

## 216d Understanding of NOx Storage/Release Mechanism over Pt-BaO/Al<sub>2</sub>O<sub>3</sub> Lean NOx Trap Catalysts

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The LNT (lean NO<sub>x</sub> trap) is generally considered as one of the promising solutions for the exhaust control of gasoline lean burn and diesel engine in order to meet future requirements on emission levels. In the LNT technology, an active (alkali and/or alkaline earth) oxide material takes up NO<sub>x</sub> under lean engine operation conditions and stores them as nitrates [1]. In a brief rich cycle these nitrates are released from the active oxide catalyst component, and reduced to N<sub>2</sub> on the precious metal component of the catalyst. Both the storage and release of NO<sub>x</sub> have been extensively studied on these BaO-based systems. Although the NO<sub>x</sub> storage mechanism is fairly well understood today [2], the nature of the nitrate species formed is poorly characterized. Here we report the results of our multi-spectroscopy study in which we set out to understand the nature of different nitrate species formed during NO<sub>2</sub> uptake on BaO/Al<sub>2</sub>O<sub>3</sub> NO<sub>x</sub> storage materials. To this end, we investigated NO<sub>2</sub> adsorption and desorption on Al<sub>2</sub>O<sub>3</sub>, 2wt%-, 8wt%-, and 20wt%-BaO/Al<sub>2</sub>O<sub>3</sub> catalysts using TPD, and Fourier transform infrared (FTIR) and <sup>15</sup>N solid state NMR spectroscopies. We also followed the changes in catalyst morphology during these NO<sub>x</sub> uptake and release processes using synchrotron time resolved XRD (TR-XRD – carried out at the National Synchrotron Light Source at Brookhaven National Laboratory) and transmission electron microscopy (TEM). In addition, we try to elucidate the role of Pt and BaO components, and the interaction between these two components during NO<sub>x</sub> storage/release process by performing the reaction at different conditions over Pt-BaO/Al<sub>2</sub>O<sub>3</sub> catalysts with various BaO loading.

(1) Epling, W.S., Campbell, L.E., Yezerets, A., Currier, N.W., Parks II, J.E., *Cat. Rev.-Sci. Eng.* 2004, 46, 163. (2) Prinetto, F., Ghiotti, G., Nova, I., Lietti, L., Tronconi, E., and Forzatti, P., *J. Phys. Chem. B.* 2001, 105, 12732.

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