Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Optimized evaporation from a microchannel heat sink REZA MONAZAMI, HOSSEIN HAJ-HARIRI, University of Virginia — Two-phase heat transfer devices, benefiting the unique thermal capacities of phase- change, are considered as the top choice for a wide range of applications involving cooling and temperature control. Evaporation and condensation in these devices usually take place on porous structures. It is widely accepted that they improve the evaporation rates and the overall performance of the device. The liquid menisci formed on the pores of a porous material can be viewed as the active sites of evaporation. Therefore, quantifying the rate of evaporation from a single pore can be used to calculate the total evaporation taking place in the evaporator given the density and the average size of the pores. A microchannel heat sink can be viewed as an structured porous material. In this work, an analytical model is developed to predict the evaporation rate from a liquid meniscus enclosed in a microchannel. The effects of the wall superheat and the width of the channel on the evaporation profile through the meniscus are studied. The results suggest that there is an optimum size for the width of the channel in order to maximize the thermal energy absorbed by the unit area of the heat sink as an array of microchannels.

Reza Monazami
University of Virginia

Date submitted: 12 Sep 2011 Electronic form version 1.4