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Length dependence of the magnetorheological properties of cobalt microwires dispersed in silicone oil. RICHARD BELL[1], JOSHUA KARLI, JEFFREY KRUG, DARIN ZIMMERMAN, The Pennsylvania State University, Altoona College — The rheological responses and dispersion stability of magnetorheological (MR) fluids were experimentally investigated. In order to improve the stability of the MR fluids, spherical particles were replaced with cobalt microwires (260 nm diameter) with varying aspect ratios ranging from 10 to 65 and suspended in silicone oil (0.17 Pa·s). Under an external magnetic field (H_0) and a steady shear flow, the yield stress of the fluids display a $H_0^{1/2}$ dependence. The apparent yield stress at magnetic saturation increased linearly with the median length of the particles until a maximum at a wire length of 7 μm was reached. Further increasing the length of the microwires resulted in a linear decrease in the yield stress of the fluids. Furthermore, the MR fluids containing microwires with lengths greater than 6 μm exhibited a larger yield stress than fluids containing only 1.6 μm diameter spherical particles. The microwire-based fluids also display improved stability against rapid sedimentation as compared to the spherical cobalt particles.

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