

Reaction kinetics for removing NOx from diesel engine by ethanol over Ag/Al₂O₃ catalyst

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Reaction kinetics for OHC/SCR reaction system with ethanol over Ag/Al₂O₃ catalyst has been developed on the basis of the possible reactions observed under the variety of the feed gas conditions. NH₃, CH₃CHO and HOCH₂CH₂NH₂ have been identified as the primary reaction intermediates for the progress of OHC/SCR reaction. The rate expressions based upon LHHW mechanism were derived with the surface reaction as the rate determining step. The model with estimated kinetic parameters well describes the experimental data such as the conversions of NO and C₂H₅OH as well as the formation of N₂, NH₃, CH₃CHO and HOCH₂CH₂NH₂ with respect to the reactor space velocity, reaction temperatures and the C₁/NOx feed ratio. After successful validation of the reactor model, the axial concentration profiles within the reactor were used for the optimal design of a dual-bed catalyst system to enhance the deNOx performance of the ethanol/SCR by best utilizing the reaction intermediates in the rear bed following the Ag/Al₂O₃ in the front bed.