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Integration of piezoelectric microsensors and transducers in microfluidic systems

Smart materials are materials that have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, electric or magnetic fields. Typical smart materials (e.g. pizeoelectric ceramics and polymers, shape memory alloys and polymers) have been extensively studied and used in various sensors and transducers. Recently, there is increased interest to integrate miniaturized smart materials-based devices in microfluidic systems aiming to enhance the systems' functionality and controllability. In particular, piezoelectric sensors and transducers are suitable candidates for such applications. In this talk, we will report some of our recent work on the development of smart microfluidic systems, with an emphasis on the physical aspect and technical issues related to the systems. A few prototype systems will be demonstrated and used as examples in the dicussions. These include a quartz microbalance (QCM)-based system for single cell mass detection and fluidic viscosity monitoring and a piezoelectric ultrasonic transducer system for accoustic wave-assisted cell trapping.

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