Testing Plastics Activity

SCIENCE HOME
APES HOME

(adapted from http://www.cms.k12.nc.us/allschools/providence/keenan_files/Chemistry/Chem%20Labs/plastics.htm)

Materials

Bunsen burner	Matches
Aluminum foil	2 metal tongs
Copper wire	Scissors (heavy duty)
Ethylene Glycol	Glycerol (Glycerin)
Isopropyl Alcohol (Isopropanol)	Water
Forceps	10 small beakers per group

Procedure

Divide the class into 4 groups and assign each group to evaluate 2 different types of plastics. Pool the results at the end.

1. Examine several samples of each recycle-coded plastic listed in Data Table 1. Be careful not to get your samples mixed up.
2. Record the rigidity and the **appearance** (can be translucent or not) of each plastic type. Use a range of 1 through 5, with 1 being least rigid and 5 being most rigid, to describe the rigidity.
3. Determine and record the **relative density** of each type of plastic as instructed in the **Density** instructions. You can reuse these samples for the burning test in step #4 after rinsing them with water and drying with a paper towel.
4. Burn a **small** piece of each plastic type with a match over a piece of aluminum foil, holding the plastic with 1 tongs and the match with another. Record if the plastic burns when lit. Record if the plastic drips when melted and the color of any smoke (black/white) given off. Be sure to remove all the plastic from the tongs before burning a new sample.
5. Perform the **Bielstein Test** as directed in the **Flame Test** instructions. Record your results.

Density Instructions

A material that is more dense than a given liquid will sink in that liquid, while a material that is less dense than the given liquid will float in that liquid. For example, cork and oil float on water because they are less dense than water; pennies and syrup will sink in water because they are more dense than water.

It is possible to estimate the density of a material by observing its sinking or floating behavior in solutions of known densities. In this activity, the approximate densities of plastic samples will be determined by making such observations. For example, if it is observed that a plastic sinks in Solution B (density = 0.93 g/mL) but floats in Solution C (density = 1.00 g/mL) then the density of the plastic must be greater than Solution B, but less than Solution C. Therefore, The density of the plastic sample must lie between 0.93 g/mL and 1.00 g/mL.

Procedure

1) Pour a few mL of each solution listed in Table 1 into labeled (1 through 10) small beakers. Arrange the test solutions in the order given on Table I.

Table I		
Number	**Description**	**Specific Gravity**
1	Glycerol	1.2613
2	Ethylene Glycol	1.1090
3	Water	1.0000
Stock isopropanol/water:		
4	20/80	0.9624
5	30/70	0.9436
6	40/60	0.9248
7	50/50	0.9061
8	60/40	0.8873
9	65/35	0.8779
10	100/0	0.8121

2) Cut a plastic sample small enough to fit into the tubes of the test solutions.

3) Determine the density range of each type of plastic by finding consecutive solutions, one in which the plastic sinks and one in which the plastic floats. **CAUTION**: Each plastic sample should be rinsed and dried before being put into a new solution.

4) Record the density range of each plastic type in Data Table 1.

Flame Test

1. Heat a copper wire red hot in the flame of a burner.
2. Quickly touch the plastic sample, removing some of the plastic with the wire.
3. Place the wire-coated plastic in the flame and look for a green flame as evidence of chlorine. If the flame turns green when the plastic is burned, record a positive for the Bielstein Test. If the flame does not turn green, record a negative for the Bielstein Test.

Data Table 1							
Coded Plastic Type	**Rigidity**	**Appearance-translucence**	**Density Range**	**Flammability**	**Drips when melted**	**Smoke color**	**Bielstein Test**
1							

2							
3							
4							
5							
6							
7							

RECYCLING CODES

#1 - **PETE**: Polyethylene Terephthalate

#2 - **HDPE**: High density polyethylene

#3 - **V**: Polyvinylchloride (or PVC)

#4 - **LDPE**: Low density polyethylene

#5 - **PP**: Polypropylene

#6 - **PS**: Polystyrene

#7 - Other

ANALYSIS

1) Which # plastic(s) contained chlorine, if any?

2) What are the implications of the presence of chlorine in plastic?

3) Did any of the different numbers have identical characteristics in all categories?

4) Which # plastics are recycled in Baltimore City?

5) Why doesn't Baltimore City recycle all 7 numbered plastics?