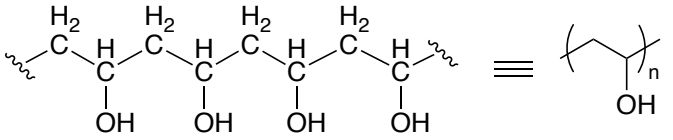
SLIMES and GLUEP

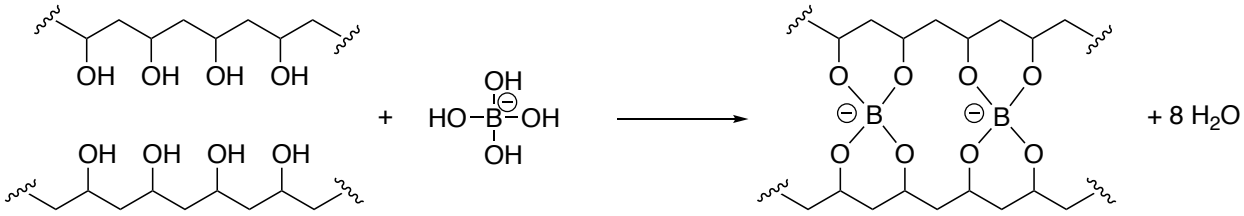
How chemical structure does PVA have?

Poly(vinyl alcohol) also known as PVA is an addition polymer where -CH_2CHOH is repeated several thousand times. The alcohol group -OH is located on alternative carbon atoms. The long chains make the liquid very viscous, or thick. The hydrogen bonds between the chains makes this polymer water soluble. PVA can be added to other polymer chains to make that material also water soluble, like in sweat sponges or in laundry bags for handling contaminated medical supplies.



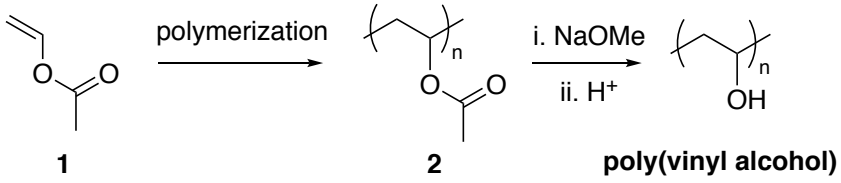
Why does it make slime?

In the making of PVA balls, the cross-linking ion is borate from sodium tetraborate decahydrate (Borax). Water molecules occupy most of the space within the 3D structure of these balls, which is why the balls dry out if left in air.



How do people make PVA?

As synthetic polymer chemists, we are always interested in how the polymer is made. Vinyl acetate **1** is reacted using radical polymerization. This makes polymer **2**! To reveal the alcohol, poly(vinyl acetate) is reacted with methanol. The acetate groups on the chain are replaced with -OH groups to form PVA.



1 **2** **poly(vinyl alcohol)**

How is PVA used?

PVA is commonly found in dissolvable laundry bags in hospitals to easily clean contaminated clothing. PVA can be used as thread in some fabric weaves so that when the material is washed, an open structure is obtained. PVA films are used for dye packages and detergent packages that dissolve in water. Highly concentrated pesticides and herbicides are packaged in PVA.

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Can I do this again at home?

Absolutely! Below are the instructions for making slime out of glue. You can also make slime out of pure PVA, a dissolvable poly(vinyl alcohol) bag, or starch packing peanuts.

Materials:

10 mL of Elmer's Glue
1 drop of food coloring
5 mL 4% sodium tetraborate solution (Borax)
Cup
Spoon
Plastic bag
Goggles

Instructions:

1. Place 10 mL of Elmer's Glue in a cup
2. Add one drop of food coloring if desired and mix with a spoon
3. Add 5 mL of a 4% Borax solution in water and stir.
4. Once the slime forms, remove it from the cup and knead it in your hands.
5. Store the slime in a plastic bag for best results.

How can I be a real scientist?

Scientists ask a question and then generate a hypothesis. Investigate the following questions, generate your own hypothesis, and design an experiment to test it out!

- What would happen if I added more Borax solution to the slime?
  - Hypothesis:
  - Experiment:
- Does the color of the food coloring matter to the strength of the slime?
  - Hypothesis:
  - Experiment:
- Do different glues make different slimes?
  - Hypothesis:
  - Experiment:
- How can I make the toughest slime ever?
  - Hypothesis:
  - Experiment:
- Question:
  - Hypothesis:
  - Experiment:
- Question:
  - Hypothesis:
  - Experiment: