

THE EFFECT OF AXIAL HEAT FLUX ON THE HEAT TRANSFER IN MICRO-CHANNELS

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ABSTRACT Numerical analysis was performed to evaluate the heat transfer characteristics of water flowing through triangular silicon micro-channels with hydraulic diameter of 160 μm in the range of Reynolds number $Re=3.2-64$. It was shown that as the bulk water temperature, as well as the temperature of the heated wall, do not change linearly along the channel. The numerical predictions results of temperature distribution on the heated wall agree with the experimental results. The behaviour of the Nusselt number along the channel has a singular point. At this point, the difference between the temperatures on the wall and the bulk water becomes negative and the heat flux changes the sign and is directed from the fluid to the wall. The singular point shifts closer to the channel outlet with an increase of the Reynolds number. It was shown that under conditions of the present study the dissipation effects can be neglected and the heat transfer may be described by conventional Navier-Stokes and energy equations as a common basis.