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Experimental and Computational Investigation of Microbubble Production in Microfluidic Flow-Focusing Devices MICHAEL WEBER, University of Colorado, ROBIN SHANDAS, University of Colorado, University of Colorado Health Sciences Center — Micron-sized bubbles have been effectively used as contrast agents in ultrasound imaging systems and have the potential for many other applications including targeted drug delivery and tumor destruction. The further development of these applications is dependent on precise control of bubble size. Recently, microfluidic flow-focusing systems have emerged as a viable means of producing microbubbles with monodisperse size distributions. These systems focus co-flowing liquid streams surrounding a gas stream through a narrow orifice, producing bubbles in very reproducible manner. In this work, a photopolymerization technique has been used to produce microfludicic flow-focusing devices which were successfully used to produce micron-sized bubbles. The flow dynamics involved in these devices has also been simulated using a volume-of-fluid approach to simultaneously solve the equations of motion for both the gas and liquid phases. Simulations were run with several variations of the flow-focuser geometry (gas inlet width, orifice length, gas-liquid approach angle, etc.) in an effort to produce smaller bubbles and increase the working range of liquid and gas flow rates. These findings are being incorporated into the production of actual devices in an effort to improve the overall effectiveness of the bubble production process.

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