Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Pool Boiling Enhancement on Textured Surfaces using Acoustic Actuation THOMAS BOZIUK, MARC SMITH, ARI GLEZER, Georgia Institute of Technology — Boiling heat transfer on submerged textured heated surfaces is enhanced using ultrasound actuation. The heated surface is textured using an array of open microchannels that advantageously separate the nucleation sites on the surface and inhibit the transition to film boiling, which significantly increases the critical heat flux compared to a smooth surface of the same planform dimensions. The present investigation shows that the formation and evolution of vapor bubbles on the heated surface can be substantially altered by a highly directional ultrasound (1.7 MHz) beam, and leads to significant enhancement in heat transfer, including reduced surface superheat and increased critical heat flux (exceeding 55%). The effects of the beam incidence and azimuthal angle on vapor formation, advection, and resulting effect on surface superheat are investigated experimentally in a liquid test cell. Heat transfer enhancement characterized by changes in the boiling curve (i.e., superheat and CHF) varies with surface texturing and is also dependent on acoustic beam orientation relative to the surface texture pattern.

Thomas Boziuk
Georgia Institute of Technology

Date submitted: 01 Aug 2015 Electronic form version 1.4