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Comparison of Hydrodynamic and Thermal Performance of Micro Heat Sinks with Inline and Staggered Arrangements of Cylindrical Micro Pin Fins ALI MOHAMMADI, PhD student, ALI KOSAR, Professor, FACULTY OF ENGINEERING AND NATURAL SCIENCES (FENS) COLLABORATION, NANOTECHNOLOGY RESEARCH AND APPLICATION CENTER (SUNUM) COLLABORATION — This computational study compares the hydrodynamic and thermal characteristics of flow inside a rectangular microchannel with different in-line and staggered arrangements of cylindrical micro pin fins (MPF). The channel dimensions are 5000 x 1500 x 100 m^3 (l x w x h) while the height and diameter of MPFs are both 100 m which results in the H/D ratio of 1. Two different values of 1.5 and 3 are considered for the horizontal and vertical pitch ratios (S_L/D and S_T/D) among MPFs in each of the in-line and staggered arrangements which results in eight configurations. A constant heat flux of 30 W/cm^2 is applied through the bottom section of microchannel as well as the liquid interacting surfaces of MPFs. The flow field is simulated at five different Reynolds numbers of 20, 40, 80, 120 and 160 using ANSYS FLUENT v.14.5. Four parameters of pressure drop, friction factor, Nusselt number and Thermal Performance Index (TPI) are used to analyze the hydrodynamic and thermal performance of micro heat sinks. Results show a great dependency of evaluating parameters on the vertical pitch ratios while minor dependencies are seen on the horizontal pitch ratio.

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