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Role of the channel geometry on the bubble pinch-off in flow-focusing devices WIM VAN HOEVE, BENJAMIN DOLLET, Physics of Fluids, University of Twente, PO Box 217, 7500AE Enschede, The Netherlands, JAN-PAUL RAVEN, PHILIPPE MARMOTTANT, Spectrométrie Physique, Université Grenoble 1, BP 87, 38402 Saint-Martin-d'Hères, France, MICHEL VERSLUIS, Physics of Fluids, University of Twente, PO Box 217, 7500AE Enschede, The Netherlands
— The role of the orifice geometry in the production of bubbles by flow focusing of a gas and a liquid in an orifice of rectangular cross-section is investigated. It is experimentally shown that the aspect ratio of the orifice dramatically influences the duration of bubble breakup, characterized by a slow linear 2D collapse, followed by a final fast 3D pinch-off. A stability analysis predicts that the 2D collapse is always stable, whereas the 3D pinch-off is always unstable. The ultimate stage of the pinch-off is recorded by high-speed imaging, yielding a scaling $w_m \sim \tau^{1/3}$ between the neck width w_m and the time τ before breakup, which indicates that breakup is driven solely by the inertia of both gas and liquid, and that it is not a capillary process. The presented study of the bubble breakup shows that elongated rectangular orifices favors high monodispersity, whereas the highest frequency of bubble production is achieved in square orifices.

Wim van Hoeve

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