Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

The role of surface tension gradients in coalescence of two unequal-size drops SWATI SINGH, ARUN K SAHA, Indian Institute of Technology Kanpur, India — The coalescence of two drops in a gaseous surrounding has received special attention due to its importance in both natural and industrial process, such as raindrop/cloud formation, spray atomization and microfluidic devices. In the present work, the coalescence dynamics of two drops made of miscible but distinct fluids, placed one over another in a vertical position are studied. The five non-dimensional parameters are used to describe the flow mechanism: Ohnesorge number, Bond number, Schmidt number, drop diameter ratio and lower to upper drop surface tension ratio. A two-dimensional axisymmetric simulation using Coupled Level set and Volume of fluid method (CLSVOF) has been performed to unveil the underlying physics under varying drop diameter ratio (1.0-3.0), Ohnesorge number (0.003-0.02) and surface tension ratio (0.3-1.5). Result shows three distinct regimes: the appearance, disappearance and re-appearance of partial coalescence with decreasing surface tension ratio. With increasing Ohnesorge number, the effect of Marangoni flow is dampened by the high viscous forces resulting in complete coalescence of drop into the bulk liquid. Moreover, a reduction in the parent size ratio is also noted to result in total coalescence.

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Date submitted: 03 Aug 2020 Electronic form version 1.4