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Structured intra-tubular catalyst carrier for highly exothermic processes: modelling and CFD study

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Numerical studies were conducted on heat transfer in tubes filled with structured catalyst carriers consisting of rosettes, rings and discs in different arrangements. The distribution of gas velocity and temperature were determined on the basis of computational fluid dynamics (CFD tool FLUENT®). The key problem of the research was heat transfer intensification to the inner tube wall. The Reynolds number range from 800 to 5000 was numerically examined. It was shown that the arrangement of the structure elements has a significant influence on heat transfer intensity. The best heat transfer was achieved for the composition of the U-shaped ring with one rosette, while the worst was for the ring (or disc) with two rosettes. The CFD results were in reasonable agreement with the experimental data. The application of the rather simple Generalised Lévêque Equation (GLE) secured quite good accuracy with respect to experiments, comparable to CFD, and provided valuable design tips.

Metryczka

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