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Gas Jet Blowing on a Falling Soap Film: Three Regimes of Interaction MAKSIM MEZHERICHER, Princeton University, CEDRIC GERBELOT, Ecole Normale Superieure, ERIC QIU[1], ANTONIO PERAZZO, YIGUANG JU, HOWARD A. STONE, Princeton University — Recently, several studies reported on the generation of soap bubbles by a gas jet blowing perpendicular to a falling soap film. However, an extensive investigation of the regimes of interaction between the air jet and the falling soap film has not been performed yet. In this work, we used hypodermic blunt needles with inner diameters between 110-260 microns as small cylindrical nozzles to create air jets blowing perpendicular to falling soap films with thickness in the range of 2-10 microns, surface tension 25-32 mN/m and viscosity 1-7 mPa*s. While gradually increasing the jet velocity, three regimes of interaction between the blowing jet and the soap film were observed: formation of a dimple in the film for jet velocities smaller than the threshold for bubbling; a bubbling regime over and above a threshold velocity; and a regime of immediate film rupture when a critical jet velocity was achieved. In the bubbling regime, tuning some parameters enabled production of monodisperse bubble aerosols. The onset of the regime of immediate film rupture was found to strongly depend on the nozzle diameter and weakly depend on the film thickness and its physicochemical properties.

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