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FSP-P-01

Magnetron sputtering as a feasible technique for palladium deposition and its applications for PEM Fuel Cell Systems

Ioan Iordache, Catalin Ducu*, Laurentiu Patularu, Sorin Moga*, Daniela Ebrasu

National R&D Institute for Cryogenics and Isotopic Technologies- ICIT, Rm Valcea, Uzinei No. 4,240050, Valcea, Romania
**University of Pitesti, Research Center for Advanced Materials, Pitesti, Targu din Vale No. 1, 110040, Arges, Romania*

The performance of a membrane device employing thin palladium-based films for hydrogen purification, as fuel for PEM Fuel Cells, is reported in many papers. This technique allows deposition of thin compact film upon a selected substrate material and ensures simplicity of the catalyst or film preparation as well as improved stability, durability and utilization. This work presents a research on the influence of sputtering parameters (dc power, argon pressure), film thickness/metal loading and substrate material on the surface structure and morphology of palladium thin films. The properties of the sputtered films were studied using X-ray diffraction (XRD). It was found that low sputtering power and sputtering pressure lead to deposition of mechanically stable crystalline Pt films. Sputtering parameters was varied between: 0.3÷10 mTorr argon pressure and 100÷1000 W dc power. The sputtered films exhibit a [111] preferred orientation.

FSP-P-02

AC Impedance tracking of glassy carbon activation

S. Stevanović, V. Panić, A. Dekanski and V. M. Jovanović
ICTM – Department of Electrochemistry, University of Belgrade
Njegoševa 12, P.O.Box 473, 11000 Belgrade, Serbia

Carbon materials, due to their physical and chemical properties, have found wide application in different electrochemical systems. They are often used as substrates for supercapacitors and different types of electrocatalysts. Upon activation, their electrochemical properties are improved. Glassy carbon can be successfully used as a model for studying the process of carbon activation.
In this work, the activation of glassy carbon by electrochemical oxidation in sulfuric acid was investigated using cyclic voltammetry, electrochemical impedance spectroscopy and atomic force microscopy. Glassy carbon was oxidized during the same time at 5 different potentials. Cyclic voltammetry shows that the higher the potential the larger the increase in double layer capacitance is. Impedance measurements confirmed significant changes in capacitive response of activated glassy carbon in comparison to unoxidized state. AFM examination of treated GC surfaces revealed morphological changes and increase in roughness upon oxidation. If combined, the results of these studies show that the activation of glassy carbon proceeds through three stages: oxidation of active site, growing of graphite oxide layer and mechanical destruction of the surface.