

2024-2025 Fall MLZ 447 Exp#5
Instructions for Polymer Processing & Thermal Characterization
of Polymeric Materials Lab. Report

Please answer the following three questions.

*Plagiarizing or blatant copying of a report or reference will result in an automatic zero !
(do not copy-paste)*

1. You are asked to enhance the capacity (output rate) of a single screw extruder, when the melt polymer shows Newtonian behavior. *Considering the operating points given in Fig. 6 and Fig. 7 in the lab booklet, what are the required die diameter, pressure, screw rotational speed, and channel dept?* (Hint: make a general comment like *low, moderate, high, etc.*)

2. Which *types of twin-screw extruders* do you use for the production of a *thermoplastic polymer and a thermoplastic polymer matrix nanocomposite?*

a) Explain with the advantages of twin-screw extruder types and their reasons.

3. You have a thermoplastic polymer (e.g. polypropylene) with 50% crystallinity, which was produced by a twin-screw extrusion under normal conditions. In contrast to this reference situation, you have the same polymer, but it was *rapidly cooled just after die extrusion*. Moreover, you know that this polymer has *a lower molecular weight and a more homogenous microstructure at the end*. Now, you are performed DSC analyses of those two polymers and you have obtained two different DSC curves.

a) What are the differences on the DSC curve of the second polymer? (Hint: Focus the glass-transition and melting events)

b) Explain the reasons in terms of structure-property relationship.