Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Optimization of Microchannel Characteristics for Enhanced Heat Transfer in the Laminar Regime R. SAKSENA, K.T. CHRISTENSEN, Univ. of Illinois — The present effort explores optimization of microchannel characteristics for enhanced convective heat transfer in the laminar regime with specific application to the development of complex microfluidic networks for self-cooling material systems. Of particular interest is optimization of the layout of the microscale flow passages in a manner that both maximizes heat transfer while simultaneously minimizing any additional pressure-drop penalty compared to straight microchannels. This optimization is achieved using a multi-objective genetic algorithm in conjunction with numerical simulations in the flow regime relevant to self- cooling applications (Re $<$ 100) that span a parameter space of both wavelength and amplitude for sinuous microchannels. Experimental validation of the identified optimal configurations is performed in a controlled heat-transfer environment using microchannels written with a unique robocasting fugitive-ink-deposition printer at UIUC.

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Date submitted: 12 Aug 2009 Electronic form version 1.4