SCI 1410: materials science & solid state chemistry

PLASTICS:
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PART 1: EXAMINE YOUR POLYMERS

For today's activity, we will consider how the properties of different commodity plastics can be explained by their chemistry, molecular structure, and bonding. The first step in this activity is to select a couple of polymer samples to explore. At the front of the room, you will find samples of nine different polymers, each with a number. Pick two that you think will make for an interesting comparison. If you find it difficult to make a choice, I recommend the following pairs of polymers:

1. Sample 2 versus Sample 4
2. Sample 7 versus Sample 8
3. Sample 8 versus Sample 9
4. Sample 7 versus Sample 4
5. Sample 5 versus Sample 8

Now that you have a couple of polymer samples, try describing their properties. How do they look? How do they feel? How do they smell? How do they respond to loading? You could try bending, scratching, weighing, fracturing (wear safety glasses), or even melting (in a fume hood) your samples. Write down a few of your observations, with a focus on the *differences* between the two polymers. At this point, you may also want to try guessing which specific polymers you have.

PART 2: EXPLAIN YOUR FINDINGS

Did you observe some differences between the two samples? Good. Next comes the reveal: we will tell you the names of the two polymers you selected.

Once you know the names your polymers, use the web to research their chemistry, molecular structure, and bonding, and try to explain some of the property differences you observed. For example, if you noted that one polymer felt more flexible when subjected to mechanical loading, can you explain this flexibility by connecting Young's modulus to the chemistry of the polymer chains, the physical size or arrangement of the polymer chains, or the type or strength of bonding within chains or between chains?

No.	Polymer
1	Polycarbonate (PC). Trade name: Lexan
2	Poly(methyl methacrylate) (PMMA). Commonly called “acrylic.” Trade names: Lucite, Plexiglas
3	Polyvinyl chloride (PVC). Commonly called “vinyl.”
4	Polypropylene (PP)
5	Nylon 6/6, a polyamide
6	Polyoxymethylene (POM). Commonly called acetal. Trade name: Delrin
7	Low density polyethylene (LDPE)
8	High density polyethylene (HDPE)
9	Polytetrafluoroethylene (PTFE). Trade name: Teflon