CHAPTER IV

CONCLUSIONS

4.1 Flow Instability Studies

There are two types of flow instability in this study; the first instability occured in the steady flow and the other one occured in the oscillating flow. In the oscillating flow regimes, conclusive evidence was found for successive Hopf bifurcations, both of the subcritical and supercritical types, appearing when the strain rates was increased for each of the three LLDPE's.

The slip velocity was measured and calculated; its dependence on strain rate and molecular weight follows the form: $V_S \alpha | \dot{\gamma}_a - \dot{\gamma}_{a,c}|^{1/2}$. We found that the prefactor of this scaling law is highly dependent on LLDPE molecular weight, in both regimes III and V.

The critical wall shear stress for every extrudate texture is independent of molecular weight and die geometry but the critical apparent strain rate depends on the molecular weight and die geometry. The ratio of the load wavelength and the extrudate wavelength depends only on the apparent strain rate and not on molecular weight.

4.2 Sharkskin Studies

Both local and asymptotic recoverable shear (S_R) produce consistent results for sharkskin surfaces. Local recoverable shear data are consistent with the results of Ramamurthy (1986) and Kalika and Denn (1987).

Two stability diagrams (W_i vs. λ_S/ε_S and S_R vs. λ_S/ε_S) for both regimes II and III were constructed. A diagram illustrates a boundary or boundaries

between a smooth skin and the sharkskin on the two parameter spaces. The boundary for both parameter spaces is unique for the sharkskin found in regime III. However, it was found that the boundary separating the smooth skin from the onset of the sharkskin in regime II depends on material or chemical structure.