

Abstract Submitted
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Effect of shear-thinning behaviour on liquid-liquid plug flow in microchannels¹ EVANGELIA ROUMPEA, MAXIME CHINAUD, WEHELIYE HASHI WEHELIYE, PANAGIOTA ANGELI², Department of Chemical Engineering, University College London, Torrington Place, London WC1E 7JE, UK, LYES KAHOUADJI, OMAR K. MATAR, Department of Chemical Engineering, Imperial College London, South Kensington Campus, London SW7 2AZ, UK — The present work investigates the dynamics of plug formation of shear-thinning solutions in a 200 μm microchannel using a two-colour micro-PIV system. Measurements, including phase-averaged velocity fields, have been conducted both at the T-junction inlet and the main channel to enhance understanding of non-Newtonian liquid-liquid flows. Two aqueous glycerol solutions containing xanthan gum are used as the non-Newtonian fluids while 5 cSt silicone oil is the Newtonian phase. The current experimental results revealed a pronounced impact of the xanthan gum (shear-thinning behaviour) on the flow pattern transition boundaries, and enhance the fluid flowrates where plug flow occurred. The addition of polymer resulted also in different hydrodynamic characteristics such as a bullet-shaped plug and an increased film thickness between the plug and the wall. In the present work, the technique allows to capture the velocity field of both phases simultaneously. Experimental results are compared with the numerical simulations provided by the code BLUE.

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