

To observe the effect of hydrodynamic flow and mixing during heating and cooling on heat transfer coefficient in a Straight Tube, Coiled Flow and Coiled Flow Inverter micromixer using OpenFOAM

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Abstract

The objective of this project is to calculate and compare the Heat Transfer Coefficient (HTC) for various tubular flow microreactor geometries, i.e. straight tube reactor (STR), coiled tube reactor (CTR), coiled flow inverter reactor (CFIR). The study is done at different Reynolds numbers of 0.1, 10, 1000 for both heating and cooling conditions with a temperature difference of 5 and 20 K between the wall and the fluid at the inlet. *buoyantSimpleFoam* is used for the laminar simulation. Geometry is created using SolidWorks and the mesh is generated using the ANSYS Meshing module. After the simulation, it is observed that for a given geometry, HTC values remain the same for both heating and cooling for both temperature differences. The HTC values are found to be a function of Re and increase with Re, the HTC values are found to be in the following order: CTR > CFIR > STR.

References

1. Garg, Dhiraj K., et al. "Numerical investigations of perfectly mixed conditions at the inlet of free radical polymerization tubular microreactors of different geometries." *Macromolecular Theory and Simulations* 29.6 (2020): 2000030.