Educational Innovations®

#SM-8A/B

Melt-A-Way Hot Water Soluble Polyvinyl Alcohol Bags

Polyvinyl alcohol laundry bags are used in hospitals to minimize the contact hospital workers have with contaminated clothing and bedding. Dirty items are put into these special bags, which are then placed directly into the washing machine. Because polyvinyl alcohol is soluble in water, the bags dissolve and are washed down the drain with the dirty water. At the completion of the washing cycle, the clean cloths are removed from the washing machine.

Polyvinyl alcohol (PVOH) laundry bags can be dissolved in hot water to make a polyvinyl alcohol solution. When combined with a *sodium tetraborate* (Borax) solution, the polyvinyl alcohol polymer is cross-linked to form a viscous fluid more commonly called Gak™ or Slime! Simply dissolve one bag in about 16-18 fluid ounces of water to make the 4% polyvinyl alcohol solution necessary to make slime. Refer to the procedure below.

Materials:

- Polyvinyl alcohol (PVOH) laundry bag
- Borax (sodium tetraborate), available from your local supermarket
- 2 containers for mixing
- Utensils for mixing
- Water (hot & cold)
- Food coloring (optional)

Procedure:

1. In a small container, dissolve one (1) PVOH bag in 16-18 ounces of hot water (the hotter the water, the faster the bag will dissolve. Do not, however, *cook* the PVOH solution. Mix with a stick or spoon until the PVOH is dissolved. Set aside and allow to cool to room temperature.

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Hints:

a) *You can dissolve more than one bag at once if you use more water!*
b) *A few drops of food coloring may be added at this point to give your slime some color.*
c) *If your bag does not dissolve completely, your water was probably not hot enough. You may continue even if there are still a few undissolved lumps remaining.*

2. In another cup or bowl, make a saturated solution of Borax. Combine a small amount of Borax powder with water and stir. To make the solution saturated, continue to add Borax powder until there is a little on the bottom of the container that will not dissolve.

3. To make slime, add the Borax solution to the PVOH solution dropwise while stirring. Continue adding the Borax solution until the PVOH solution is no longer a liquid. Knowing just how much Borax solution to add is the trick to this experiment. If you add too little, your slime will contain excess PVOH and it will be sticky. Too much, and your slime will be excessively wet.

   Hints:

   If your slime feels sticky, try adding a little more Borax solution. If your slime feels very wet and slippery, remove it from the container and kneed it. In a few minutes, the excess Borax solution will be absorbed.

4. Your slime is made of polyvinyl alcohol and if you leave it exposed to air for a long time (a few hours), it will begin to dry. Therefore, when you are not using it, you should story it in a plastic bag (zip top bags work great), or other small container, like a plastic film canister.

5. As with any science experiment, your slime should not be consumed! Do not taste it or eat it, and do not leave it where a pet or young child might have access without supervision. (If your slime should become moldy, throw it away.)

Explanation:

Polyvinyl alcohol consists of very long chain-like polymers. PVOH is viscous (thick) because all of these molecules are tangled together, just like a pot full of spaghetti. When the Borax is added, the sodium tetraborate molecules connect many of the PVOH molecules together. The result is a new substance which is even more viscous, and which has the physical properties of both a solid and a liquid.

