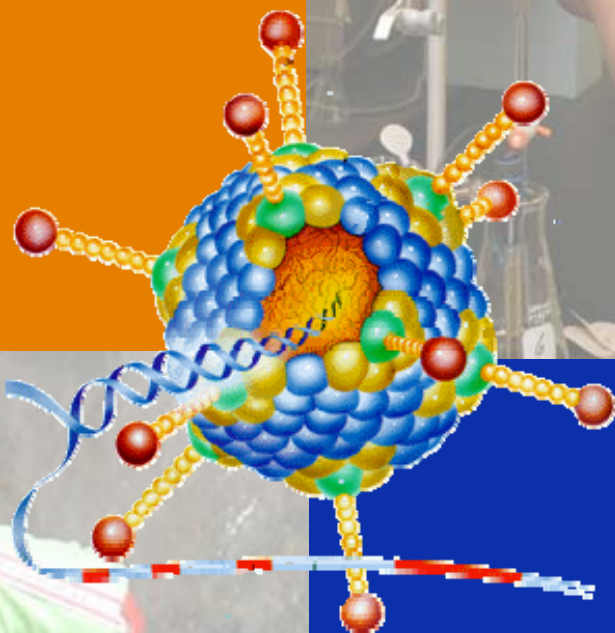


Super Absorbent Polymers

Lab Book



The waterCAMPWS
Center for Advanced Materials
for Purification of Water with Systems



Overview

Recall from the introduction that sodium polyacrylate is a hydrophilic polymer that can absorb liquids up to 800 times its molecular weight. This extraordinary ability to absorb liquids is due to many factors but the most important is polarity. Polar molecules have bonds that involve the unequal sharing of electrons. When atoms dissociate from polar molecules, the molecule is no longer neutral. Free negative and positive ions move freely in solution, as with sodium polyacrylate when it is added to water.

In this experiment, you will use test a polymer, sodium polyacrylate, in water with and without various additives.

Materials and Equipment

Materials required for this lesson are (for each group of students):

- 3 400 mL beakers
- 200 mL water
- 200 mL lemon juice
- 200 mL vegetable oil
- sodium polyacrylate
- NaCl, table salt
- 4 plastic spoons

Procedure

1. Before beginning the experiment, develop a hypothesis about how the super absorbent polymer will react to the different substances being used in this experiment. Write your hypothesis and your reason for thinking so in the space below.
2. Pour 200 mL of each liquid (water, lemon juice, and vegetable oil) into separate beakers and label each beaker.
3. Record observations in the results section on the next page.
4. Add 3 spoonfuls of sodium polyacrylate to each beaker and stir.
5. Wait 2-3 minutes and record your observation in the results section on the next page.

The Good, the Bad, the Silly...

Writing a good hypothesis is harder than you think. For example:

When it gets cold, water turns to ice.

is an acceptable hypothesis, but not very helpful, since there are many temperature of "cold" when ice wouldn't form.

A better hypothesis would be:

When the temperature reaches 32 degrees Fahrenheit and remains at that temperature, water turns to ice.

The hypothesis:

When the temperature reaches 32 degrees Fahrenheit and remains at that temperature in a room with three windows that face North on a Sunday, water turns to ice.

While this last statement may be true, it contains a lot of unnecessary detail that makes it of little practical value, since there are lots of conditions that will cause ice to form that are excluded in this hypothesis.

Results

Polymer and Water	Polymer and Lemon Juice	Polymer and Vegetable Oil
Initial	Initial	Initial
Addition of salt	Addition of salt	Addition of salt

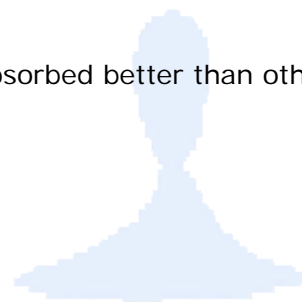
Analysis

1. What properties of water, oil and lemon juice account for their interactions with sodium polyacrylate?

2. In your own words, what is osmosis?



3. Based on your answer, why do you think some liquids are absorbed better than others by sodium polyacrylate?



4. How does NACL affect the absorption of the water by the sodium polyacrylate?

5. For what everyday life situations can sodium polyacrylate be used?

6. What is the relationship between polymers like sodium polyacrylate and water purification/conservation?

7. In one or two sentences, explain what you learned in the lab today.

