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Pressure gradient induced generation of microbubbles ALVARO EVANGELIO, FRANCISCO CAMPO-CORTES, JOSE MANUEL GORDILLO, Escuela Superior de Ingenieros, Universidad de Sevilla, Spain — It is well known that the controlled production of monodisperse bubbles possesses uncountable applications in medicine, pharmacy and industry. Here we provide with a detailed physical description of the bubble formation processes taking place in a type of flow where the liquid pressure gradient can be straightforwardly controlled. In our experiments, a gas flow rate discharges through a cylindrical needle into a pressurized chamber. The pressure gradient created from the exit of the injection needle towards the entrance of a extraction duct promotes the stretching of the gas ligament downstream. In our analysis, which is supported by an exhaustive experimental study in which the liquid viscosity is varied by three orders of magnitude, different regimes can be distinguished depending mainly on the Reynolds number. Through our physical modeling, we provide closed expressions for both the bubbling frequencies and for the bubble diameters as well as the conditions under which a monodisperse generation is obtained in all regimes found. The excellent agreement between our expressions and the experimental data fully validates our physical modeling.

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