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**Multi-Scale Acoustic Actuation of Vapor Bubbles for Pool Boiling Enhancement** THOMAS R. BOZIUK, MARC K. SMITH, ARI GLEZER, Georgia Institute of Technology — The effect of multi-scale acoustic actuation on heat transfer from a submerged structured surface in pool boiling is investigated experimentally. Actuation over a range of frequencies affects the growth, detachment, advection, and condensation of vapor bubbles and results in significant favorable changes to the boiling curve and critical heat flux. Heat transfer is also improved with a structured heated surface containing fixed but separate nucleation sites designed to limit the merger of vapor bubbles above the surface and to enable an efficient inflow of makeup liquid to the evaporation sites. However, the geometry of the surface between the evaporation sites can impede the effectiveness of the acoustic actuation within certain bandwidths related to the scale of the geometry. It is shown that a multi-scale approach combining low frequency (kHz-range) actuation, for bubble interface excitation and enhanced condensation, with high frequency (MHz-range) actuation, for induced interfacial forces near the contact line, yields effective control of the evolution of vapor bubbles over a broad range of scales and surface geometries and leads to a significant improvement in boiling heat transfer.

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