DMR 1046599 "RAPID: Metal Oxide Nanogrids as Photocatalysts for the Decomposition of Oil in Water"
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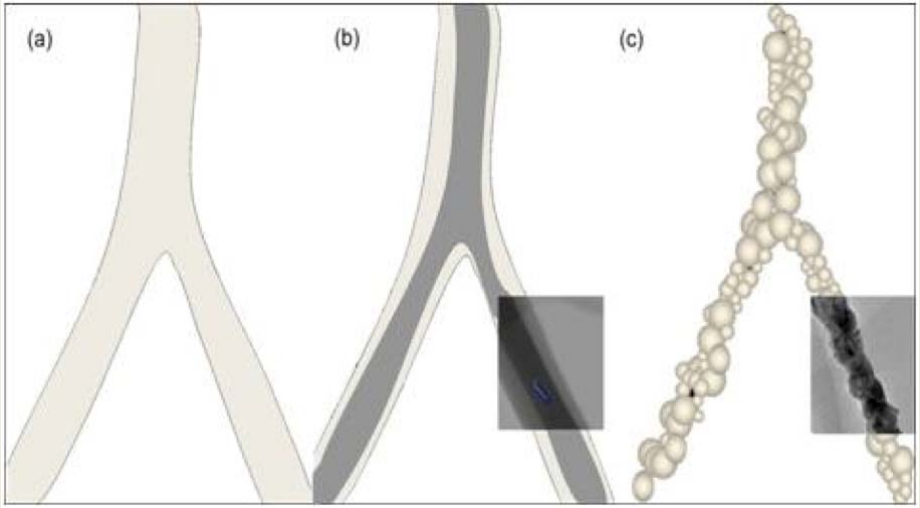
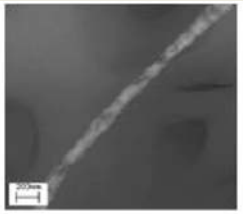
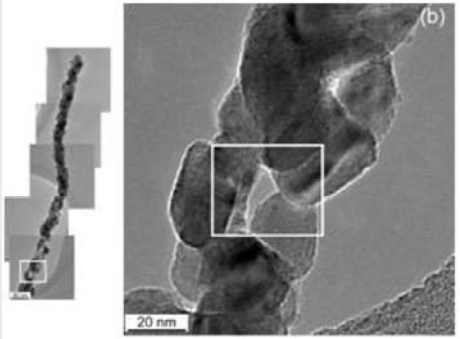
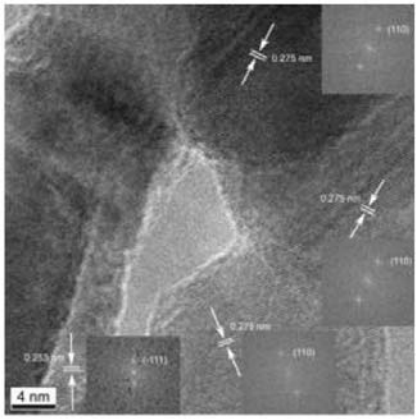
This project involves oxide-based photo-assisted oxidation of crude oil in salt water and it's decomposition to eco-friendly constituents through the use of nanostructured oxide photocatalysts that absorb in the visible range of solar radiation. Novel synthesis of 3D nanogrids of the CuO/WO_3 system and prototyping of "photocatalytic screens" for the remediation of large areas of water surface are the key themes of this work. The objective of this research is to decocompose the hydrocarbons present in the medium crude oil of the Mexican Gulf spill to CO_2, H_2O, and water-soluble organic products that are easily biodegradable.

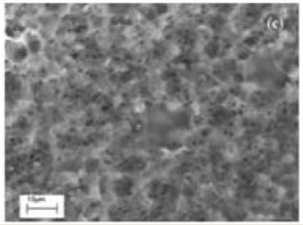




This figure shows the dimensions of an individual oxide fiber in the nanogrid.







The three figures above are (a) montage of five HRTEM micrographs of the structure of a single nanofiber in the grid, and (b) and (c) enlarged views of the particle arrangement within the fiber. Left is a micrograph of the "screen".

The breakthrough synthesis of robust, self-supported, metal oxide nanogrids forms the basis of this work. Polymer fiber electrospun mats deposited on metal foils are used as templates controlling the "tailored" microstructural evolution of the products of the thermal oxidation of the metal (see schematic above for CuO nanogrids).

References:

J. Lee and P.I. Gouma " Tailored 3D CuO Nanogrid Formation", Journal of Nanomaterials, 2011, in print.