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Rheology of complex fluids by particle image velocimetry in microchannels GUILLAUME DEGRE, PIERRE JOSEPH, PATRICK TABELING, ARMAND AJDARI, Laboratoire Theorie et Microfluidique - UMR 7083 - ESPCI, CNRS - Paris FRANCE, SANDRA LEROUGE, Matiere et Systemes Complexes - UMR 7057 - Universite Paris 7 - FRANCE, MICHEL CLOITRE, Matiere Molle et Chimie - UMR 7167 - ESPCI, CNRS - Paris FRANCE — We use an experimental method to investigate the rheology of complex fluids. Here we propose to use microchannels to scan large dynamic ranges of shear rates observing the flow directly with a set-up developed in our group based on a micro-PIV technique. We image the flow of complex fluids in microchannels of controlled geometry using tracers. We show on model polymer solutions that the bulk nonlinear rheology can be extracted from velocity profiles. The spatial resolution allows us to access quantitatively slip effects that occur at the liquid – solid interface. We have also used this technique to study wormlike micelles solutions. The macroscopic flow-curve of those fluids displays a constant stress plateau that suggests shear-banding effects. We indeed observe banding in the velocity profile when the shear stress imposed to the fluid reaches a critical value. This system exhibits large slip lengths (tens of microns) below the shear banding transition and smaller slip lengths (around one micron) when shear bands are present.

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