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Funding decision

Name	Organisation	Project title	Decision No.	Decision date	Funding period	Funding
Kordás, Krisztian	OY	Novel catalyst materials based on robust carbon nanotube membranes (RoCaNaMe)	128626	15.09.2008	01.01.2009 - 31.12.2012	248 000

Project description
In the framework of this project, our consortium is developing and studying new catalyst materials based on metal (1-10 nm Pd, Pt, Ir, Ni, Co, Fe, Au) and metal oxide (PdO, NiO) nanoparticles that are supported on single- and multi-walled carbon nanotube (CNT) membranes. The goal is to achieve nanotube membranes with geometries that extend to 3-dimension, and accordingly provide large room for the catalyst nanoparticles. To be able to use carbon nanotubes as practical catalyst support, we investigate two approaches. In the first, we grow CNTs in the form of thick (several millimeters) and mechanically robust films that are self-supported. In the other approach, the nanotubes are synthesized on solid support materials (or monoliths) that have a 3-dimensional microscopic/macroscopic pore structure. In both cases, the nanotubes are synthesized by the catalytic chemical vapor deposition method. In this project, we address a number of scientific challenges: - Investigate how carbon nanotubes grow on various monoliths with emphasis on (i) the role of interfaces between the surface/catalyst/nanotube, (ii) structural studies of materials, and (iii) investigation of the possible growth kinetics and mechanisms. - Examine (i) how catalyst nanoparticles can be anchored to the surface of nanotubes, (ii) how to achieve monodisperse catalyst size distribution and homogeneous surface coverage, and (iii) how to avoid catalyst agglomeration, coarsening and poisoning. - Study the catalytic activity i.e. selectivity, conversions and deactivation of our novel catalyst membranes and compare those to conventional materials used in the contemporary research and industry. Here we also investigate the role of catalyst structure to understand the main governing factors in a particular chemical reaction. - Study whether the electrical properties of the carbon nanotube membranes change during catalysis, and if so, can we use that information to monitor chemical reactions in situ by electrical methods. By solving the challenges related to membrane and catalyst syntheses; and revealing the correlations between structure, catalytic activity and electrical properties we gain a better understanding on the fundamental catalytic behavior of materials. In turn, we learn how we can make novel carbon nanotube based catalyst systems that compete or even outperform conventional materials used in e.g. Fischer-Tropsch synthesis; reforming of CO2, alcohols and sugars; oxidation of CO; or reduction of unsaturated organics, exhaust gas, etc. ¿ just to mention a few potential applications.

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