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Universal scaling laws of top jet drop size and speed in bubble bursting[1] ALFONSO GANAN-CALVO, ETSI, Universidad de Sevilla — The collapse of a bubble of radius R_o at the surface of a liquid generating a liquid jet and a subsequent first drop of radius R follows a universal flow pattern that can be universally scaled using the difference between the parent bubble radius and a critical radius $R^* = Oh^{*-2}\mu^2/(\rho\sigma)$ below which no droplet is ejected for a given Newtonian liquid. Here, $Oh^* = 0.037$ is the critical Ohnesorge number (Walls et al. 2015, Phys. Rev. E 92, 021002(R)), where $Oh = \mu/(\rho\sigma R_o)^{1/2}$; ρ, σ and μ are the liquid density, surface tension and viscosity. Based on a flow singularity occurring for $R_o = R^*$, a scaling analysis of the complex flow structure at the onset of jet ejection for $R_o > R^*$ leads to the diameter of the first emitted droplet and the initial ejection velocity: $D = k_d(R_o - R^*)^{5/4}R^{*-1/4}$ and $V = k_v\sigma\mu^{-1}(R_o - R^*)^{3/4}R^{*-3/4}$, respectively. A remarkable collapse of data taken from available literature since 1954 to 2017 furnishes the universal constants $k_d = 0.1$ and $k_v = 1.6$, for negligible gravity effects.The role of gravity is subdominant and can be reflected by the exponential dependence of the scaling laws obtained on the Bond number.

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