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Experimental and numerical visualization of the recirculation flow inside a gas flow-focused liquid meniscus[1] M. TORREGROSA, ESI, Universidad de Sevilla, Spain, C. FERRERA, Universidad de Extremadura, Spain, A. GANAN-CALVO, M.A. HERRADA, ESI, Universidad de Sevilla, Spain, M. MARCHAND, ENSMA, Futuroscope, France — The liquid cone-jet mode, which can be produced upon stimulation by gas flow-focusing among other procedures, is explored by both numerical simulation and experimental visualization. The results for low viscosity liquids show that, like in previous computational simulations, a recirculation cell inside the meniscus appears when the injected liquid flow rate is reduced below a certain limit. The size of that cell increases as the flow rate decreases until a global instability is reached (minimum flow rate). The results were confirmed with experimental visualization of the flow inside the meniscus. However, when the viscosity of the liquid is increased over a threshold value, the recirculation cell disappears. In this case, the viscous diffusion of momentum from the meniscus surface tends to arrange the streamlines and direct the flow towards the meniscus tip, which prevents the recirculation cell from being formed even for very small injected flow rates and very large applied pressure drops. Besides, the recirculation cell exhibits a rich and beautiful collection of topological flow features when the capillary cone-jet configuration deviates from the pure axial symmetry.

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