

Nanomaterials and Technologies for Hydrogen Economy

Vladimir Fateev *

Hydrogen Energy and Plasma Technology Institute RRC "Kurchatov Institute" Kurchatov Square, 1, Moscow, 123182, Russia

Hydrogen economy is the background of energy safety and sustainable development for not far future. Hydrogen energy is one of keys for solution of ecology and energy safety problems of megapolises and large industrial centers. Application of hydrogen energy will first of all result in: - qualitative leap in city transport emission, - increase of energy security quality of most important (sensitive) establishments such as hospitals, government and security bodies, - decrease of ecological impact on nature due to decentralized (for example based on renewables) energy supply of infrastructure in national parks and city recreation zones. But development of hydrogen economy is restrained by some technical (not sufficient efficiency and life time of some apparatus) and economical (high prices large platinum metal consumption) reasons. New nanocatalysts for fuel conversion, electrolyzers, fuel cells; nanostructures solid electrolytes, membranes and membrane-catalyst units; nanostructured absorbents for hydrogen storage; nanofilms and nanocoatings for protection of structural components of apparatus may result in successful solution of large amount of problems. For example, one of the major components of hydrogen energy are PEM fuel cells and electrolyzers. Various types of PEM fuel cells with power of an individual module up to 5 kW were created in the frame of Federal projects. Operating current density up to 1 A/cm² and efficiency factor of batteries up to 60 The problem of creation of highly effective and inexpensive PEM fuel cells, electrolyzers and other hydrogen energy systems is complex scientifically technical task where the nano-materials and nano-technologies play the major role. Development new nanostructural catalysts and electrocatalysts, selective membrane materials, protective and catalytic coatings is an integral part of hydrogen technologies development. Plasma technologies (magnetron ion sputtering, ion implantation, level-by-level chemical sedimentation in plasma) are making an essential contribution for creation of such new materials. Only application of new nanocatalysts in fuel cells and electrolyzers can decrease platinum consumption for about 3 times, increase specific productivity up to 50

* Corresponding author.

Email address: fat@hepti.kiae.ru (Vladimir Fateev).