Electrochemical routes for functional nanostructures synthesis for energy and heterogeneous catalysis applications

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Abstract: This report is devoted to the electrochemical formation methods of solid-state functional nanostructures. Great interest in nanostructured materials is caused by perspective of new device with enhanced properties design. The fabrication of structures with feature sizes smaller than 100 nm is an expensive using conventional (ebeam and photo) lithographic methods. Therefore, nonlithographic methods may be better suited for mass production of nanoscale materials. Most approaches fall into one of three main categories: template methods; self-organized nanostructures and direct growth. Electrochemical processing is a simplest way to produce nanostructured materials. One of the interesting nanostructures are porous anodic oxides. Porous anodic alumina, titania, tungsten oxide and oxides of other valve metals are promising structures or already found their application in various fields, such as medicine, photocatalysis, energy storage, functional electronics, MEMS, sensing and others. 1-D nanostructures (nanowires) – are other highly demanded structures. Such nanostructures can be obtained by various methods such as AC, DC or pulsed electrodeposition. Due to the simplicity and scalability of the formation processes and the large specific surface of such nanostructures, they are promising for use as electrodes of metal-ion batteries, supercapacitors, nanostructured solar cells.