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Inducing coalescence by a superposition of two Rayleigh-Plateau instabilities: Experimental implementation PASCAL SLEUTEL, THEO DRIESSEN, University of Twente, ROGER JEURISSEN, ACFD Consultancy, FRITS DIJKSMAN, DETLEF LOHSE, University of Twente — In this work we present an experimental method to efficiently breakup and coalesce multiple droplets from a jet by a superposition of two Rayleigh-Plateau perturbations. A continuous liquid jet is ejected from a glass capillary which has a piezo electric actuator attached to it. The periodical pressure perturbations applied by the piezo induce two growing modes on the jet. By choosing the perturbation wavenumbers close to wavelength of the most unstable mode, fast coalescence and a stable stream of droplets are obtained. By tuning the phase between the two perturbations we control the coalescence time and the satellite droplet formation. When the coalescence process is finished, the final droplet size is set by the low frequency beating wavelength. This means that stable streams of mono-disperse droplets can be generated at inter-droplet distances and droplet velocities very different from a single Rayleigh-Plateau instability. Our experimental results are compared with numerical results and there is agreement in great detail.

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