

Acoustic Microfluidics with Tiny Droplets

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In our project we develop and construct devices for the use in microfluidics using surface acoustic waves. Microfluidics has become an important field of modern research and allows the construction of entire miniaturized laboratories, so-called Labs-on-a-Chip. Furthermore, microfluidics promise a great reduction in costs, risk potential and enable working with tiny amounts of chemicals while still being able to gather meaningful data. Since common mechanical laboratory equipment cannot be used at the micrometer scale, we researched alternatives which are able to function at such a small scale. Using computer simulations and experiments we developed and tested devices able to create flows inside of droplets. With our invention, which uses the piezoelectric effect of lithium niobate (LiNbO_3), we are able to mix multiple chemicals and concentrate solids in the middle of a droplet in a very short amount of time. We are also able to move droplets in a controlled manner. This allows us to merge and mix droplets consisting of different chemicals to initiate reactions much faster than currently possible with other technologies.