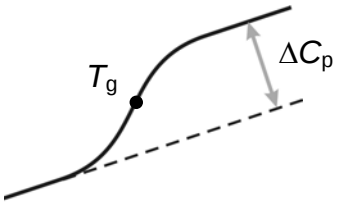
Chem/MatS/ChEn 4223W

Assignment 18
Due: *In Lecture*, Monday, April 29

Your differential scanning calorimetry (DSC) data has also been posted to the course website. You will use this data to determine a glass transition temperature (T_g) and/or a crystalline melting temperature (T_m) for your polymers. As you do this, you may want to use Menczel & Prime's chapter on DSC (http://dx.doi.org/10.1002/9780470423837.ch2) from their *Thermal Analysis of Polymers: Fundamentals and Applications* as a reference.

Follow the Lab 6 instructions on how to analyze this data using the TA Instruments Advantage software, and answer the following questions:

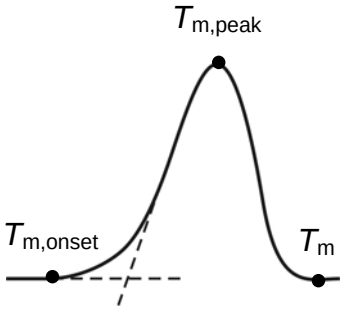
- A glass transition temperature (T_g) for your sample may show up as a first-order inflection point in each DSC ramp. For each ramp of your group's sample, do you observe a T_g? What value do you measure?



- Occasionally, annealed polymer glasses will exhibit a peak in the DSC trace at T_g due to "enthalpy overshoot". Did this occur in any of your supergroup's samples? What is "enthalpy overshoot"?

- A melting temperature will show up as a second-order peak in the DSC endotherm (increasing temperature) ramps. As Menczel and Prime explain (p.103), the real T_m is the temperature at the tail of the peak, where the peak meets the baseline. However, under non-equilibrium conditions—as the temperature of the sample compartment increases, and when there is a lag between the heat applied by the DSC and the physical response of the material—it can be difficult to accurately measure T_m. In this lab, we'll work instead with $T_{m,peak}$, which can vary according to experimental conditions, but is easier to measure.

  In your sample, what was $T_{m,peak}$ for each peak you observed?



- The area underneath the T_m endotherm is related to the transition enthalpy of fusion (ΔH_f) and the degree of crystallinity in a given sample. What do you calculate for these values in each of your traces?

- Other than melting (T_m) and glass (T_g) transitions, were you able to observe any other features in your DSC traces? Can you explain them?

The purpose of this assignment is to help you prepare material for your Lab 6 writeup. You can answer the questions in whatever format you like, but you may want to answer them in a Word document that you can edit into your report. However you complete the assignment, include printouts/embedded images of your DSC traces for both pure PLLA and “impure” PLA.