PROJECT FACTS

UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

CLEAN FUELS & CHEMICALS

Nanocatalysis: 3D Spectrum Imaging and Analysis

The ability to produce 3D images of nanostructures is an invaluable tool leading to a greater understanding of structures and chemical phenomena (reactivity) at a scale relevant to nanocatalysis investigations.

The addition of the GATAN Digiscan to UK's Electron Microscopy (EM) facility, permits beam control in scanning transmission mode and further allows the acquisition of spectrum profiles (Electron Energy Loss Spectroscopy (EELS) and EDS applications as well as image collection (GIFs) with the additional advantage of including absolute elemental quantification analysis.

A computer-controlled 5-axis tilt stage with high angle tilt holder, in conjunction with the state-of-the-art electron tomography software, enables researchers at CAER to obtain 3D-tomography together with 3D STEM and Z-contrast imaging and allows us to characterize catalyst nanoparticles that are as small as 1 nm in size. Variations in chemical composition can be identified using 3D energy filtered imaging and the CAER currently focuses on developing new methodologies to combine these imaging methods with analytical capabilities for nanoscale materials used in:

Fuel Synthesis Applications:
- Water-Gas-Shift catalyst
- Fischer-Tropsch catalysts

Energy Conversion Devices:
- Reformers
- Fuel Cells

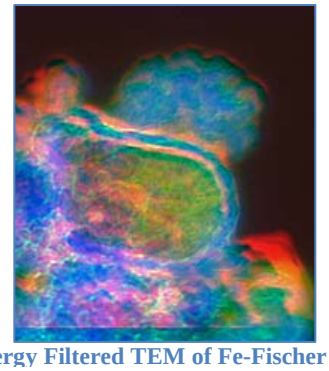

Figure 1. 3D-Energy Filtered TEM of Fe-Fischer Tropsch catalyst

PARTICIPANTS

UKCAER

UK Electron Microscopy Center

SPONSORS
Toyota
NASA

PROJECT VALUE
$100,000

CONTACT
UK CAER
2540 Research Park Dr.
Lexington, KY 40511
Tel.: (859) 257-0299
Fax: (859) 257-0302
graham@caer.uky.edu