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Bubble microstreaming: Transport and force actuation SASCHA HILGENFELDT, ESAM and Mechanical Engineering, Northwestern University, PHILIPPE MARMOTTANT, Laboratoire de Spectrométrie Physique, Université Joseph Fourier, Grenoble, France — The energy of acoustic waves can be focused onto the microscale through oscillating bubbles, setting up microfluidic flow. Rather than driving the flow directly through the bubble interface motion, we use small periodic oscillations that are rectified into a powerful, steady streaming flow. Substrate patterning allows for control of both the bubble positions and the direction of the flow. High transport speeds are obtained, while different flow patterns can be activated on the same subtrate. Directed transport is achieved by simple, localized patterning, without the need for confining microchannels. The flow field also allows for the simultaneous actuation of large forces onto transported objects, such as lipid vesicles or cells. Potential applications abound in MEMS and lab-on-a-chip systems handling biomaterials.

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