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PROJECT FACTS

UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

BIOFUELS & ENVIRONMENTAL CATALYSIS

Development of Optimal Catalyst Designs and Operating Strategies for Lean NO_x Reduction in Coupled LNT-SCR Systems

Lean NO_x Traps (LNTs) represent a promising technology, particularly for light duty diesel and gasoline lean-burn applications. Moreover, recent studies have shown that the performance of LNTs can be significantly improved by adding an *in situ* selective catalytic reduction (SCR) catalyst in series downstream (Fig. 1). SCR catalysts promote the selective reduction of NO_x with ammonia (NH_3) in the presence of excess oxygen. An *in situ* SCR catalyst refers to a system where the NH_3 is generated in the upstream LNT and subsequently is stored on the SCR catalyst where it reacts with NO_x that breaks through the LNT. The LNT-SCR system has several significant benefits in comparison with competing NO_x reduction technologies. Most importantly, the LNT-SCR system requires only fuel as the reductant and therefore eliminates the need and associated cost for the urea infrastructure. The LNT-SCR system also has several advantages over an LNT-only system. First, the SCR catalyst eliminates NH_3 slip from the LNT by storing it and subsequently catalyzing its reaction with unreacted NO_x from the LNT. Second, the presence of the SCR catalyst relaxes the NO_x conversion requirements of the LNT. Consequently, the LNT catalyst volume in the LNT-SCR system can be lower than for an LNT-only system, reducing the precious metal costs for the system. Third, the durability of the LNT-SCR should be superior since the system requires both less frequent and shorter desulfations than an LNT-only system owing to its higher overall efficiency and mitigation of H_2S emissions, respectively.

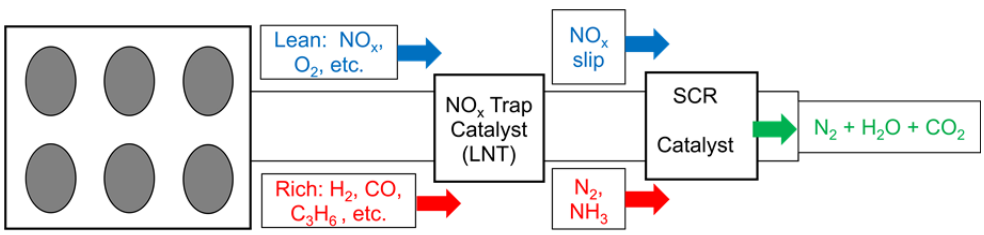

Fig.1 Coupled LNT-SCR System for NO_x reduction

The principle objective of this project is to identify the mechanisms responsible for the synergy of coupled LNT and SCR catalysts, and to use this knowledge to design optimized LNT-SCR systems in terms of catalyst architecture and operating strategies.

PARTICIPANTS

University of Houston

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Ford Motor Company

ORNL

BASF

SPONSORS

DOE Office of Energy Efficiency and Renewable Energy Vehicle Technologies Program

PROJECT VALUE

$ 3,144,720

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