CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

We measured the dynamic viscoelasticity of elastic polystyrene (PS) droplet dispersed in an elastic high density polyethylene (HDPE) matrix under simple shearing flow between two transparent parallel disks and observed the deformed shape of a dispersed phase with viscosity ratios 0.5, 1.0 and 2.6. In the start up of a steady shear flow to strain around 40, the deformations of droplet show small oscillations in the flow direction. After strain more than 40 reverting to vorticity alignment, drops eventually deform in the vorticity direction, and show large oscillations before reaching steady shapes. When the capillary number is increased at a fixed shear rate (fixed elasticity) by increasing the droplet size, the steady-state droplet shape becomes increasingly elongated in the vorticity direction and develops cusps along the vorticity axis. Above a critical capillary number, Ca_c, droplet breakup occurs when two ends of drop separate further of different velocity which pull the droplet ends apart. The system with sufficiently high elasticity, the droplet breakups like a S shape, but the system with low elasticity and at low viscosity ratio, the droplet breakups like a dumbbell shape. As the elasticity is increased at a fixed capillary number by varying shear rate, the steady state droplet shape decreasingly deforms in vorticity direction. For the blend systems with viscosity ratios 0.5, 1.0 and 2.6 at fixed capillary number and fixed Weissenberg number the values of steady-state deformation in vorticity direction and the critical capillary number for droplet breakup are found to increase with viscosity ratio.

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 futher, other systems with the vastly differing viscosity ratios , different elasticities, and with different capillary number should be studied.