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Inertial microfluidic pump PAVEL KORNILOVITCH, ALEXANDER GOVYADINOV, DAVID MARKEL, ERIK TORNIAINEN, HP Inc — The inertial pump is powered by a microheater positioned near one end of a fluidic microchannel. As the microheater explosively boils the surrounding fluid, a vapor bubble expands and then collapses asymmetrically, resulting in net flow. Such devices become an effective means of transporting fluids at microscale. They have no moving parts and can be manufactured in large numbers using standard batch fabrication processes. In this presentation, physical principles behind pump operation are described, in particular the role of reservoirs in dissipating mechanical momentum and the expansion-collapse asymmetry. An effective one-dimensional dynamic model is formulated and solved. The model is compared with full three-dimensional CFD simulations and available experimental data. Potential applications of inertial micropumps are described.

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