Room temperature oxidation of carbon monoxide with 100% efficiency

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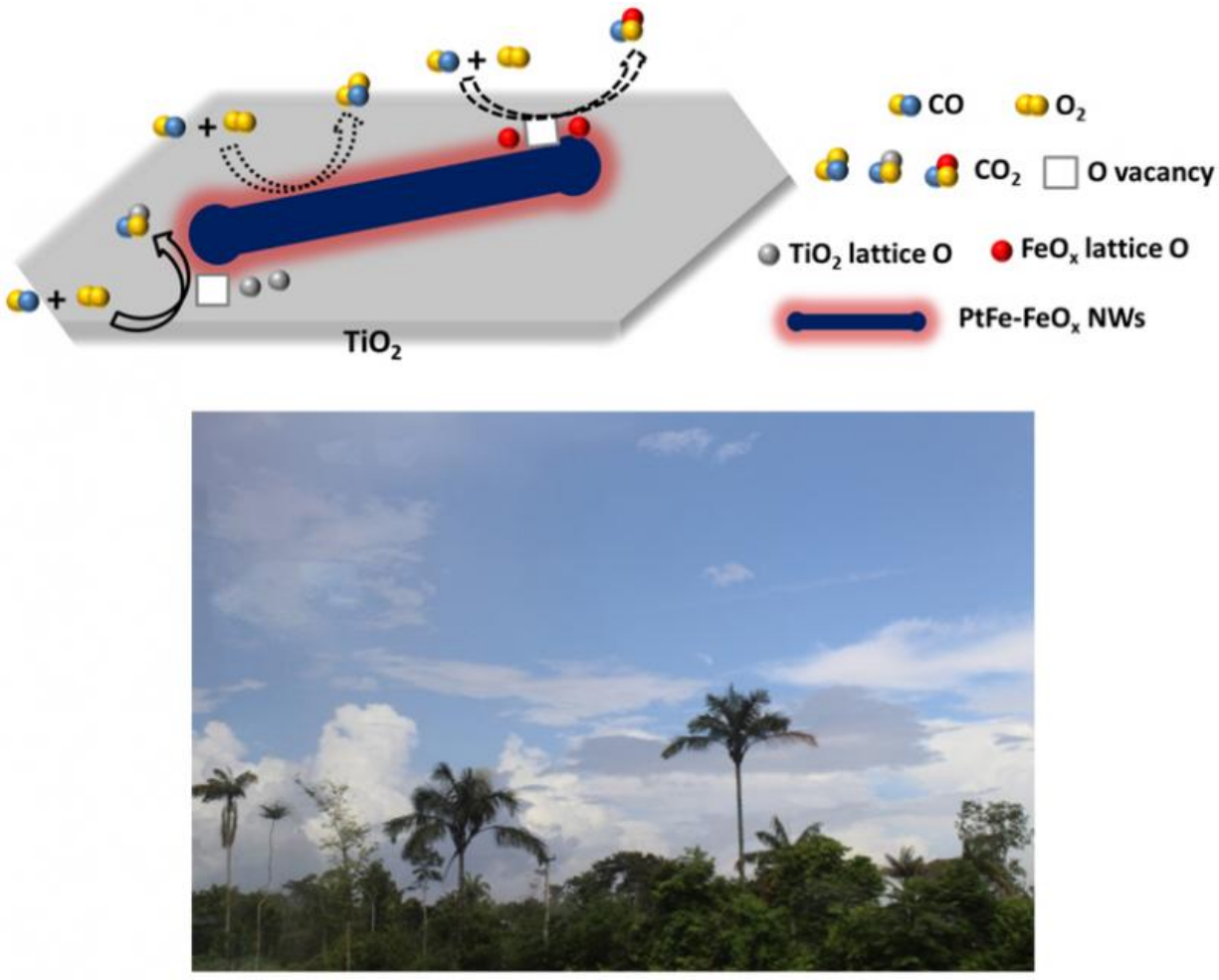

(Top) Schematic illustration of the two oxidation reaction regimes within the PtFe-FeO_x/TiO_2 system. (Bottom) This new nanomaterials system could have a profound impact on the reduction of carbon monoxide pollution, improving air quality.

Ultra-thin 1-dimensional (1D) nanowires (NWs) have emerged as a new class of effective nanoscale catalysts, exhibiting impressive activity and durability, as demonstrated by their excellent performance in fuel cell reactions.

A collaborative effort among scientists from Oak Ridge National Lab, the University of Tennessee, Zhejiang University of Technology, and CFN has produced unique 1D, core-shell PtFe-FeO_x NWs, supported on a TiO_2 substrate, that yield highly efficient, room temperature carbon monoxide (CO) oxidation. Atomic level interactions between the PtFe core and the FeO_x shell and interactions between the NWs and the TiO_2 substrate enabled CO oxidation with 100% conversion efficiency at room temperature. Additionally, after 30 hours in the reaction environment, the PtFe–FeO_x/TiO_2 NW catalyst exhibited no decay in the catalytic activity. These results provide a general approach and new insights into the construction of hierarchical interfaces for advanced catalysis. These results also could provide a highly efficient and potentially cost-effective means for carbon monoxide air pollution abatement and CO-based fuel cell operation.

These 1D nanostructures enable CO oxidation with 100% conversion efficiency at room temperature, which could provide insight into the production of hierarchical interfaces for advanced catalysis. Further, this work could eventually lead to a highly efficient and cost-effective means for CO air pollution abatement.

The CFN Electron Microscopy Facility's HD2700C Scanning Transmission Electron Microscope was used to characterize the samples.

More information: "Constructing Hierarchical Interfaces: TiO_2-Supported PtFe–FeO_x Nanowires for Room Temperature CO Oxidation." *J. Am. Chem. Soc.*, 2015, 137 (32), pp 10156–10159 DOI: 10.1021/jacs.5b07011

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