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Bubble Gate for In-Plane Flow Control ALI KAZEMI OSKOOEI, AXEL GUENTHER, University of Toronto — The ability to control fluid flow is of key importance for microfluidic devices. While a large number of sophisticated solutions have been demonstrated, there is still a great amount of interest in developing simple strategies that do not require complex fabrication steps and electrical connections. A small footprint, compatibility with different substrate materials, working fluids and temperatures are amongst other desirable characteristics. We demonstrate a bubble gate strategy that meets all the above. In this strategy, flow control is achieved using a controlled gas stream that intercepts a liquid stream at a T-junction, forming a gas-liquid interface (i.e. bubble). Closely positioned micropillars are employed to limit the bubble motion to a single degree of freedom. The bubble breaks into the liquid stream and occupies the entire liquid cross-section, when the gas pressure is continued. Hence, the bubble movement is able to stop or manipulate the liquid flow. Several control operations are discussed herein, including, but not limited to, valves, liquid metering and peristaltic pumping. PIV measurements are employed to investigate the transient flow structure.

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