

Homework 4 Polymer Processing

- 1) Tadmor Problem 6.6 pp. 192.
- 2)
 - a) For a polymer extruder give semi-empirical equations for viscosity which might describe five regions of flow. These five regions comprise the region of partially melted polymer pellets, low shear melt in the screw, high shear melt in the die, the die swell region following extrusion and the viscoelastic region as the polymer is drawn and cools after extrusion (class notes and pp. 157-76).
 - b) Describe the three reference frames (pp. 155 and notes) used to derive equations which describe non-Newtonian behavior in polymer melts.

Exam 1 will include Questions 1 and 2 but not 3.

- 3)
 - a) For the capillary rheometer (pp. 176-9 and class notes), the Couette viscometer (class notes), and the cone and plate viscometer (pp. 179-84 and class notes) give equations to obtain $\dot{\gamma}$, $\tau_1(\dot{\gamma})$, and $\tau_2(\dot{\gamma})$ based on parameters which can be measured with each instrument (several are not measurable so skip these).
 - b) What are the disadvantages of each of these instruments?
 - c) Which viscometers closely approximate processing flows?
 - d) Which viscometers rely on a model for viscosity as a function of shear rate?

Homework 4 Answers