Boost NOx removal by perovskite-based catalyst in NSR-SCR diesel aftertreatment systems

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Abstract

$DeNO_x$ activity of 0.5% Pd–30% $La_{0.5}Ba_{0.5}CoO_3/Al_2O_3$ formulation is analysed in single-NSR and combined NSR–SCR systems, using response surface methodology (RSM). Operational maps are built for any combination of reaction temperature in the NSR and SCR beds and H_2 concentration. A 4% Cu/SAPO-34 is used as the SCR catalyst. Results for single-NSR allows tuning operational conditions in coupled NSR-SCR technology to maximize NO_x-to-N_2 conversion, with minimum NH_3 and N_2O productions. Control of H_2 concentration and temperature in the NSR system allows generating the stoichiometric amount of NH_3 to eliminate NOx slipping. The tuned coupled NSR–SCR system achieves high N_2 yield under wide operational range (T=175–425 °C; C_{H_2}=2–4%). Specifically, N_2 yield reaches 92% when NSR and SCR catalysts work at 300 °C and 3% H_2 is injected, with NH_3 slip and N_2O production nearly zero. This provides a promising alternative for NO_x removal in diesel aftertreatment systems.

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