

ACOUSTICS2008/2051 Cavitation bubbles as microfluidic actuators

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In this talk we give an overview on the usage of single cavitation bubbles to pump, mix, and manipulate cells in microfluidics. The bubbles are generated with a laser pulse in optically transparent lab-on-a-chip devices. The bubble pulsations is inherently fast, thus although the characteristic dimensions are small high Reynolds numbers flow can be achieved. Experiments show that depending on the channel height 2-dimensional or 3-dimensional fluid flow is generated. Interestingly, there exists a regime which can be described with the Laplace equation, thus it is essentially a potential inviscid flow. We will present the current work (of others and our group) on cavitation assisted pumping using the jetting effect, mixing flows through the creation of vorticity, and the interaction of a bubble with suspension cells. The first results on the latter promise a fruitful future for biologic relevant applications in integrated lab-in-chip devices.