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# Purely-elastic instabilities in microscale flows of complex fluids

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## ABSTRACT

Complex fluids, such as some biological and synthetic fluids, are common in our daily life and are also important in several industries. Due to their nonlinear rheological behaviour, the flow of complex viscoelastic fluids often leads to (counterintuitive) flow instabilities, even at low Reynolds number (*Re*) conditions.

In this talk, we will present an overview of the complex flow of non-Newtonian fluids in several microfluidic devices, typically with a strong extensional component, such as contraction/expansion geometries, flow focusing and cross slot microfluidic devices. The fluids used in the experiments, and modelled numerically using an in-house finite-volume method, include dilute polymer solutions, DNA solutions, and analogues of synovial fluid and blood.

The complex flow patterns observed experimentally, and predicted numerically, include the Newtonian-like low Weissenberg number (*Wi*) flow conditions, the generation of purely elastic flow instabilities, and the onset of the elastic turbulence regime at very large *Wi* and low *Re*.

**KEY-WORDS:** Flow instability; Microfluidics; Viscoelastic fluids; Computational rheology; Elastic turbulence.