

Detailed Reaction Kinetics for Combined DOC-SCR System for removing NO_x from Diesel Engine Exhaust

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Most of kinetic models developed so far have been mainly employed for simulating the kinetic trend of a single reactor system, which may not be appropriate for comprehensively describing the catalytic behavior of a modern diesel after-treatment system consisting of multi catalytic reactors including DOC and SCR. There has thus been a strong demand for developing the appropriate reaction kinetics for simultaneously predicting the catalytic performance of the combined DOC-SCR system. In the present study, the combined kinetic model has been developed for the series of the catalytic systems comprised of DOC in the front reactor and SCR in the rear reactor. In order to derive the overall reaction kinetics for the DOC-SCR catalytic system, two sets of detailed reaction kinetics for the NO oxidation reaction over La_{0.5}Ag_{0.5}MnO₃ and NH₃/SCR reaction over CuSSZ13 have been independently developed in view of microkinetics based upon the reaction mechanism postulated by TPD and FTIR studies. Eventually, the catalytic performance of the DOC-SCR system under a variety of operating conditions has been well predicted by combining the reaction kinetics derived for each DOC and SCR catalyst.