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Educational Innovations, Inc.®

Sodium Polyacrylate (Diaper Polymer)

GB-6

Our Sodium Polyacrylate and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

Elementary

2-PS1-2
Students can analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

5-PS1-3
Students can use Sodium Polyacrylate to make observations and measurements to identify materials based on their properties.

5-PS1-4
Students can use Sodium Polyacrylate to conduct an investigation to determine whether the mixing of two or more substances results in new substances.

Middle School

MS-PS1-2
Students can analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

MS-PS1-6
Students can use Sodium Polyacrylate to undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical process.

ETS1.B
A solution needs to be tested, and then modified on the basis of the test results in order to improve it.

MS-PS1-4
Students can use Sodium Polyacrylate to develop a model that predicts and describes changes in particle motion, temperature, and state of pure substance when thermal energy is added or removed.

High School

HS-PS1-4
Students can use Sodium Polyacrylate to develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.

HS-PS1-5
Students can use Sodium Polyacrylate as evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which the reaction occurs.

HS-PS2-6
Students will observe and communicate scientific information about why the molecular-level structure is important in the functioning of a material.

HS-PS1-7
Students can use Sodium Polyacrylate to construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table and knowledge of the patterns of chemical properties.

What Is Sodium Polyacrylate?

Sodium Polyacrylate is a white granular powder which rapidly absorbs water. It will instantly absorb from 500 to 1,000 times its mass in water. One of its greatest uses is in making diapers super-absorbent. Table salt (NaCl) destroys the gel and releases the water.

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Suggested Activities

1. How much water will a super-absorbent diaper hold?

Procedure: Show students a super-absorbent diaper, a glass, and a pitcher of water. Ask students how many glasses of water the diaper will hold. While one student is holding the diaper open, slowly pour glasses of water into the entire length of the diaper. If you are careful, it will hold 7 to 10 glasses of water. One might conclude that babies only need to be changed once a day!

Explanation: The fibers of the diaper contain a small amount of sodium polyacrylate, which instantly gels the water.

2. What's inside of a super-absorbent diaper?

(Good for small groups)

Procedure: Over a tabletop, cut a super-absorbent diaper in half and pull out some of the fibers. Shake the fibers and pull them apart, allowing the sodium polyacrylate granules and fibers to fall onto the table. With your hand, push everything that has fallen into a pile. Pick up and discard the top fibers. The white granules that remain are sodium polyacrylate, which makes the diaper super-absorbent. Using a dropper, slowly add water to the granules and watch the gel instantly form. Show the students a bottle of sodium polyacrylate and ask them to predict how many super-absorbent diapers could be made with this amount of powder.

3. How good are your powers of observation? ("Three Cup Monty")

(Good for both large and small groups)

Procedure: Start with three tall white Styrofoam™ cups and a pitcher of water. After showing students that the cups are empty, fill one halfway with water. Tell students to carefully observe the cup with water as you quickly move the cups back and forth. Ask them which cup has the water. Then show them that they are correct by pouring the water into one of the other cups. Do this several times until finally everyone guesses wrong. Simply invert the cup they guessed. Then ask them to guess among the two remaining cups. Wrong again, invert this cup on top of the first inverted cup. Finally, show them that the water has disappeared by inverting the remaining cup and adding it to the stack.

Explanation: Beforehand, add a heaping teaspoon of sodium polyacrylate to one of the three cups. It is so white no one will notice when you initially show them that the cups are empty. In the initial pourings, never pour the water into this prepared cup. Then, when you want the water to "disappear," pour the water into the cup containing the sodium polyacrylate. The water will instantly gel and stick to the inside of the Styrofoam™ cup.

Suggested Activities

4. How many drops of water can you hold on the tip of your finger?

(Good for small groups, and for winning bar room wagers)

Procedure: Ask students to guess the number of drops of water that can fit on one of their fingers—usually only a few. Then, with a dropper, show them that you can keep as many as twenty drops of water on your fingertip.

Explanation: Simply place a few granules of sodium polyacrylate on your fingertip, and slowly add the drops of water, allowing one drop to gel before adding another.

5. Can you invert a glass of water without the water flowing out?

(Good for both large and small groups)

Procedure: Start with two beakers or two clear plastic cups, one of which contains a heaping teaspoon of sodium polyacrylate. From a pitcher, pour water into the empty container. Holding both containers, one in each hand, pour the water into the one containing the sodium polyacrylate. Quickly pour the water back and forth until it completely gels. Then invert.

NOTE: To reverse the process and release the water, add a few heaping teaspoons of table salt to the gel and stir.

6. Can you follow directions?

(Good for both large and small groups)

Procedure: Pour water into a Styrofoam™ cup, place a card over the opening, invert, and place on top of a student's head. Ask the student to hold this inverted cup on top of his head. Pull out the card and have the student who is holding the cup read what is on the card. It says: "DO NOT REMOVE THIS CARD FROM THE CUP!" Pick up the cup and show that the water seems to have disappeared.

Explanation: Before starting, add a heaping teaspoon of sodium polyacrylate to the cup.

Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons.

Please visit our website for more lesson ideas:

www.TeacherSource.com

Check our blog for classroom-tested teaching plans on dozens of topics:

http://blog.TeacherSource.com

For us, "*Teachers Serving Teachers*" isn't just a slogan—it's our promise to you!

Educational Innovations has many hydrophilic materials that can be used in follow-up lessons. Consider our other "Gro-Beasts" shaped of like frogs and dinosaurs. These critters start at 1-3" long and expand by up to 600% when left in water. They are fantastic for any grade level, and affordable enough to hand out to every student in your class.

Hydrophilic Growing Spheres, Cubes, Spikes and Crystals are also excellent for investigating concepts like mass, volume, surface area, absorption and more.

Gro-Beast Dinosaur (GB-1)

Growing Cubes (GB-740)

Growing Frogs (GB-25)

Growing Spheres (GB-702, GB-710, GB-730)

Water Gel Crystals (GB-5C)

Water Gel Spikes (GB-3)

And don't forget our HYDROPHOBIC material!

Magic Sand (SS-2)

Magic Sand is regular sand which has been dyed and coated with a hydrophobic material—a substance which repels water. The coating on the outside of the magic sand repels water and keeps the sand dry, even when submerged in water! Available in four fluorescent colors.

Instant Snow (GB-300)

Add water to this granular white powder and watch it instantly expand to 40 times its original volume. The result is a fluffy artificial snow that feels as cool as it looks! Our snow won't "melt" but it can be dehydrated and re-used. Great for teaching endothermic and exothermic reactions or as part of a polymer lab. This is a great demonstration of interest to students and educators of ALL ages and abilities.