

Abstract Submitted  
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**Experiment and computational simulations of liquid-liquid flow displacement in microchannels**<sup>1</sup> YU LU, MARK SIMMONS, University of Birmingham — Microfluidics has great potential for tight process control in the generation of high value-added products and there is a requirement to understand how one fluid displaces another for either cleaning or control of the interfacial phenomena. Micro-Particle Image Velocimetry ( $\mu$ -PIV) and shadowgraphy have been used to examine the injection of a fluid into a circular or semi-circular microchannel (with diameters of 200  $\mu\text{m}$  and 205  $\mu\text{m}$  respectively) which is pre-filled with another fluid. Both immiscible and miscible Newtonian fluid pairs with varying viscosity ratio have been used. Flow instabilities and regimes have been observed which can be characterised using dimensionless flow maps. Displacement efficiency, residual liquid film thickness on the wall, velocity fields and the effect of wall conditions such as wall wettability are also studied. The flow phenomena observed have been modelled using the finite volume ANSYS Fluent CFD package and compared with the experiments.

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