MICROFLUIDICS USING SURFACE ACOUSTIC WAVES ON PIEZOELECTRIC MATERIALS - NON-CONTACT ACOUSTOFLUIDIC ACTUATION

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Acoustic-fluidics, which uses sound waves to manipulate fluids in microfluidic systems, has emerged as a powerful tool to enable a wide range of applications, from cell separation to sample processing and biomarker detection.

In this talk, we will show how the use of acoustic band gap materials enables to integrate different microfluidic functions (separation, concentration, heating, mixing, etc.) onto a single platform. (*1*) This configuration offers the possibility to change the way microfluidics is actuated and carried out, where classically samples are moved through channels to reach different positions where different functions are performed, to one where the sample stays mostly stationary while the functions are changed by switching the frequency of the acoustic excitation.

This methodology has been applied to integrate DNA diagnostics onto a single disposable microchip under 40 min (for the diagnostics of neglected tropical diseases and sexually transmitted diseases (*2*)), as well as to control nebulisation of drugs(*3*).

1. J. Reboud *et al.*, Shaping acoustic fields as a toolset for microfluidic manipulations in diagnostic technologies. *Proc. Natl. Acad. Sci.* **109**, 15162–15167 (2012).

2. G. Xu, R. N. Gunson, J. M. Cooper, J. Reboud, Rapid ultrasonic isothermal amplification of DNA with multiplexed melting analysis – applications in the clinical diagnosis of sexually transmitted diseases. *Chem. Commun.* **51**, 2589–2592 (2015).

3. J. Reboud *et al.*, Nebulisation on a disposable array structured with phononic lattices. *Lab. Chip*. **12**, 1268–1273 (2012).