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The effect of microbubble cavity formation on the breakup of glowing sprays DENNIS VAN DER VOORT, NICO DAM, WILLEM VAN DE WATER, RUDIE KUNNEN, HERMAN CLERCX, GERTJAN VAN HEIJST, Eindhoven University of Technology — Spray atomization is affected by an interplay of several physical phenomena. To understand the breakup as a whole, it is essential to understand the contribution of individual phenomena (turbulence,cavitation,etc). This work investigates the contribution of cavity formation inside the nozzle by seeding a system with microbubbles, generating transient cavities. Using transparent nozzles, pressure sensors, and high-speed imaging, we find that the pressure pulses generated by cavity collapse can be used to correlate the time and magnitude of the spray angle increase, valuable for application in non-transparant setups. Laser-induced phosphorescence is used to quantitatively measure liquid dispersion, which excites ('tags') 10-20 nL of fluid at the nozzle exit and tracks the spread of glowing fluid. The dispersion correlated to cavity formation events is compared to the average. We show that the dispersion (which is independent of the starting tagged spray width) does not increase with the formation of a cavity. This indicates that, while the spray angle may increase, the turbulent processes (both liquid and gas phase) that governs the dispersion remains the same, and the cavitation events do not influence this process.

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