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Simulation of diesel exhaust aftertreatment system DOC—pipe—SCR: The effects of Pt loading, PtO<sub>x</sub> formation and pipe configuration on the deNO<sub>x</sub> performance

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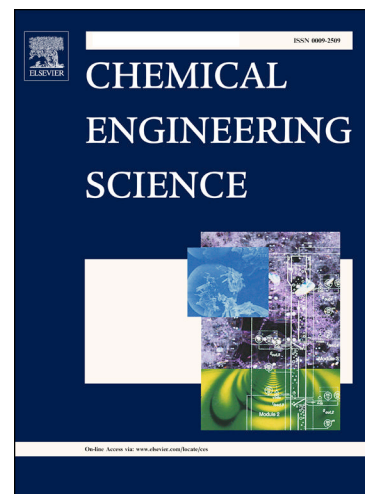
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Simulation of diesel exhaust aftertreatment system  
DOC—pipe—SCR: The effects of Pt loading, PtO<sub>x</sub>  
formation and pipe configuration on the deNO<sub>x</sub>  
performance

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**Abstract**

A combined exhaust aftertreatment system consisting of a diesel oxidation catalyst (DOC), pipe and selective catalytic reduction of nitrogen oxides (SCR) is studied in this paper by the means of mathematical modeling and simulations. Pt/ $\gamma$ -Al<sub>2</sub>O<sub>3</sub> DOC and V<sub>2</sub>O<sub>5</sub>-WO<sub>3</sub>/TiO<sub>2</sub> SCR catalysts for heavy-duty Diesel engines are examined. First, spatially 1D models of the DOC, SCR and pipe are introduced and calibrated using the measured engine test data. The models are then employed in a simulation study of the effects of Pt loading, PtO<sub>x</sub> formation and pipe configuration on the NO<sub>2</sub> yield in DOC and the resulting deNO<sub>x</sub> performance of the SCR in the driving cycles ETC and WHTC. It is shown that there exists optimum washcoat loading in the DOC with respect to NO<sub>x</sub> conversion in SCR and that the minimization of heat losses in the connecting pipe can further improve the NO<sub>x</sub> conversion. Finally, the decrease of NO oxidation activity in DOC due to PtO<sub>x</sub> formation and its impact on NO<sub>x</sub> conversion in SCR is quantified over the repeated driving cycles, showing 2–10 % difference between the deNO<sub>x</sub> performance with the pre-reduced DOC and after few hours of operation under oxidizing conditions. Based on the simulation results, an im-

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