

## Polymers

What's the Wow?: Polymers can be made from all sorts of things and have very unique properties.

### Procedure:

#### A. Silly Putty<sup>1</sup>

1. In a 150 mL beaker, pour ~30 mL glue and a drop(s) of food coloring (if you like).
2. Add 15 mL of 4% borax to the beaker containing the glue and vigorously stir it using a stir rod. Continue until the mixture has gelled. After the initial mixing is complete, you may continue the mixing by hand until the desired consistency is reached. Squeeze out the excess water.
3. Form a ball and drop it on a hard surface. Does it bounce? Reform the ball and allow it to sit on a flat surface. What do you observe? Take two different colored balls and place one on top of the other for a minute. Can you completely separate the two?

**Waste: Any waste can go down the drain or in the garbage can.**

#### B. Disappearing Peanuts<sup>23</sup>

1. Acetone
  - a. Add ~25 mL of acetone to a 250 mL beaker.
  - b. Fill another 250 mL beaker with Styrofoam peanuts and add them to the acetone.
  - c. You may need to swirl the solution to get the peanuts to interact better with the acetone. If you like, continue to add beakers full of peanuts.
  - d. Repeat the same experiment using Ecofoam peanuts (start by using one peanut instead of a beakerful).
2. Water
  - a. Add ~25 mL of warm (if possible) water to a 250 mL beaker.
  - b. Add a beaker of Ecofoam peanuts to the water and swirl.
  - c. Repeat the experiment using a Styrofoam peanut.

**Waste: Pour the acetone solutions into a recovery waste bottle. The Ecofoam peanuts can go down the drain or in the garbage can.**

#### C. Plastic Sulfur<sup>4</sup>

**Safety Note: Do not inhale the vapor in this experiment and perform it in the hood! Sulfur dioxide is acidic and can cause damage to the lungs. Keep all acetone away from the Bunsen burners.**

1. Place an amount of sulfur (to a height of about 1 in.) in a test tube.
2. Heat the test tube in the hood using a Bunsen burner until the liquid becomes more like molasses.
3. Quickly pour the molten sulfur into a beaker of cold water.
4. Remove the rubbery material and note its properties.

**Waste: Throw the solid contents of the beaker into the garbage. Once the test tube has cooled, throw it in the "broken glass" box.**

<sup>1</sup> Adapted from <http://www.elmhurst.edu/~chm/demos/index.html>.

<sup>2</sup> Adapted from *Environmental Chemistry: Experiments and Demonstrations*, 2<sup>nd</sup> ed., M.G. Ondrus, Wuerz Publishing, Winnipeg, Canada, 1996.

<sup>3</sup> Adapted from <http://membership.acs.org/C/Chicago/ChmShort/cs95.html#6.95>.

<sup>4</sup> Adapted from *Chemical Demonstrations: A Sourcebook for Teachers*, Volume 2, L.R. Summerlin, C.L. Borgford, J.B. Ealy, , ACS, Washington, D.C., 1987.