Submitted to the 2002 Symposium of the Southeastern Catalysis Society

Novel Uranium-Oxide Based Catalysts for Catalytic Oxidation of Toluene and Chlorobenzene

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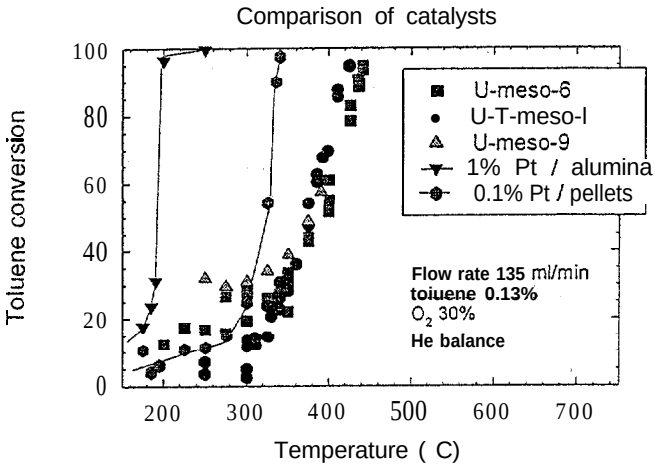
The US has huge inventories of depleted uranium, and so it is of interest to identify new uses for this material that could increase its value and help pay for conversion, processing or inventory maintenance costs. We report on work related to research into the catalytic application of uranium oxide. As a possible application, we have explored catalytic combustion of volatile hydrocarbons and chloro-organic compounds as a safe and energy efficient route for their removal. Uranium has been'shown to have substantial activity for this catalytic process.

We have prepared uranium oxide catalysts by a variety of synthetic approaches including impregnation of silica mesoporous supports, co-assembly of uranyl cations in mesoporous silica, attachment to silica sesquisiloxane and co-assembly with titanium oxide. The resulting materials have been characterized by a variety of structural techniques including XRD, STEM and BET. The catalysts have been tested for their activity for catalytic-oxidation of toluene and chlorobenzene and compared with supported Pt catalysts. Lightoff curves have been obtained along with measurements of dependence upon flow rate and reactant concentration.

Different solid forms of the catalysts have been explored including monoliths, powders and gel castings with the goal of producing a non-friable form of the catalyst with sufficient activity. We find that the uranium oxide is an active catalyst for both of these oxidations, and its activity is affected and can be improved by adjusting the synthesis techniques,, Results of these investigations will be presented and discussed.



Lightoff curves for toluene conversions for various uranium oxide catalysts are compared with Pt /alumina catalysts

Research sponsored by the Office of Basic Energy Sciences, and by Office of Environmental Management Science and Technology (EM-50), U.S. Department of Energy, under contract DE-AC05-00OR22725 with Oak Ridge National Laboratory, managed and operated by UT-Battelle, LLC.