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Acoustic actuation and sorting of droplets and cells at ultra-high rates in microfluidics THOMAS FRANKE, Harvard University/University of Augsburg, LOTHAR SCHMID, SUSANNE BRAUNMUELLER, ACHIM WIXFORTH, University of Augsburg, DAVID A. WEITZ, Harvard University, FRANKE TEAM, FRANKE/WEITZ TEAM — We direct the motion of droplets in microfluidic channels using a surface acoustic wave device. This method allows individual drops to be directed along separate microchannel paths at high volume flow rates, which is useful for droplet sorting. The same principle can be applied for biological cell sorting which operates in continuous flow at high sorting rates. The device is based on a surface acoustic wave cell-sorting scheme and combines many advantages of fluorescence activated cell sorting (FACS) and fluorescence activated droplet sorting (FADS) in microfluidic channels. It is fully integrated on a PDMS device, and allows fast electronic control of cell diversion. We direct cells (HaCaT, MV3 melanoma, fibroblasts) by acoustic streaming excited by a surface acoustic wave. The device underlying principle works without additional enhancement of the sorting by prior labeling of the cells with responsive markers such as magnetic or polarizable beads. We have combined the acoustic device successfully with a laser based fluorescence detection system and demonstrate sorting of fluorescent labeled drops at rates of several kHz without any false sorting.

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