



*The Chinese University of Hong Kong
Department of Chemistry
Research Seminar Series*

Speaker: Dr. CHEN Ye
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Title: Metal Nanomaterials with Novel Crystal Phases: Synthesis and Catalytic Applications

<< Abstract >>

Metal nanomaterials possess outstanding catalytic properties in a wide range of reactions. In the past decades, controlled synthesis to fine tune the size, shape, architecture, and composition of metal nanocatalysts to boost their performances has been intensively investigated. Crystal phase represents another important parameter of nanocrystals. However, to date, most efforts on crystal phase engineering of metal nanocrystals rely on extreme conditions such as high pressure and high temperature. It remains difficult to prepare large-scale, free-standing metal nanostructures with unusual crystal phases under ambient condition, hindering a comprehensive understanding on their phase-dependent physicochemical properties. As a result, strategies to further improve the catalytic performances of metal nanomaterials via crystal phase control are yet to be explored.

The seminar starts with introducing the wet-chemical synthesis of Au nanostructures with the novel 4H/*fcc* crystal-phase-heterostructures, which feature the random alternating of 4H and *fcc* crystal phases. Then, by using the Au nanostructures with the pure 4H phase and the mixed 4H/*fcc* phase as templates, a general wet-chemical method for the epitaxial growth of a series of metals with the novel 4H and 4H/*fcc* crystal phases is introduced. In the second part of the seminar, the outstanding catalytic performances of the epitaxially grown Au@Metal core-shell nanocatalysts are demonstrated. Specifically, the superior electrocatalytic performances of 4H/*fcc* Au@Pd in ethanol oxidation reaction, and the phase-dependent electrocatalytic performances of 4H Au@Cu and 4H/*fcc* Au@Cu in carbon dioxide reduction reaction (CO₂RR) are shown. Importantly, a crystal phase-dependent catalytic behavior of Cu in CO₂RR is experimentally observed and theoretically investigated. Lastly, some extended works based on the aforementioned metal nanomaterials are briefly introduced, and some personal perspectives on the future directions in the development of metal nanocatalysts with novel phases are discussed.

Date: November 12, 2019 (Tuesday)

Time: 9:00 a.m.

Venue: L4, Science Centre

