

Abstract Submitted
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Influence of surface properties and miscibility upon displacement flow in microchannels¹ YU LU, EMILIA NOWAK, University of Birmingham, JAMES PERCIVAL, CHRIS PAIN, Imperial College London, MARK SIMMONS, University of Birmingham — Microfluidics have potential for a wide range of applications, yet successful operation will depend upon precise understanding of the fluid distribution in multiphase operations, particularly for cleaning of the system. Experiments and numerical studies have been conducted on the displacement process in a single microchannel geometry as a function of fluid dynamics and fluid properties. The microchannel has a near-semicircle cross-section of 205 μm width and 100 μm in depth. Miscible and immiscible fluid pairs (water/glycerol and water/silicon oil respectively) with different viscosity ratios and wettability of the channel walls are examined. Micro-Particle Image Velocimetry (μ -PIV) and Planar Laser Induced Fluorescence (PLIF) are used to obtain velocity fields and interface profile respectively. Flow patterns, interfacial instabilities, displacement efficiency and possible secondary flows are examined.

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