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ABSTRACT BOOK

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[Abstract:0130]

Fabrication, Characterization and Hydrogen Evolution Activity of Three-Dimensional Nickel Nanodomes

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Three-dimensional (3D) Ni nanodomes (NiNDs) were fabricated and characterized for alkaline water electrolysis. The nanodomes were prepared by a combined method of soft lithography-nanosphere lithography and physical vapor deposition (PVD) using polydimethylsiloxane (PDMS) as template. The 3D-NiNDs nanostructures were characterized using scanning electron microscopy and atomic force microscopy. Their hydrogen evolution activities were tested in 6 M KOH solution using electrochemical techniques. The similar studies were repeated for bulk Ni for comparison. The data obtained showed that well-structured and homogenously distributed NiNDs could be fabricated using this combined method. The NiNDs perform excellent hydrogen evolution activity. The higher activity of the domes was related to their large real surface area and good intrinsic electrochemical activity of Ni.

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Keywords: Three-dimensional nickel nanodomes, nanostructures, electrolysis, hydrogen evolution.

[Abstract:0136]

Bimetallic Nanoparticles for Alcohol Oxidation

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Metal nanoparticles (NPs) have investigated in the last decade due to their chemical, physical and mechanical properties as well as their potential applications in catalysis, biology, electronics and optics. Alloying of metals is an effective way of developing new materials that have better technological usage than their monometallic ones. Alloy nanoparticles display different structural and physical properties than bulk samples. Bimetallic alloy nanoparticles received great attention because of nanoparticle catalytic activity depends on their structural features. These nanoparticles could display both the single properties of two metals and new properties due to the synergy between two metals. Moreover, these bimetallic particles could be in a core shell structure or alloy form depending on the preparation method. Core-shell bimetallic nanoparticles can reduce the noble shell metal and retain similar or superior catalytic activity compared to bulk alloy catalysts. Shape and size of mono and bimetallic nanoparticles are strictly dependent on the preparation methods and conditions and affects the physicochemical properties of synthesized material. Electronic structure of nanoparticles could be tuned by synthesizing core-shell structured nanoparticles, leading to produce nanoparticles having controlled shape, size, and structure. It is possible to tune electronic, crystal and surface structure of the nanocatalyst by employing effective nanocatalyst preparation methods. Various methods have been employed to obtain different classes of core -shell nanoparticles, being one of them the dendrimer template route. It is one of the most useful methods to control the particle size, compositions, and structures. This method consists of two main steps: mixing the metal ions with dendrimer and chemical reduction. This method is the best method for preparing small catalytically active nanoparticles. In the present study, the application of palladium bimetallic alloy nanoparticles as electrocatalysts and the comparison of the electrocatalytic activity of alloy and core-shell structures of different bimetallic catalysts for electro-oxidation of alcohol oxidation has been discussed.

Keywords: Bimetallic nanoparticles, alcohol oxidation, core-shell catalysts