Report for the Short Research Visit Grant: **Exploration of integrated microfluidics with phononics and acoustofluidics based on thin film platform**

By Prof. Richard Fu, Northumbria University.

Surface acoustic wave (SAW) propagation is a powerful tool to manipulate liquid movement, while phononic structures can control the acoustic wave propagation, thus shaping the microfluidic patterns. The novelty of the work is associated with the fabrication of a microfluidic device on a thin film platform with both SAW and phononic patterns on silicon chips, which can be mass-produced with low-cost integrated-circuit-compatible processes, opening up flexible and wearable applications (Fig. 1(a)).

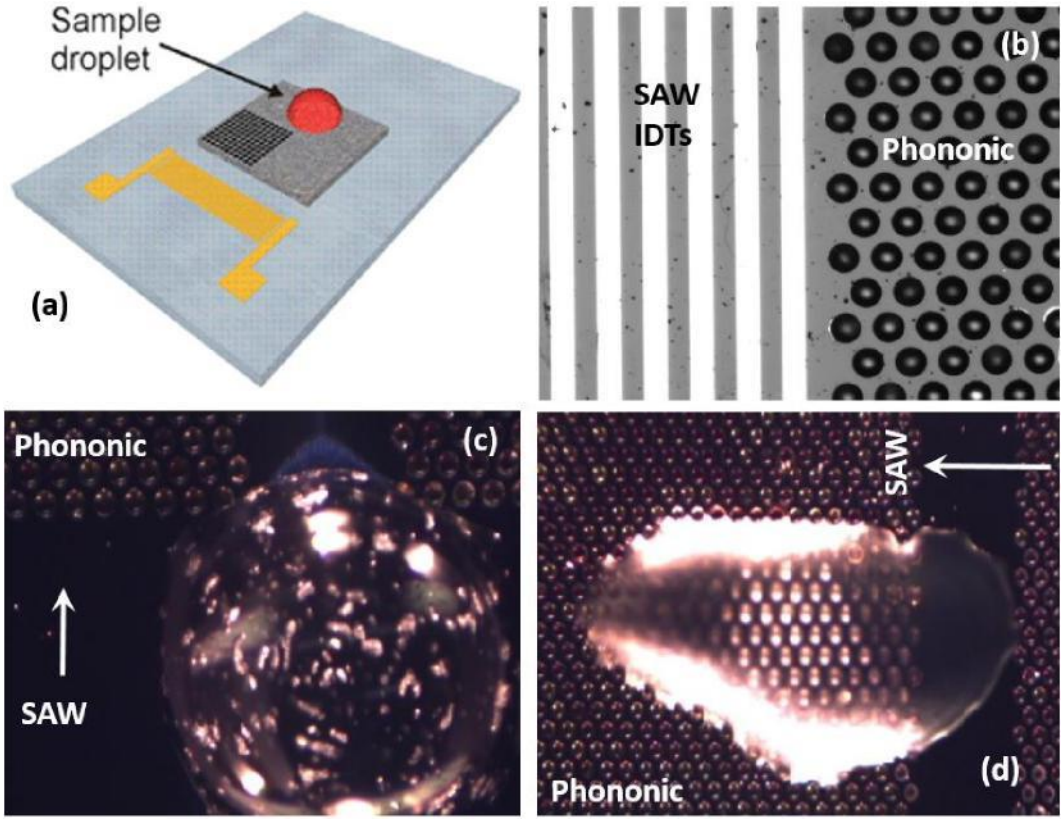

Figure 1: (a) Illustration of integrated SAW and phononic design; (b) ZnO/Si SAW and phononic device; (c) patterning of microparticles inside the liquid droplets; (d) pumping and jetting of liquid droplet on the phononic structure surface due to SAW actuation.

The SAW devices were fabricated on ZnO thin film coated Si substrates, and microfluidics functions were demonstrated to show the droplet could be driven efficiently by SAWs generated from the interdigital transducers (IDTs). The ZnO/Si SAW devices were patterned and phononic structures were made (Fig. 1(b)). The SAW interacts with the phononic structure, causing the patterning of microparticles inside the liquid droplets (Fig. 1(c)). If the SAW power is increased, the liquid droplet will be pumped and even jetted from the phononic structure surface (Fig. 1(d)).

The work is a collaboration between Prof. Fu from Northumbria University and Dr. Julien Reboud and Dr. Rab Wilson from Glasgow University.