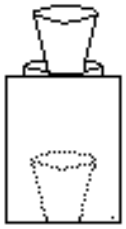
Disappearing Styrofoam Cup

Acetone disrupts the bonds in styrofoam, returning it to its original polymer form

Chemicals and Equipment Needed

- Large bottle of acetone – **R1**
- Glass petri dish – **P3**
  - **MUST BE GLASS!**
- 2 styrofoam cups – **P4**
- Coffee can – **N5**
- Previously melted cups – **N5**



Hazards

- Acetone is a flammable organic solvent. Keep bottle capped when not in use, and do not do this demonstration in conjunction with any that has open flames.
- Make sure to move the petri dish to the hood immediately after picking up the demo.

Preparation

- Gather all components on a cart. Before class, out of sight of the students, place an intact styrofoam cup underneath the coffee can as shown in the amazing MS Paint diagram above.

Presentation

- Fill glass petri dish half full with acetone and set on top of the lid of the coffee can.
- Set the styrofoam cup in the dish of acetone. It will sink slowly into the acetone as the acetone disrupts the interactions between the polymer chains in the expanded polystyrene. You may have to apply some pressure to the top of the cup to get it started.
- If you want to be funny, feel free to say some magic words (abracadabra, *accio cup*!), and lift up the coffee can to reveal the intact cup hidden underneath.
- Show the class the flat discs of pre-made polystyrene - these are the remains of the dissolved cup after the acetone evaporates

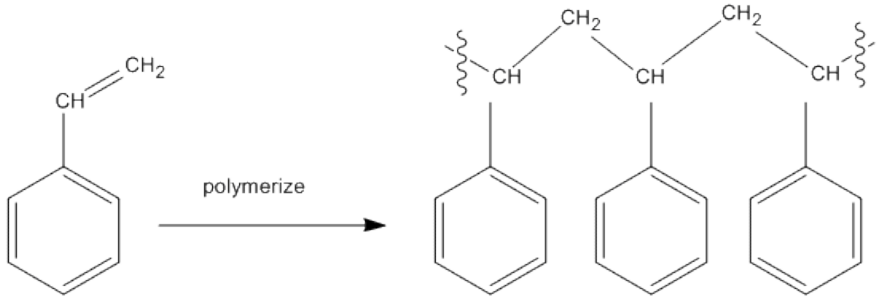
Discussion

- Acetone will disrupt the interaction between polymer chains because both acetone and styrofoam (extended polystyrene) are relatively nonpolar. As the styrofoam dissolves, all the air in the foam is released, leaving behind pure polystryrene. The solubility of polystyrene in acetone is not high because the polymer chains have very high molecular weights. After all the acetone evaporates, a thin wafer of polystyrene remains. Students may be surprised to see that polystyrene is transparent

Clean-Up

- Perform the demonstration in a well-ventilated room or next to a hood. Transfer the dish to a fume hood as soon as possible and allow the acetone to evaporate. Safe the hardened discs for later.

REFERENCE: P.B. Kelter et al., The Dissolving Polystyrene Cup, *Journal of Chemical Education*, December **1985**, 1108.



styrene polystyrene