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**Nonlinear microrheology of wormlike micelle solutions using magnetic nanowire probes** NATHAN CAPPALLO, CLAYTON LAPOINTE, ROBERT L. LEHENY, DANIEL H. REICH, Johns Hopkins University — Using ferromagnetic Ni nanowires we investigate the local mechanical properties of wormlike micelle solutions composed of equimolar concentrations of the surfactant cetylpyridinium chloride (CPCl) and sodium salicylate (NaSal). Rotating the nanowires with external magnetic fields, we access both linear and nonlinear regimes of the fluid's rheology. The linear viscosity at low rotation rates is strongly temperature dependent as expected from mechanical rheometry experiments. At high rotation rates the viscosity exhibits pronounced shear thinning that is independent of temperature. The onset of the nonlinear response is characterized by a hysteretic shear thickening that is strongly dependent on temperature, but has no counterpart in the macroscopic rheometry. Further, the nonlinear regime coincides with a transient, anisotropic shear-induced state in the fluid that generates a torque on the wire, causing it to tip out of the plane of rotation when the field is removed.

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