Institute of Chemical Engineering

Entrance effects on forced convective heat transfer in laminar flow through short hexagonal channels : experimental and CFD study

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Hexagonal channels display promising flow and transfer characteristics, thus they are considered as prospective structured catalyst carriers. While transfer intensity in long channels is rather moderate, it may be greatly enhanced by channel shortening, because developing laminar flow can be reached in the major part of short channels. Heat transfer in honeycomb structures composed of short hexagonal channels was experimentally studied. The structures of three different channel lengths were made from stainless steel using the 3D printing method. Generally, experimental results agreed rather satisfactory with the literature solutions, but some of the observed deviations were difficult to explain. Therefore, CFD modeling was applied. Serious impact of channel wall thickness on the velocity distribution, thus also on the local Nusselt number distribution, was observed. Such behavior differs seriously from the theoretical predictions assuming zero wall thickness. Nevertheless, the average Nusselt number for both zero and non-zero wall thickness were in surprisingly good agreement.

Metryczka

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