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Enhanced viscoelasticity of polyalphaolefins confined and sheared in submicron-to-nanometer-sized gap range and its dependence on shear rate and temperature

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Abstract

The viscoelasticity of polyalphaolefins confined and sheared in a submicron-to-nanometer-sized gap range was measured. A continuous transition from bulk viscosity to confined viscoelasticity was observed in this gap range. The viscosity increased when the gap was less than around 100 nm, whereas the elasticity rapidly increased when the gap was less than 10 nm. The shear rate and temperature dependence of the unique viscoelasticity was also measured in the confined state. The enhanced viscosity decreased as the shear rate and the temperature increased. These findings are expected to improve the basic understanding of hydrodynamic lubrication