Abstract Submitted
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Direct Numerical Simulation of Elastically Modified Turbulent Taylor-Couette Flow[1] NANSHENG LIU[2], Dept.Chemical & Biomolecular Engineering, University of Tennessee, Knoxville, BAMIN KHOMAMI, Dept. Chemical & Biomolecular Engineering, University of Tennessee, Knoxville — Direct Numerical Simulations (DNS) of elastically modified turbulent Taylor-Couette (TC) flow are carried out to study the effect of polymer additives on the dynamics of the flow, using a fully spectral method in conjunction with the FENE-P model for the description of polymer chain dynamics. Significant polymer-induced drag increase is observed for the TC flow, which is strikingly different from the findings of drag reduction in the turbulent viscoelastic channel flow. Careful examination of turbulent, viscous and elastic stresses show that the elastically modified wall structures are mainly responsible for the polymer-induced drag increase. In addition, turbulence statistics are analyzed to develop the correlations between the polymer body force and velocity. The probability density functions (PDFs) of the velocity and polymer stress fluctuations are illustrated to reveal the stochastic characteristics of the flow.

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