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Rheology and birefringence of Fomblin YR at very high shear rates. KHALED MRIZIQ, HANK COCHRAN, MARK DADMUN, University of Tennessee — Simultaneous measurements of the rheological and structural properties of perfluoropolyether (PFPE) lubricant films were measured at relatively low to extremely high shear rates using a rotational optical rheometer. The viscosity of various films with different thicknesses exhibit Newtonian behavior up to a shear rate $1 \times 10^4 \text{ s}^{-1}$, with a transition to shear-thinning behavior obvious at higher shear rates. Birefringence of these films was also measured, and these results indicate chain alignment with shear in the shear-thinning regime. The shear rate at which alignment occurs is similar to that of the onset of shear thinning. This correlation between chain alignment and shear thinning provides direct evidence that the ability of PFPEs to lubricate hard drives at high shear rates is a direct consequence of the ability of the applied shear field to align the molecules on a molecular level.

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