CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

We measured the dynamics of deformation of an elastic droplet in an elastic matrix by selecting two blend systems with viscosity ratio near unity, but of different elasticities of both droplet and matrix phases. In start up of a steady shear flow, the different elasticities in the polymer blends produce qualitative differences in the droplet deformations that occur before the droplet attains its steady-state shape. In system A with higher elasticity, the deformation oscillates before reaching its steady-state shape. In system B with lower elasticity, the droplet first deforms in the shear direction, and thereafter continuously contacts in the flow direction until it reaches its steady-state shape. When the capillary number is increased at fixed shear rate (and hence fixed elasticity) by increasing the droplet size in system A and B, the steady-state droplet shape becomes increasingly elongated in the vorticity direction and develops cusps along the vorticity axis. In this system A, at still higher capillary number, droplet breakup occurs when two ends of a drop elongated in the vorticity direction are situated on streamlines of different velocity which pull the droplet ends apart, leading to rupture.

In addition, for both systems, the deformation parameter decays exponentially with time after cessation of steady-state shear, until long times are reached. The characteristic relaxation time is larger when the capillary number increases or the elasticity ratio decreases (See Appendix F).

To explore this knowledge, other systems with the viscosity ratio of unity, but with different elasticities, or with different viscosity ratios should be studied.