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# Heat transfer enhancement in microchannel heat sink using hybrid technique of ribs and secondary channels

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ABSTRACT

The flow and heat transfer characteristics of microchannel heat sink with secondary oblique channels in alternating direction and rectangular ribs (MC-SOCRR) are studied numerically for Reynolds number (*Re*) ranging from 100 to 500. The effects of secondary channels and ribs on the Nusselt number and friction factor are investigated. A comparative analysis has been conducted to the performance of the proposed design with related geometries such as microchannel with rectangular ribs (MC-RR) and microchannel with secondary oblique channels (MC-SOC). The results emphasized the superiority of overall performance of MC-SOCRR over both MC-RR and MC-SOC. The strategy which pursued by new design is the exploitation of larger flow area which provided by secondary channel to reduce pressure drop caused by ribs. Besides, the existence of the ribs in central portion of the channel is utilized to inject more flow through secondary channels for further enhancement in flow mixing. The effect of three geometrical parameters; relative width of secondary channel ($\lambda$) relative rib width ($\beta$) and angle of secondary channel ($\theta$) on the convective heat transfer and pressure drop have been investigated. The MC-SOCRR with parameters; $\lambda = 0.666$, $\beta = 0.5$ and angle = 45° yields the best overall performance with $Pf = 1.98$ at $Re = 500$.