Institute of Chemical Engineering

Modification of Short-Channel Structures Towards Heat Transfer Intensification: CFD Modeling

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In this paper, we present the results of heat transfer studies on short-channel structured packing in chemical reactors. Heat transfer coefficients, streamlines, and fluid temperatures were determined using CFD (Computational Fluid Dynamics). CFD simulations were performed for three modified short-channel structures, in which the front of the walls was rounded to eliminate inlet vortices and the outlet was modified (in three versions) to minimize outlet vortices that disturb the fluid flow. CFD simulations for a classic short-channel structure with straight walls were also performed. The results proved that modified structures experienced significantly more intensive heat transport compared to classic structures. Among the tested modifications, the most promising was Modification 1, for which the Nusselt number increased from 65% to 15% depending on the structure length and the Reynolds number. Additionally, for all modifications considered, there was no inlet vortex, which significantly reduced the transport intensity in the classic structure. Further down the channel, the transport intensity was similar for all structures, including the classic structure. The smoothest flow at the outlet of the structure was observed for Modification 1.

Metryczka

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