Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Effect of Wetted Microtexturing on Hydrodynamic and Thermal Characteristics in Microchannel Flow[1] NASTARAN RABIEI, GRACE MCDONOUGH, CARLOS HIDROVO, Northeastern University — Microscale duct flow is characterized by large laminar pressure drop. Due to the wide applications of microchannel flow in different areas, such as drug delivery and microelectronics cooling, exploring new methods to manipulate their hydrodynamic and thermal behavior can result in improved performance and energy saving benefits. Our goal here is to obtain a better understanding of the flow physics inside microchannels with microstructures on the walls. We are working on investigating the combined effect of flow and heat transfer when there are square trenches with different dimensions, both experimentally and numerically. The microstructures on the surfaces increase the wetting surface area which is expected to increase the friction (skin drag) induced by the shear forces, but the recirculation generated inside the grooves can reduce this effect. Conversely, the recirculation can cause a negative pressure difference opposing the flow direction (pressure drag). The textures disturb the thermal boundary layer and can potentially improve heat transfer through recirculation mixing. However, low conductivity of stagnant fluid trapped inside the grooves can adversely impact the total heat transfer. In this ongoing research, we are interested in figuring out if any combination of the geometrical parameters of the trenches can result in the lowest drag while having the highest heat transfer.

[1]We acknowledge funding support from NSF award grant CBET-1705958

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Date submitted: 12 Nov 2020 Electronic form version 1.4