Fabrication of Platinum Catalyst Nanoparticle Arrays

Hakala, Branislav

In my work I present a research conducted with the purpose of improving the platinum based catalysts for hydrogen fuel cell. In my research, I performed series of measurements to determine the best instrument setup for the electron nanolithography. Patterns for lithography were produced analyzed by atomic force microscopy (AFM) and tested. I also fabricated platinum nanoparticles in order to test their catalytic activity by electron lithography and by sputtering. Made nanoparticles with sizes of 40 nm were characterized by AFM and the obtained results were used to improve the setup and the technique. I also conducted a research with a wide scale of materials such as STO or TiN to determine the best materials for a future use. Platinum gradients for a layer thickness test were also fabricated. Layers with thicknesses between 1 to 10 monolayers were used for the evaluation of Pt layers degeneration and EDAX was used and X-ray spectra in range of 0-15 keV were compared for various test conditions ranging from temperature of 150°C to 550°C in nitrogen. Transmission electron microscopy (TEM) was operated in order to characterize the structure of the platinum after the annealing.

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