefore, nanoscale characterization has become an important research topic in nanoscience. Here we demonstrate the research of the growth and structure evolution of transition metal nanocrystals at atomic scale.

Revealing the catalyst structure and chemistry in the reactive environment at the atomic scale is imperative for the rational design of catalysts. Here, tracking intermetallic Co7W6 nanoparticles with a defined structure and a high melting point by environmental aberration-corrected transmission electron microscope, we directly present the structural and chemical stability of the Co7W6 nanocrystals in methane, carbon monoxide, and hydrogen at the temperature of 700–1100 ºC.

The morphology and structural stability of metal/2D semiconductor interfaces strongly affect the performance of 2D electronic devices and synergistic catalysis. Here we study the structural evolution of Au nanoparticles on few-layer MoS2 by high resolution transmission electron microscopy (HRTEM) and quantitative high-angle annular dark field scanning TEM. It is found that in the transition of Au from nanoparticles to dendrites, a dynamically epitaxial alignment between Au and MoS2 lattices is formed, and Moiré patterns can be directly observed in HRTEM images due to the mismatch between Au and MoS2 lattices.

Biography

He received his bachelor and master's degrees in physics from peking university and Ph. D. in materials science from beijing institute of aeronautical materials, China. After one year visiting scholar in university of california, berkeley, he joined beihang university as a professor in physics in 2005. Currently, he is a professor in university of science and technology beijing, director of beijing key laboratory for magneto-photoelectrical composite and interface science. His research interests include magnetic nanomaterial, transmission electron microscopy and interface science.

He has published over 200 articles including Phys. Rev. Lett., Adv. Mater., Nano Lett. etc. with citations about 10,000 times and H factor 51. He has been awarded the title of national expert with remarkable contributions and state council expert for special allowance and has been serving as session editor of J. Phys. D-Appl. Phys. and editorial board member of reputed journals.

3rd International Conference on Nanomaterials | August 29-29, 2020

Citation: Rongming Wang, Atom-resolved characterization on the growth and structure evolution of nanocrystals, Nanomaterials Congress 2020, 3rd International Conference on Nanomaterials, August 28-29, 2020 | Webinar, 04