



Curiosity Guide #501

Polymers

Accompanies Curious Crew, Season 5, Episode 1 (#501)

Anti-Gravity Polymers

Investigation #8

Description

Some polymers can defy gravity! Who's up for a polymer circus?

Materials

- Polyvinyl alcohol
- Stove
- Measuring cup
- Food coloring
- Pot
- 2 clear dishes with lids
- Rubber bands
- Thermometer
- Digital scale
- Spoon
- Syringe
- Plate of rubber bands

Procedure

- 1) Measure 5 grams of polyvinyl alcohol on a digital scale and set aside.
- 2) Measure and heat 100 milliliters of water in a pot on the stove to 80 degrees Celsius.
- 3) Slowly stir in the polyvinyl alcohol until dissolved.
- 4) Add a small amount of food coloring to the polyvinyl alcohol.

- 5) Remove from heat and set aside. Cover when cool.
- 6) Fill a second dish with water.
- 7) Depress the syringe into the dish of water.
- 8) While pulling back on the syringe's plunger, lift the syringe out just above the water line.
- 9) Does the water continue to enter the syringe above the water line?
- 10) Repeat the process with the colored polyvinyl solution.
- 11) What do you notice?
- 12) Use a plate of rubber bands to help explain what is happening.

My Results

Explanation

When conducting the investigation with water, the syringe must be submerged to work. However, with the polyvinyl solution, the syringe continues to work out of the water. Because the molecules of the polyvinyl polymer are like long chains, they tangle up. One chain pulls onto another. As a result, the syringe can be above the solution surface and still draw the solution upward, seeming to defy gravity.

Try this! To demonstrate the way polymer molecules work, challenge a friend to lift a rubber band from the center of the pile without moving another rubber band. Because the rubber bands are long and easily tangle, more than just one rubber band will move.

Investigate further: Here's one more fun polymer example. Have you ever noticed how clothes get wrinkled after going through the washing machine or when the clothes are left somewhat damp in the dryer? This is because many fabrics contain polymers. Cotton, for example, has hydrogen-bonded polymers. When hydrogen-bonded polymers get wet, the water can form new bonds between the chains. We see those new bonds as wrinkles. To fix the wrinkles, use a good steam iron to press the polymers back into place or get fabrics whose polymers don't react in this way to water. Looks like I have some polymers to iron! Remember stay curious and keep experimenting!

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