PROJECT FACTS

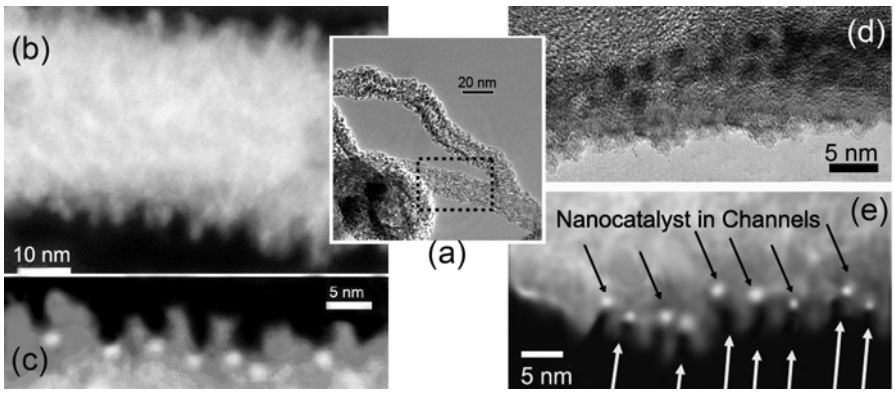
UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

CLEAN FUELS & CHEMICALS

Carbon Nanotube Docking Stations: A New Concept in Catalysis

Carbon nanotubes (CNTs) have been researched extensively as a catalyst support structure for a variety of chemical reactions including synfuel synthesis. Recently, CNT-based catalyst supports were commercially applied during the hydrogenation of nitrobenzene and cyclohexene.

Researchers at UK's CAER and the University of the Witwatersrand in South Africa manipulated the surface of multiwalled CNTs using acid treatment and calcination procedures in the presence of calcium precursors to form unique 3D ridge/valley structures that are aligned perpendicular to the CNT surface and have the appearance of 'docking stations.' The 3D surface structures are shown in the Figure below and may offer ways of protecting ultra-small catalyst nanoparticles against sintering (a process where catalyst particles migrate along a support surface and tend to agglomerate and lose effective surface area). Iron (Fe) supported on the CNTs enhanced with docking stations showed excellent long-term stability during Fisher-Tropsch synthesis reactions. The TEM and STEM investigation (Figure below) revealed Fe-catalyst nanoparticles that are clearly protected or harbored inside the CNT docking stations.



A more detailed description of the initial project results are published in the Journal of Catalysis Letters under "Carbon Nanotube Docking Stations: A New Concept in Catalysis," *Volume 129*, p 39-45 (2009).

Researchers are currently focused on more precisely manipulating the CNT surface by modifying the width, depth and density of these docking stations to accommodate differently sized and shaped catalyst nanoparticles for other important catalytic reactions.

PARTICIPANTS

UKCAER

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SPONSORS

Commonwealth of Kentucky
South Africa: THRIFT, DST, NRF

PROJECT VALUE

500 K

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