Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Stability response of liquid bridges to maximum volume asymmetric perturbations TEJASWI SOORI, LIGE ZHANG, ARIF ROKONI, YING SUN, Drexel University — The stability response of a bounded axisymmetric liquid bridge to maximum volume asymmetric perturbations is investigated using theory and experiments. Based on stability theory, a liquid bridge undergoes maximum volume asymmetric instability when the contact angle reaches 180°, for all radial Bond numbers $Bo_R = \Delta\rho g R^2/\gamma$, where $\Delta\rho$ is the density difference between the bridge liquid and ambient fluid, g the acceleration due to gravity, R the bridge radius, and γ the liquid surface tension. The Young–Laplace equation is solved to estimate the maximum stable volume before rotund drop instability occurs for radial Bond numbers in the range $0.1 < Bo_R < 5$. Experiments are performed using water on surfaces with identical chemical signatures on both top and bottom substrates. A needle connected to the bottom substrate is used to increase the bridge volume in small increments to reduce surface waves. The maximum volume theoretical limit of $V_{max} = (2/3)^{1/3} Bo^{-2/3}$ is compared with experiments. Deviations in contact angle and volume are explained by comparing experiments with numerical results.

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Date submitted: 10 Aug 2020 Electronic form version 1.4