A novel integrated rotary reactor for NOx reduction by CO and air preheating: NOx removal performance and mechanism

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Abstract

A novel integrated rotary reactor for NOx reduction by CO and air preheating (iNA reactor) was proposed. NOx removal performance was investigated in a fixed-bed reactor, which was used to simulate the working conditions change in iNA reactor. Lab-synthesized Cu/FeCeOx were used as catalyst. Two different modes were tested with iNA reactor: short cycles and long cycles. Excellent NOx removal efficiencies of over 95% and 90% for short cycles and long cycles were observed in iNA reactor. Moreover, compared with the constant-temperature rotary reactor, better H2O and SO2 resistances were also found in iNA reactor. The reaction mechanism was proposed based on in-situ DRIFT study. NOx was stored as nitrates in the adsorption zone, and then decomposed rapidly by both high temperatures and CO, leading to the deep catalyst regeneration. Therefore, temperature swinging and the feed of CO were key to having high iNA reactor performance for NOx removal.

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