MONASH University
Engineering

Final Year Project 2014
12 Credit Points/ 1 person

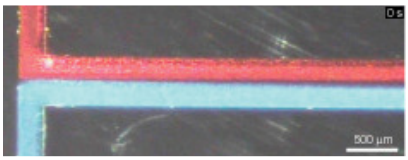
Biochemistry: Sample handling

Project Supervisor:	**Adrian Neild**
Contact:	**adrian.neild@monash.edu**
Department:	**Mechanical & Aerospace, Laboratory for Micro Systems (LMS)**
Suitability:	**Aerospace or Mechanical students with an interest in experimentation**

The Challenge

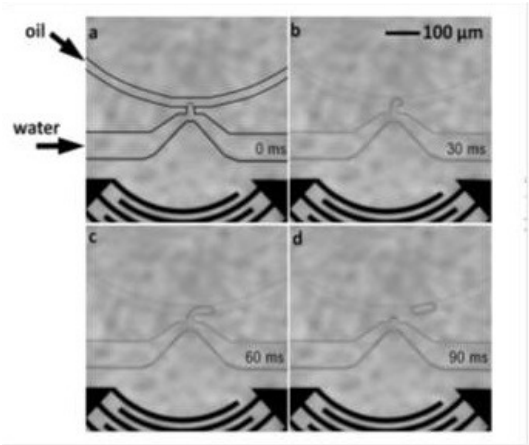
The miniaturisation of fluidic systems for chemical and biological analysis has become an important research field. The goal is to produce systems capable of mixing multiple different reagents with a sample to interrogate biological response for drug development of microbiological research into cell and pathogen behaviour. A microfluidic chip will be developed to dispense tiny volumes of sample; technologies will then be investigated to merge these droplets with multiple reagents so that biochemical assays can be formed.

The Project



Microfluidic channels (left) are widely used in biological and chemical analysis, the laminar flow allows for high controllability of fluid behaviour. One key benefit is that reagent usage can be massively reduced from laboratory scale experiments offering a large financial saving and spurring work into “lab-on-a-chip” devices.

With the intention of creating biochemical assays, that is a range of reagents mixed with a range of samples (or sample concentrations) we have been investigating the use of ultrasound as an actuation method in microfluidics. By applying a small burst of energy, a small droplet can be dispensed from a larger sample, these are held separate from each other by an immiscible fluid (oil). By subdividing the sample in a controlled manner like this and then keeping them separate, “virtual testubes” are created. The project will be to conduct multiple reactions between a range of reagent pairs using this method.



Production of a single aqueous droplet in oil using surface acoustic waves (the black arcs are the electrodes which generate these waves in a piezoelectric substrate) [Lab Chip. 13 (2013) 3225]