



Curiosity Guide #501

Polymers

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

Climbing Polymers

Investigation #2

Description

Are you ready for a little climbing fun? You will be amazed at what a polymer can do!

Materials

- Polyvinyl alcohol
- Stove
- Measuring cup
- Food coloring
- Drill
- Glass rod drill bit
- Pot
- Clear dishes with lid
- Rubber bands
- Wood dowel
- Thermometer
- Digital scale
- Spoon
- Container of water
- Container of salt
- Plate

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 until the water reaches 80 degrees Celsius.
- 3) Slowly stir in the polyvinyl alcohol and stir until dissolved.
- 4) Add a small amount of food coloring to the polyvinyl alcohol.
- 5) Place the polyvinyl solution in a dish.
- 6) Put a glass rod into the drill and begin to drill into the polyvinyl solution.
- 7) What do you notice?
- 8) To explain this, place a pile of rubber bands on a plate and try to drill in the center with a wooden dowel.
- 9) How is this like drilling the polyvinyl alcohol?

Other things to try

- 1) What happens if you drill the dowel into a container of water?
- 2) Try drilling the dowel into salt.
- 3) Compare the drilling results of the polyvinyl solution, the rubber bands, a container of water, and a container of salt.

My Results

Explanation

Polyvinyl alcohol is a polymer. Polymers are big molecules made of a chain of the same chemical units that are bonded together. This is a type of covalent bonding, which happens when the different chemicals share electrons.

Imagine these polymers are like long, wet spaghetti noodles. Although the polymer molecules can slide past each other, they get easily tangled up. Drilling the rubber bands is like a magnified look at polymer molecules tangling up.

In contrast, water molecules are not as long as polymer molecules are. When you drilled into the water, nothing happened. We can use drilling the salt as a magnified look at what happens with the water molecules. The molecules move away from the rotating dowel but don't get tangled up.

Because the polyvinyl alcohol molecules are long, they easily tangle and begin to climb up the drill bit. This effect is referred to as the Weissenberg Effect.

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