Breakup of Liquid Droplets

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Abstract

In this paper, deformation and breakup of liquid droplets has been studied. Detailed physics pertaining to four different breakup regimes, oscillatory, bag, multimode and shear breakup, has been investigated using an incompressible interface tracking methodology. Critical Weber numbers for the three regimes have also been indentified for a wide pressure range. A generalized regime diagram valid for $Oh < 0.1$ was developed to predict the breakup mechanism, taking into account the pressure effect on the critical Weber number, using data from previous experimental investigations and simulations conducted during the current study. Child droplet diameters were also characterized during the present research effort and it was concluded that for $We > 300$, the droplet size distribution follows a universal log-normal distribution. A theoretical correlation for sauter mean diameter (SMD), d_{32}, was also developed and it showed decent agreement with the simulation and experimental outcomes.

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