



INDUSTRIAL TECHNOLOGIES PROGRAM

Nanoscale Electrodeposition Process for Manufacturing High-Selectivity Catalysts

There is a great need for methods for making industrial catalysts that provide a high degree of control of chemical reactions at the molecular level. The intent of this work is to develop a new nanoscale fabrication concept for forming high-selectivity catalysts for the chemical industry. The idea behind the concept is to take advantage of the precision fabrication that is possible with electrochemical deposition in non-aqueous electrolytes. It is proposed that catalytically active inorganic nanocavities that mimic the active sites of enzymes in providing molecular-level control of chemical reactions can be formed on and within metallic, semiconductor or dielectric substrates by modulated-current electrochemical nucleation and growth of metal oxide

crystalline nanostructures. Because of the wide versatility of electrodeposition that is possible in solvent electrolytes, these molecular-sized cavities can be decorated with any number of different metal atoms and atom clusters that could potentially function as catalytically active sites.

The goal of this nanomanufacturing concept definition study is to show that this new catalyst fabrication concept is technically feasible. If the results of this one-year study are promising, further development of the concept for specific chemical process applications will be proposed for follow-on cooperative R&D projects with appropriate industrial partners.

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March 2009