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ABSTRACT BOOK

EDITORS
İbrahim DİNÇER
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[Abstract:0047]

The Effect of Diameter of Three-dimensional Silver Nanodomes on Electrochemical Hydrogen Production

Handan Yüksel[1], Ayşe Özbay[2], Mehmet Kahraman[2], Ramazan Solmaz[1]

[1]Bingöl University, Science and Letters Faculty, Chemistry Department, 12000 Bingöl, Turkey

[2]Department of Chemistry, Faculty of Arts and Sciences, Gaziantep University, 27310 Şehitkamil, Gaziantep, Turkey

In this study, three-dimentional (3D) Ag nanodomes (AgNDs) at various diameters were fabricated using combination of soft lithography and nanosphere lithography. A Ni film was electrochemically deposited on the nanodomes which were prepared on PDMS templates to increase its mechanical strength. The 3D-AgNDs were connected to a conductive wire and electrodes were prepared for the measurements. The 3D nanostructures were characterized using scanning electron microscopy and atomic force microscopy. The hydrogen evolution activities of the nanodomes were investigated in 6 M KOH solution and the effect of diameter of the domes were determined. For this aim, cathodic current-potential curves and electrochemical impedance spectroscopy measurements were performed. The activities of the 3D-AgNDs were compared with the activity of bulk Ag electrode. It was found that well-structured AgNDs have higher hydrogen evolution activity than Ag bulk. The activities of the domes depend on their diameter.

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Keywords: Three-dimentional silver nanodomes, electrochemical metal deposition, electrolysis, hydrogen evolution

[Abstract:0058]

Graphene Aerogel Supported Platinum Catalyst for Formic Acid Electrooxidation

Mehmed Selim Çögenli[1], Ayşe Bayrakçeken Yurtcan[2]

[1]Department of Nanoscience and Nanoengineering, Atatürk University, Erzurum, Turkey

[2]Department of Chemical Engineering, Ataturk University, Erzurum, Turkey

Fuel cells are electrochemical energy devices that convert continuously supplied fuel to electricity. Direct formic acid fuel cells (DFAFCs) have attracted considerable attention because they are promising power sources for portable devices. Important issues involved in developing efficient fuel cells are related with the catalyst and catalyst support material. The insufficient activity and durability of electrocatalyst used for formic acid oxidation at the anode is still a major concern. Carbon materials have been widely used as catalyst supports for fuel cells. Vulcan XC-72 carbon black is a popular carbon support because of its high surface area and conductivity. Reduced graphene oxide (rGO) and graphene aerogel (GA) are considered promising candidates for new support materials because of their extraordinary electronic and mechanical properties. The combination of graphene aerogel and carbon may lead to hybrid support materials with improved electrocatalytic activities for application in DFAFCs. The graphene oxide used in this work was prepared from natural graphite powder by a modified Hummers method. The prepared stable suspension (5mg/ml in water) with GO was transferred into a Teflon-lined autoclave with a stainless steel shell and graphene aerogel was obtained by hydrothermal synthesis. In this study, GA and carbon have been employed as hybrid supports for the dispersion of Platinum (Pt) nanoparticles to improve their electrocatalytic activities for the oxidation of formic acid. Chemical reduction method using microwave heating have been applied to the synthesis of Pt nanoparticles supported on the defect sites of hybrid support materials. The as-prepared GA catalyst was characterized by a variety of means such as SEM, EDS, XRD, BET. The electrocatalytic activities of the catalyst is evaluated for formic acid oxidation using electrochemical measurements.

Keywords: Direct formic acid fuel cell, Graphene aerogel, Formic acid electrooxidation