Simulation of Oxidation Catalyst Converter for After-Treatment in Diesel Engines

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ABSTRACT
In the diesel engine after-treatment system of motor vehicles, Diesel Oxidation Catalytic (DOC) converter is used to purify hydrocarbons (HCs) consisting of oil and fuel residue, and Carbon Monoxide (CO) from the exhaust gas. The exhaust gas flowing through DOC converter experiences chemical reactions that oxidize CO and HCs which are formed by incomplete combustion. Reactive properties, geometric features and thermal properties are fundamental design elements of a DOC converter. Flow of the exhaust gas through the converter with these properties can be described using a mathematical model given by Partial Differential Equations (PDEs). In this work, a simulation program for solving these PDEs describing the mathematical model of DOC converter was developed. PDEs were solved by Finite Volume Method (FVM) for volume elements and an implicit method for time steps. Using the solution of PDEs, reduction of CO and HCs at the outlet of the converter was computed. Thus, our model can be used to simulate, or design DOC converters and to predict the reduction of CO and HCs from DOC converters.

KEYWORDS: Diesel engine; Environmental pollution; DOC (Diesel oxidation catalyst); FVM (Finite volume method); Implicit method

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