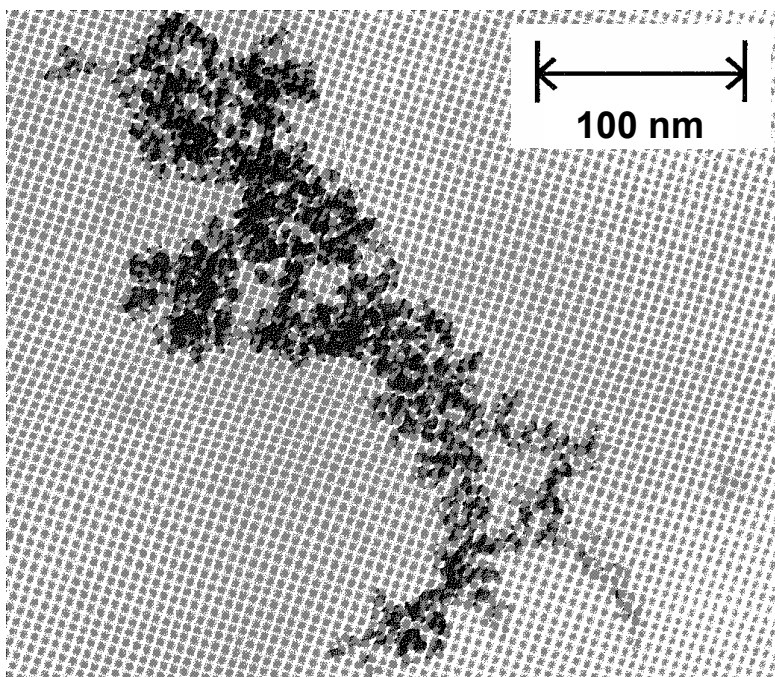


Activation of Nanostructured Catalysts for Environmentally Friendly, Energy Efficient Heavy Crude Oil Processing

Collaborative, cost-shared research sponsored by the Industrial Technologies Program of DOE-EERE is focused on the utilization of nanoscale catalysts in large-scale, energy-intensive industrial processes. Oak Ridge National Laboratory, in collaboration with the Materials Technology Institute (a non-profit technology institute serving the refining and petrochemical industry), and Mach I Corporation, are actively involved in the evaluation and development of energy-efficient processes that take advantage of the benefits offered by nanostructured catalysts that can be activated by microwave, RF, or radiation beams. Microwave activation is expected to reduce the energy consumed during processing of heavy crude oils and other materials by selectively heating the active sites of the catalysts, where reactions occur, rather than the bulk of the material being processed. Results obtained to date have shown that heavy oils are transparent to microwaves in industrially permitted frequencies that couple with a nanostructured refinery catalyst. State-of-the-art instrumentation at the Center for Nanophase Materials Science at ORNL, including Raman spectroscopy of the catalyst surfaces and X-ray diffraction of catalysts under reaction conditions with and without microwave activation will be employed to better understand the mechanisms. A life-cycle study, which includes energy and mass-balances, as well as emissions, for catalyst production, disposal, and process use, will identify pathways to commercial application.



Industrial Mach I nanoscale (~3 nm) catalyst

Patents or other steps toward commercialization: An industrial catalyst supplier and a materials-related industrial consortium are actively collaborating in R&D toward commercialization.

Contributing Agencies: DOE