

Numerical simulation of soot filtration and combustion within diesel particulate filters

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Description

The numerous benefits offered by diesel engines, compared to gasoline ones, are balanced by a drawback of increasing concern, namely soot emissions. Nowadays, soot emissions can be reduced by physically trapping the particles within on-board diesel particulate filters (DPF). The filter gets progressively loaded by filtering the soot laden flue gases, thus causing an increasing pressure drop, until regeneration takes place. The aim of this work is to develop a fully predictive three-dimensional mathematical model able to accurately describe the soot deposition process into the filter, the consequent gradual modification of the properties of the filter itself (i.e. permeability and porosity), the formation of a soot filtration cake, and the final regeneration step. The commercial computational fluid dynamics (CFD) code Fluent 6.2.16, based on a finite-volume numerical scheme, is used to simulate the gas and particulate flow ...

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