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Absolute instability of a flow focused capillary liquid microjet. The minimum liquid flow rate. ALFONSO M. GANAN-CALVO, PASCUAL RIESCO-CHUECA, ESI, Universidad de Sevilla, Spain — The absolute instability of a gas-flow focussed capillary liquid microjet has been analyzed following a well established spatial- temporal linear stability analysis formalism (e.g. Leib and Goldstein 1986, Huerre and Monkewitz 1990, Chomaz 2005) for quasi-parallel developing flows. Under realistic conditions, a simple asymptotically exact model can be established from which a closed and simple analytical dispersion relation is obtained. This model reproduces the many earlier results from temporal stability analyses (back to Rayleigh 1878) existing in the literature for our fluidic configuration. In this work, however, in addition to provide a spatial-temporal stability analysis previously not attempted for our specific configuration, we unveil the fundamental role of the properly calculated gas-to- liquid momentum ratio and the asymptotic surface liquid velocity as a function of the Weber number. Thus, our approach asymptotically reduces the problem of finding the onset of absolute instability of a flow focused capillary microjet and the minimum liquid flow rate (for which the issuing microjet ceases to be steady and begins to drip) to find a critical Weber number which depends on the liquid properties and the geometry. Analytic results are then compared with experiments.

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