Numerical study on the turbulent mixed convective heat transfer over 2D microscale backward-facing step

ABSTRACT

Background: Quality improvement projects have been widely adopted to prevent complications The current numerical study investigated over two-dimensional (2D) flat microscale backward-facing step (MBFS). The boundary conditions and the controls fixed by the finite volume method (FVM) and RNG k-ε model. The upstream and the step of the wall considered adiabatic, while the downstream of the wall heated by constant heat flux. The straightforward wall of the channel fixed at a constant temperature that is higher than the fluid inlet temperature. The Reynolds number (Re) range of $5{,}000 \leq Re \leq 15{,}000$ was used in the study. The results show that the increase in the Re will resulted in increased of Nusselt number (Nu). The study also found that the highest Nu was produced from the ethylene glycol case. The current study also found that the recirculating range at steps is more significant than using water under the same Re by using ethylene glycol. The current numerical study investigated over two-dimensional (2D) flat microscale backward-facing step (MBFS). The boundary conditions and the controls fixed by the finite volume method (FVM) and RNG k-ε model. The upstream and the step of the wall considered adiabatic, while the downstream of the wall heated by constant heat flux. The straightforward wall of the channel fixed at a constant temperature that is higher than the fluid inlet temperature. The Reynolds number (Re) range of $5{,}000 \leq Re \leq 15{,}000$ was used in the study. The results show that the increase in the Re will resulted in increased of Nusselt number (Nu). The study also found that the highest Nu was produced from the ethylene glycol case. The current study also found that the recirculating range at steps is more significant than using water under the same Re by using ethylene glycol.

Keyword: Turbulent flow; Microscale backwardfacing step; Heat transfer; Base fluids