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New streamlined catalytic carriers of enhanced transport properties: Experiments vs CFD

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The paper presents the research on the new structured catalytic carriers, called streamlined structures. The innovative structures are composed of short triangular channels, the walls of which are similar to an airfoil profile. The structures were made using additive manufacturing method – selective laser melting (SLM) - in three different lengths. The study includes flow resistance and heat transfer, both realized using Computational Fluid Dynamics (CFD) modeling and experimentally. Flow resistance was measured by precise micromanometer over a wide range of gas velocities. During heat transfer experiments, electric current flowing through the metal structures heated them (Joule effect). The experimental results are in acceptable agreement with the CFD taking into account the accuracy of the structures' manufactured. The novel structures display improved heat transfer properties compared to monoliths and satisfactory low pressure drop. The flow patterns modelled using CFD prove that the inlet vortex has completely disappeared and the outlet vortex is significantly reduced compared to classic monolithic structures. The novel structure studied here is a promising prospect for the development of catalytic reactors.

Metryczka

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