Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Nozzleless Spray Cooling Using Surface Acoustic Waves KAR MAN ANG, School of Engineering, Monash University, 47500 Bandar Sunway, Malaysia, LESLIE YEO, Micro/Nanophysics Research Laboratory, RMIT University, Melbourne, VIC 3001, Australia, JAMES FRIEND, Department of Mechanical and Aerospace Engineering, University of California, San Diego, CA92093, United States, YEW MUN HUNG, MING KWANG TAN, School of Engineering, Monash University, 47500 Bandar Sunway, Selangor, Malaysia — Due to its reliability and portability, surface acoustic wave (SAW) atomization is an attractive approach for the generation of monodispersed microdroplets in microfluidics devices. Here, we present a nozzleless spray cooling technique via SAW atomization with key advantage of downward scalability by simply increasing the excitation frequency. With generation of micron size droplets through surface destabilization using SAW, the clogging issues commonly encountered by spraying nozzle can be neutralized. Using deionised water, cooling is improved when the atomization rate is increased and the position of the device is optimized such that the atomized droplets can be easily seeded into the upstream of the flow circulation. Cooling is further improved with the use of nanofluids; a suspension of nanoparticles in water. By increasing nanoparticle mass concentration from 1% to 3%, cooling is enhanced due to the deposition and formation of nanoparticle clusters on heated surface and eventually increase the surface area. However, further increase the concentration to 10% reduces the cooling efficiency due to drastic increase in viscosity μ that leads to lower atomization rate which scales as $\dot{m} \sim \mu^{-1/2}$.

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Date submitted: 01 Aug 2015 Electronic form version 1.4