

THIN FILM ACOUSTOFLUIDICS: A NEW PLATFORM FOR LAB-ON-A-CHIP

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This talk will focus on piezoelectric thin films including zinc oxide (ZnO) and aluminium nitride (AlN), which are used for a broad range of lab-on-chip applications such as biosensing, particle/cell concentrating, sorting/patterning, pumping, mixing, nebulisation and jetting. Integrated acoustic wave sensing/microfluidic devices have been fabricated by depositing these piezoelectric films onto a number of substrates such as silicon, ceramics, diamond, quartz, glass, and more recently also polymer, metallic foils and bendable glass/silicon for making flexible devices. Such thin film acoustic wave devices have great potentials for implementing integrated, disposable, or bendable/flexible lab-on-a-chip devices into various sensing and actuating applications. Different acoustofluidic and biosampling functions which can be generated from thin film surface acoustic wave (SAW) devices.

Recent developments in thin film acoustic devices have been focused on: (1) sensors prepared on cheap and commonly used substrates to reduce the cost, or new substrate materials to introduce novel functionality, or flexible substrates for wearable and wireless applications; (2) high frequency sensing with improved sensitivity; (3) shear-wave or Love mode based thin film devices for liquid sensing; (4) Development of various sensing layers/material systems; (5) Integration with acoustic streaming and microfluidics to form the Lab-on-a-chip systems. We foresee that such microsystems are capable of performing the complete task from delivering drops of bio-sample into the device, cell/bacteria separation, manipulation, and tissue generation, through to the delivery of the detection results, using portable, wireless, flexible and remotely controlled devices.

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