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**Nonlinear microrheology of wormlike micelle solutions using ferromagnetic nanowire probes**[1] N. CAPPALLO, C. LAPOINTE, D. H. REICH, R. L. LEHENY, Johns Hopkins University — We describe the application of high-aspect-ratio ferromagnetic nanowires to the microrheology of wormlike micelle solutions composed of equimolar cetylpyridinium chloride/sodium salicylate (CPCl/NaSal). Employing video microscopy to track the rotation of suspended nanowires in response to external magnetic fields, we access both the linear and nonlinear rheology of the fluid. The linear viscosity at low rotation rates is strongly temperature dependent as expected from macroscopic rheometry. At high rotation rates the viscosity exhibits pronounced shear thinning. The onset of the nonlinear response is characterized by a temperature-dependent shear thickening that has no apparent counterpart in the macroscopic rheometry. Time-resolved measurements involving step changes in rotation rate reveal that, once the fluid has been prepared into a shear-induced state, it exhibits nonlinear viscosity within the expected linear regime. Further, the shear-induced state of the fluid generates an out-of-plane torque on the wire that we have characterized by time-resolved studies.

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