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CONSTRUCTAL DESIGN OF SINGLE MICROCHANNEL HEAT SINK WITH VARYING AXIAL LENGTH AND TEMPERATURE-DEPENDENT FLUID PROPERTIES

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ABSTRACT

The objective of this numerical study is to investigate the best geometric configuration that maximises heat transfer from the heated base by allowing both the length of the solid substrate and the microchannel heat sink freedom to morph. The thermal performance of the microchannel is based on the minimised peak temperature on the heated surface which gives a global minimised thermal resistance. The optimisation of the geometric parameters of the heat sink and solid substrate is carried out using a computational fluid dynamics code with a goal-driven optimisation algorithm. Results of the effect of Bejan number on the minimised peak temperature and minimised thermal resistance for solid substrate with varying axial lengths of 1 to 10 mm but fixed volume of 0.9 mm^3 is presented. Results of optimal channel aspect ratio, solid volume fraction and channel hydraulic diameter of the microchannel were also presented.

Keywords: Forced convection, Minimised peak temperature, Minimised thermal resistance; Microchannel, Aspect ratio.