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Small Pore Zeolites: Effective Catalysts for the Selective Catalytic Reduction of NO_x

Frontiers in Catalysis Science and Engineering Seminar Series

Presented by...

Prof. Raul F. Lobo

University of Delaware

Center for Catalytic Science and Technology

Department of Chemical Engineering



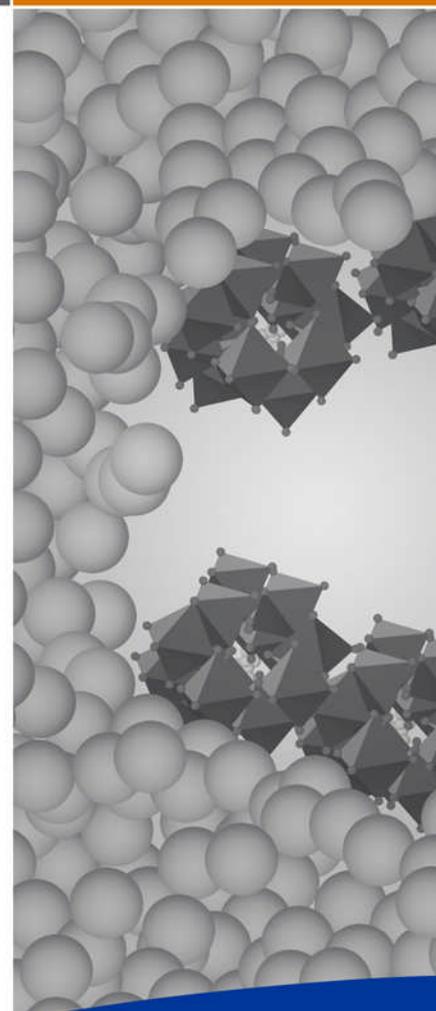
Abstract

Nitrogen oxides (NO_x) are a major atmospheric pollutant produced through the combustion of fossil fuels in internal combustion engines and power plants. Copper-exchanged zeolites are promising as selective catalytic reduction (SCR) catalysts for the decomposition of NO using ammonia as the reducing agent. It has been shown before that when fresh, Cu-ZSM-5 has high NH₃-SCR activity, however, ZSM-5 zeolites are highly susceptible to dealumination during steaming, which results in a loss of SCR activity. We will show that the NH₃-SCR activity of the small-pore zeolites, Cu-SSZ-13, Cu-SSZ-16, and Cu-SAPO-34 is comparable or better than Cu-ZSM-5. These copper-exchanged small-pore zeolites have high SCR activity between 150-500°C and are shown to be much more hydrothermally stable than the medium-pore zeolite, Cu-ZSM-5. The degree of copper exchange, the dimensionality of the framework, and heteroatom framework substitution all impact the SCR activity and hydrothermal stability of the materials. In-situ X-ray powder diffraction, EXAFS and optical spectroscopy suggest that in SSZ-13 copper is found only as isolated metal cations. Furthermore, the Cu²⁺/Cu⁺ redox cycle appears to be unnecessary for the so-called standard SCR reaction at low temperatures (less than 200°C).

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November, 17, 2010

EMSL Auditorium

1:30 pm