

607a Experimental Investigation of Film Formation: Film Casting

Kenneth K. Aniunoh and Graham M. Harrison

In film casting, a polymer melt is extruded through a flat die before rapid cooling on a chill roll. The chill roll is run at faster speeds than the melt exits the die, thus stretching the material. This induces some orientation in the film. In this paper, we study experimentally the effects of material properties and process conditions on film formation in the region between the die exit and the chill roll. Experiments are conducted using polypropylene. Process variables investigated include the draw ratio and the die temperature. The temperature, width and velocity profiles in the air gap are measured. Centerline velocity and strain rates increase with distance from the die. The velocity, measured as a function of transverse position within the web, decreases towards the edge of the film. Neck-in increases with increasing die temperature due to the effect of temperature on the edge-beads. Transverse direction temperature profiles near the die are relatively flat. As the chill roll is approached, the centerline temperature decreases more rapidly than the temperature at the film edge. Experimental results are interpreted in terms of a coupling between the velocity, the temperature and the polymer rheology.