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Modelling and Analysis of Shear Banding in Flow of Complex Fluids

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Abstract : We present the Johnson-Segalman constitutive model to capture certain fluid flow phenomena that has been experimentally observed in the flow of complex polymeric fluids. In particular, experimentally observed phenomena such as shear banding, spurt and slip are explored and/or explained in terms of the non-monotonic shear-stress versus shear-rate relationships. We also explore the effects of the inclusion of physical flow aspects such as wall porosity on shear banding. We similarly also explore the effects of the inclusion of mathematical modelling aspects such as stress diffusion into the stress constitutive models in order to predict shear-stress (or shear-rate) paths. We employ semi-implicit finite difference methods for all the computational solution procedures.

Keywords : Johnson-Segalman model, diffusive Johnson-Segalman model, shear banding, finite difference methods, complex fluid flow
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