Technology Offer

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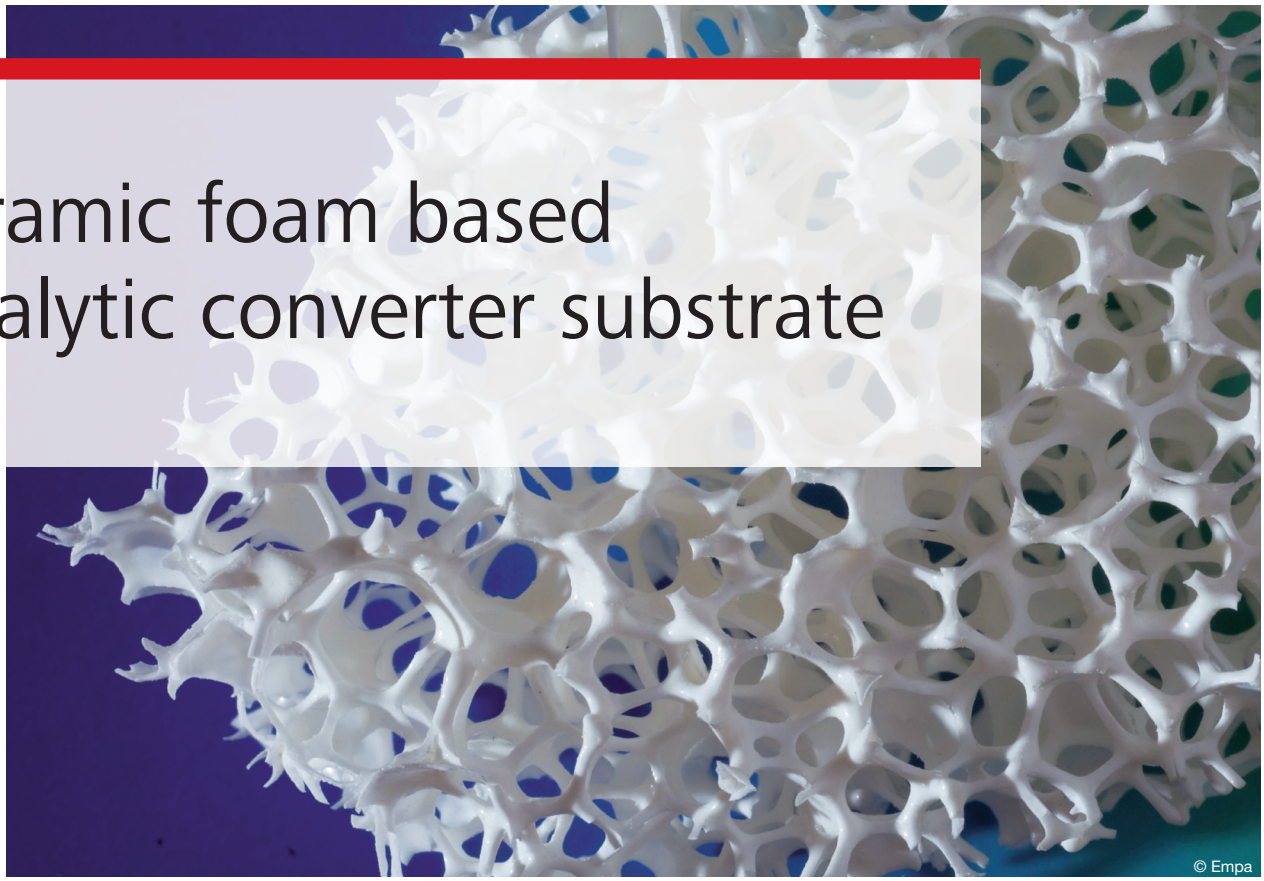
Materials Science and Technology

Ceramic foam based catalytic converter substrate



Invention

The invention addresses the application of ceramic foams as converter substrates for the aftertreatment of motor vehicle exhaust gases. Such systems increase the efficiency of the catalytic converter itself, improve the evaporation and mixing of added reactants (e.g. urea) and optimize the loading and regeneration of downstream particle filters.

Background

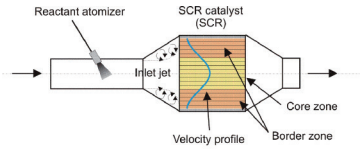
Unlike standard, honeycomb type catalytic substrates, ceramic foam based systems homogenize the flow as well as the thermal and chemical loads inside the converter. The flow of exhaust gases inside the foam is turbulent, leading to improved heat and mass transfer characterized by significantly higher sherwood and nusselt numbers compared to the laminar flow inside honeycomb substrate channels.

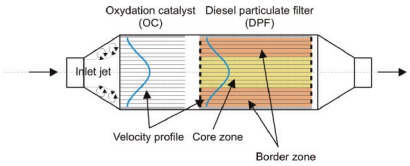
Advantages

The ceramic foams developed represent a promising concept, since they redistribute the flow of exhaust gases thus enhancing turbulence and the mixing of species, without increasing flow resistance to prohibitive levels. They can initiate, facilitate or balance complete oxidation of unburnt HCs and CO, oxidize a substantial fraction of particulates while generating required reactants for the following aftertreatment step. The turbulent flow inside the ceramic foams permits short overall lengths for high conversion rates. The relatively low material and manufacturing costs are an additional important aspect.

Applications

In urea based SCR (Selective Catalytic Reaction) nitrogen oxide reducing systems, the evaporative characteristics of the liquid reactant and the mixing of NH3 with NOx are improved by the turbulent flow through the ceramic foam based catalytic converter. (Figure 1)





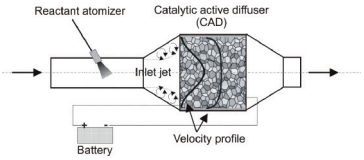


Figure 1

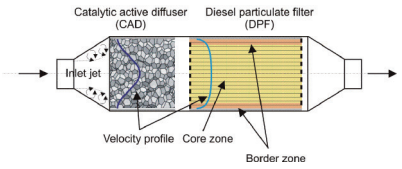


Figure 2

With an aftertreatment system consisting of an oxidation catalyst and a particle filter, the loading of the filter with soot and ash as well as the thermal and chemical loads will be more homogeneous downstream of a ceramic foam based catalytic converter. (Figure 2)

Ownership

Empa, Swiss Federal Laboratories for Materials Testing and Research, Überlandstrasse 129, CH-8600 Duebendorf and ETH Zurich, Swiss Federal Institute of Technology, Raemistrasse 101, CH-8092

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Keywords

catalytic converter, ceramic foam, aftertreatment of exhaust gases, turbulent flow catalytic converter, homogenization of exhaust gas flow

Contact

Empa, Technology Transfer
Dr Andreas Kündig, andreas.kuendig@empa.ch
Phone +41 58 765 48 30, Fax +41 58 765 69 08

Technical Information
Christian Bach, Head of Internal Combustion Engines
christian.bach@empa.ch
Phone +41 58 765 41 37

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Empa

CH-8600 Dübendorf
Überlandstrasse 129

Telefon +41 58 765 11 11
Telefax +41 58 765 11 22

CH-9014 St. Gallen
Lerchenfeldstrasse 5

Telefon +41 58 765 74 74
Telefax +41 58 765 74 99

CH-3602 Thun
Feuerwerkerstrasse 39

Telefon +41 58 765 11 33
Telefax +41 58 765 69 90

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