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Ultrasonically-Enhanced Condensation by Induced Interfacial Droplet Ejection THOMAS BOZIUK, MARC SMITH, ARI GLEZER, Georgia Institute of Technology — Ultrasonic (MHz range) actuation at the liquid-vapor interface of vapor flowing over a slow moving sub-cooled liquid layer exploits the differences in acoustic impedance to form a train of droplet that are ejected into the vapor. The increased interfacial surface area of the ejected droplets result in increased heat transfer between the vapor and the liquid and a significant increase in condensation without inducing a significant increase in upstream pressure. The enlarged droplets drop back into the subcooled liquid stream under gravity. A two-stream liquid-vapor experimental setup was designed to assess the effects of the acoustic actuation on the formation and ejection of the subcooled liquid droplets and the enhanced condensation over several combinations of relative flow rates and liquid subcooling, the observable increases in the sensible heat of the liquid stream as well as increased rate of mass transfer from the vapor to liquid stream. The evolution of the droplet-laden vapor within a mixing volume is visualized using high-speed imaging and is used to investigate the effects of the residence time of the droplets within the vapor volume and possible applications to acoustically-driven heat exchangers.

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