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Analysis of Wire Coating for Heat Transfer Flow of a Viscoelastic PTT Fluid with Slip Boundary Conditions

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Abstract : Slip boundary value problem in wire coating analysis with heat transfer is examined. The fluid is assumed to be viscoelastic PTT (Phan-Thien and Tanner). The rheological constitutive equation of PTT fluid model simulates various polymer melts. Therefore, the current consequences are valuable in a number of realistic situations. Effects of slip parameter γ as well as εDec^2 (viscoelastic index) on the axial velocity, shear stress, normal stress, average velocity, volume flux, thickness of coated wire, shear stress, force on the total wire and temperature distribution profiles have been investigated. A new direction is explored to analyze the flow with the slip parameter. The slippage at the boundaries plays an important role in thickness of coated wire. It is noted that as the slip parameter increases the flow rate and thickness of coated wire increases while, temperature distribution decreases. The results reduce to no slip when the slip parameter is vanished. Furthermore, we can obtain the results for Maxwell and viscous model by setting ε and λ equal to zero respectively.

Keywords : wire coating, straight annular die, PTT fluid, heat transfer, slip boundary conditions
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