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Surface morphology and electrocatalytic properties of nickel nanoparticles formed in track pores

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Abstract

© 2016, Pleiades Publishing, Ltd.Structures, each of which is composed of a conducting substrate with a protective dielectric layer containing an array of equal-sized pores formed under the action of high-energy ions and chemical etching, are created. The created pores are electrochemically filled with nickel nanoparticles. With atomic-force microscopy (AFM), it is established that Ni nanoparticles are generated exclusively within ion tracks without film formation on the surface of a silicon-dioxide layer. Histograms illustrating the nanoparticle-diameter distribution are constructed, and areas of the nickel nanoparticles are calculated. The electrochemical and electrocatalytic properties of Ni nanoparticles inherent to ethanol-oxidation reactions are investigated. The catalytic activity per unit area of the nanocatalyst is estimated using voltammograms, AFM data, and histograms characterizing the particle size distribution.

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Keywords

atomic-force microscopy, electrocatalysis, metal nanoparticles, track technologies