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Acoustic spreading of thin films of water: balancing capillary, viscous, and vibrational mechanisms OFER MANOR, GENNADY ALTSHULER, Chemical Engineering, Technion - Israel Institute of Technology, Haifa, Israel, SMALL SCALE TRASPORT LABORATORY TEAM — Substrate vibrations at frequencies comparable to HF radio frequencies and in contact with liquid generate flow at submicron length scales that may result in spreading of liquid films. This spreading mechanism is thought as a way of manipulating liquids on microfluidic platforms. In previous studies we used silicon oil as a model liquid; silicon oil spread easily and smoothly as long as the oil and substrate vibrations are in contact. Water films under similar conditions, however, were observed to spread to a minute extent and only under high power levels that further render intense capillary instabilities. In this presentation we use theory and experimental evidence to discuss the physical mechanisms associated with acoustic spreading of water films. We highlight mechanisms associated with acoustic spreading of arbitrary liquids, and we show the various influences of these mechanisms on liquid spreading is encapsulated within one dimensionless number whose value determines whether spreading is to take place. We further elucidate the discrepancy, observed in earlier literature, between the response of oil and water to acoustic excitation and highlight an intermediate parametric region, where precise manipulation of water spreading is achieved by carefully balancing the governing mechanisms.

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