

Complex Cooling Approach in Microchannel Heat Exchangers Using Solid and Hollow Fins

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Abstract : A three-dimensional numerical optimisation of combined microchannels with constructal solid, half hollow, and hollow circular fins is documented in this paper. The technique seeks to minimize peak temperature in the entire volume of the microchannel heat sink. The volume and axial length were all fixed, while the width of the microchannel could morph. High-density heat flux was applied at the bottom wall of the microchannel. The coolant employed to remove the heat deposited at the bottom surface of the microchannel was a single-phase fluid (water) in a forced convection laminar condition, and heat transfer was a conjugate problem. The unit cell symmetrical computation domain was discretised, and governing equations were solved using computational fluid dynamic (CFD) code. The results reveal that the combined microchannel with hollow circular fins and solid fins performed better at different Reynolds numbers. The numerical study was validated for the single microchannel without fins and found to be in good agreement with previous studies.

Keywords : constructal fins, complex heat exchangers, cooling technique, numerical optimisation

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