Chemistry/MatSci 5223W Wednesday, March 8

Assignment 14
Due: *In Lab*, Thursday, March 9/Friday, March 10

1. Using the approximation

$$E = \frac{\Delta\sigma}{\Delta\varepsilon},$$

calculate the elastic modulus for each of the polymers you tested in Lab 4 over the first 5% strain, using a stress-strain curve. In Lab 4, the dimensions of the variables in your load-extension measurements were Newtons (load) and mm (extension). In order to convert load into stress, expressed in Pascals (Pa), you will need to correct for the cross-section of your sample. Because the vast majority of the load is felt by the thinnest (i.e., weakest) part of the sample, use the area of the thin part of the dogbone for this calculation. Even though tensile specimens naturally thin as they extend, assume that your cross-sections remained constant over the first 5%.

Strain is usually expressed as the unitless fraction L/L_0, where L is extension and L_0 is the original sample length. Again, because most of the load is felt by the skinny part of your dogbone, use only the length of this part as L_0.

Turn in copies of your stress-strain curves. On the graphs, also plot lines that show the moduli you calculated above; these should look somewhat like tangents to the stress-strain curve at the origin. Label each line with the corresponding calculated modulus value. If either of your materials yielded (i.e., showed $E = 0$ anywhere along the curve), label this point.

Problem 1 will be graded in lab; don't leave without it.

2. On the WebCT Discussion Board, share your calculated polymer properties. You should post:

- All $\overline{M_n}$ and $\overline{M_w}$ values from all methods for all polymers, including GPC, NMR and MALDI. Attach your original GPC files to your post so that your classmates can use these if they wish. If you have reason to believe that one or more of your polymers terminated early, or contained multiple components (e.g., diblock and triblock in the same sample), note this in your post.
- Elastic moduli over the first 5% extension. Attach your original load-extension data to your post.
- Stress and strain at yield and at break, where applicable.

Problem 2 should be posted to WebCT by the evening of Friday, March 11.