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Entrance effects and high shear rate rheology of shear banding wormlike micelle fluids in microcapillary flow[1] PAUL SALIPANTE, VISHNU DHARMARAJ, STEVEN HUDSON, National Institute of Standards and Technology — The viscosity of a shear-banding wormlike micelle solution at high shear rates is investigated using capillary rheology and particle streak velocimetry. Measurements of the flow profile and pressure gradient show an extended entrance region, which exceeds a length to diameter ratio of 100, to reach a fully developed flow. We characterized this entrance region for capillaries with different cross-sections and use the results to select a downstream portion of the capillary where viscosity measurements can be made on fully developed flow. Measurements from this portion of the channel show a shear-thinning power-law behavior for all channel geometries from shear rates of 1,000 1/s to 120,000 1/s. Varying the surfactant concentration shows two distinct power-law behaviors that depend on both shear rate and concentration and are an indication of change in micelle length.

[1]NIST on a Chip

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