Nylon

Recommended for Chapter(s): 21

Demo #044

Materials NOT in box

1. Safety goggles (if you are going to have a student roll the nylon you will need 2 pairs).

Procedure

1. (Prep) Make solution B by mixing 1 g sebacoyl chloride in 25 ml hexane. This solution does not last long so need to be made within 2 days of doing the demonstration.
2. (Prep) Pour 25 mL of solution A into a 100 mL beaker. This measurement does not need to be exact.
3. Slowly pour 25 mL of solution B into the same 100 mL beaker so that solution B sits on top of solution A.
4. Using tweezers pull a strand of nylon from the interface between the two solutions.
5. Begin wrapping the nylon around a glass stirring rod.
6. As long as the glass stirring rod is rotated slowly the nylon should continue to spool around it.
7. If you wish a student can wind the nylon onto the glass stirring rod. Make sure that the student is wearing goggles and gloves.

Safety

1. Wear safety goggles and gloves for this demonstration.
2. Do not touch nylon unless it has been rinsed with water.

Clean Up

1. Make sure that the cyclohexane and sebacoyl chloride are sealed with parafilm.
2. Pour the solution into the waste bottle.
3. Return the materials to the cart in the demonstration library room.

Stockroom Notes

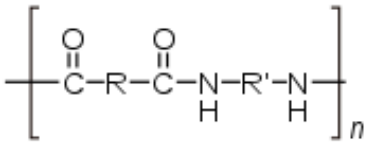
1. If the waste bottle is full or more than 6 month since start date, put bottle to be picked up by environmental health and safety.
    a. Make another waste bottle with the appropriate tag and put in box.
        i. Faculty Name: Feldwinn
        ii. Department: Chemistry
        iii. Phone: x2127
        iv. Start Date: Leave blank (will fill out when chemicals are put in the bottle)

v. Proper chemical name and concentration: 48 % cyclohexane, 48% water, 2% sebacoyl chloride, 2% hexamethylenediamine
vi. Physical State: liquid
vii. Chemical Hazard: Flammable

2. Replace all glassware with clean glassware.
3. If solution A is low (less than 25 mL) make new solution by:
    a. Dissolve 5 g hexamethylenediamine in 125 mL of water
4. Make sure the sebacoyl chloride and the hexane have parafilm seals on them.
5. Return items to demonstration tub.
6. Return tub to the demonstration library.
    a. Return goggles to the goggle box.

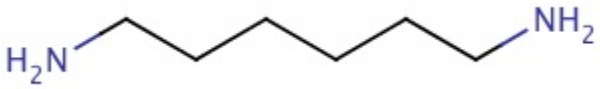
Discussion

Nylons are condensation polymers (polymers that when formed, have small molecules that are liberated). All nylons have the general form:

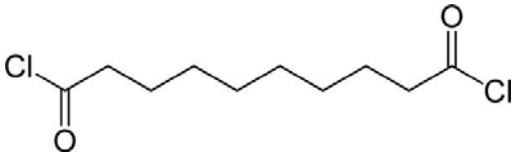


The nylon formed in this demonstration is nylon-6,10. The numbers after the word nylon represent the number of carbons atoms on each side of the nitrogen atoms (amide groups). Nylon-6,10 is used as toothbrush bristles.

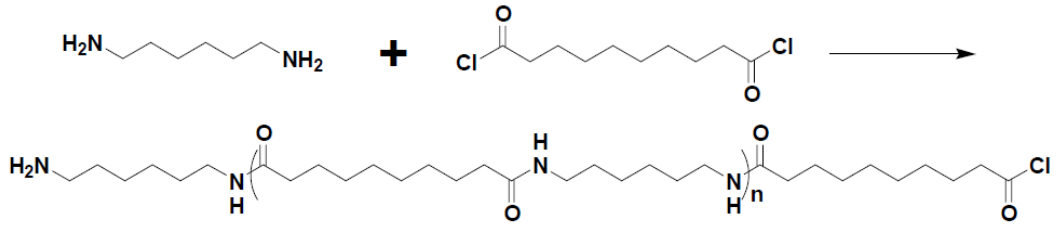
Solution A contained hexamethylenediamine which is seen below:



Solution B contained sebacoyl chloride which is seen below:



When the monomer units meet at the interface the following reaction takes place making nylon-6,10.



Materials for demo 044

1. Hexamethylenediamine
2. Cyclohexane (make sure that the top is wrapped with parafilm)
3. Sebacoyl chloride (make sure that the top is wrapped with parafilm)
4. Parafilm
5. Solution A (H_2O and $H_2N(CH_2)_6NH_2$)
6. Gloves
7. Bottle for solution B
8. Waste bottle
9. Plastic tweezers
10. Glass stir rod
11. 100 mL beaker
12. 50 mL graduated cylinder