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VISCOUS DISSIPATION OF A COMPLEX LIQUID IN AN OSCILLATORY PIPE FLOW

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In this work the temperature increase due to viscous dissipation in an oscillating pipe flow is analyzed. The bulk temperature of the fluid at the exit of the oscillating section was found to increase with the oscillatimg frequency and amplitude. If the dimensionless temperature increase is plotted as a function of the characteristic oscillation speed, the experimental results collapse into a single curve. In order to justify the experimental measurements, a theoretical analysis was performed for two simple non-Newtonian fluid models: Ellis model and Bautista-Manero-Puig models, the latter couples the coderformational Maxwell equation with a kinetic equation to account for the structure break down process. These models predicted and increase of the bulk temperature with the speed of oscillation. The effects of the viscous dissipation can be determined by a coupling between structural, kinetic and viscoelastic mechanisms. Finally, viscous dissipation is predicted using rheometric data of a wormlike micellar solution (CTAT) for different sample concentrations