Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Experimental investigation of liquid-liquid plug formation in a T-junction microchannel PANAGIOTA ANGELI, MAXIME CHINAUD, EYNAGELIA-PANAGIOTA ROUMPEA, WEHELIYE WEHELIYE, Department of Chemical Engineering, University College London, Torrington Place, London, WC1E 7JE, OMAR. K. MATAR COLLABORATION[1], LYES KAHOUADJI COLLABORATION[2] — Plug formation mechanism of two immiscible liquids was studied experimentally in a 200 μm microchannel using two innovative micro Particle Image Velocimetry (μ PIV) techniques i.e. two-colour μ PIV and high speed bright field μ PIV. The aqueous phase was a water/glycerol solution whereas the organic phase was silicon oil with a range of viscosities from 5 to 155 cSt. Experiments were conducted for different fluid flow rate combinations in the T-junction inlet and it was observed that velocity profiles within the forming plugs depend on the flow rate ratios. The velocity field studies provided insight into the plug mechanism revealing that the interface curvature at the rear of the forming plug changes sign at the later stages of plug formation and accelerates the thinning of the meniscus leading to plug breakage. Results from the two-colour PIV show that the continuous phase resists the flow of the dispersed phase into the main channel at the rear of the plug meniscus and causes the change in the interface curvature.

[1]Department of Chemical Engineering South Kensington Campus Imperial College London SW7 2AZ
[2]Department of Chemical Engineering South Kensington Campus Imperial College London SW7 2AZ

Panagiota Angeli
Department of Chemical Engineering, University College London,
Torrington Place, London, WC1E 7JE

Date submitted: 31 Jul 2015 Electronic form version 1.4