Teaching the Scientific Method with Instant Snow Polymer

GB-300, 315 and 320

What Is Instant Snow Polymer?

Instant Snow Polymer is a white granular powder which rapidly absorbs water. It will instantly absorb 40 times its original volume, producing a snow-like material. Originally developed to clean up aqueous spills in hospitals, its unique properties make it useful for other applications. When wet, this polymer has the consistency of snow. It is used as an artificial base for skiers and as artificial snow on film sets. One of its first film uses was in Stephen Spielberg's mini-series, *Band of Brothers*. Instant Snow Polymer is reusable. Simply allow your snow to dry and it will return to its powdered form, ready to be used again.

Teaching the Scientific Method with Instant Snow

This is a wonderful lab activity to give students a basic understanding of the steps involved in the scientific method. Immediately after hydrating the snow polymer, have students touch the expanded material. It should be slightly warm to the touch, as the reaction between the water and the polymer is slightly exothermic. If students touch a sample of snow that was previously expanded (10 minutes or more) they will find it cool to the touch. Question students as to why this might be. (The reason is that the water in the polymer is beginning to evaporate and it takes heat energy for this process to occur).

Have students brainstorm what variables might affect the evaporation rate of the water over a long period of time. Possible variables might be the size of the container it is left in, the shape of the container, the temperature of the room, the humidity of the room, etc. Students should select ONE of these variables to test how the evaporation rate of the hydrated polymer is affected. All the other possible variables must be kept constant. Copy and distribute the sample lab sheet on pages 3-4.

Students should design an experiment based on the variable they select to examine. Each group should have three different values to test. For example, if they select the size of the container the snow is kept in, there should be three different containers. Students should be sure that the containers are all made from the same material, are kept in the same area, etc.

After the groups have properly planned their experiment, they should begin the data collection stage. Give each group the same amount of expanded snow to use to test their hypothesis. Over the next two weeks, have students measure each of their samples, using a balance each day and recording the mass on their data table. This should take very little time, so the remainder of the experiment can be completed for homework. Upon writing a conclusion, students can be expected to report their findings to the class.

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NGSS and Instant Snow Polymer

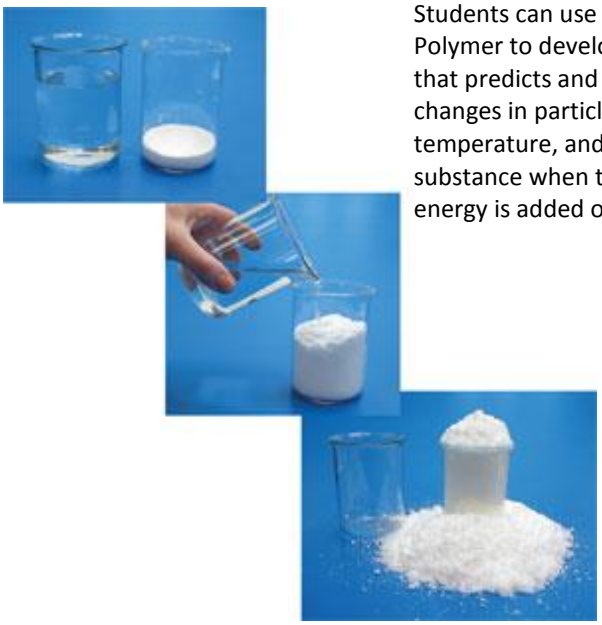
Our Instant Snow Polymer and these lesson ideas will support your students' understanding of these Next Generation Science Standards (NGSS):

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 Instant Snow Polymer to make observations and measurements to identify materials based on their properties.

5-PS1-4
Students can use Instant Snow Polymer 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 Instant Snow Polymer 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 Instant Snow Polymer 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 Instant Snow Polymer 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 Instant Snow Polymer 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 Instant Snow Polymer 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.

Snow Polymer Lab

In this lab, you and your group will investigate an independent variable to see how it affects a dependent variable. The dependent variable for all groups will be the evaporation rate of the water in the snow polymer.

1. Brainstorm a list of variables you think may be important in changing the rate of evaporation of the water from the snow polymer. List them below or on the back of this sheet.

2. Together with your group, choose only ONE of these variables to be your independent variable.

3. Write your problem. You should state it as, "What is the relationship between (your chosen independent variable) and the rate of water evaporation?"

4. Write your hypothesis (how you think your independent variable may affect the rate of evaporation).

5. ALL the variables you listed in #1 that are NOT your independent variable are your constants. In the space below, please list these variables that you will not allow to change as you conduct your experiment. How will you ensure that each is unchanged?

6. Now discuss and record the actual design of your experiment, listing procedures you plan to follow. You'll need at least three trials of at least three different values of your independent variable. Remember to mention keeping the constants and be sure to explain how you will keep your measurements of the dependent variable accurate. Make a step-by-step, numbered rough draft of your general lab procedures on the back of this sheet.

7. Use the Data Table below to record your measurements of a two-week period.

	Mass (g)		
Date	Sample 1	Sample 2	Sample 3
Total Loss of Mass			

8. On a separate sheet of paper, create a graph to display your data. Be sure to label your x and y axes appropriately.

9. On a separate sheet of paper, write a conclusion that summarizes the relationship between each change of the independent variable and the dependent variable. A reasonable explanation of your results should be included.

Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, "*Teachers Serving Teachers*" isn't just a slogan—it's our promise to you!

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

To extend your lesson, consider these Educational Innovations products:

Sodium Polyacrylate (Diaper Polymer) (GB-6A)

You know... the super-absorbent polymer found in disposable baby diapers. Also used in many 'disappearing water' magic tricks, this fine white powder instantly turns liquid water into a slush-like solid substance. Technically speaking, the polymer absorbs from 500 to 1,000 times its own weight in water. Simply add table salt to reverse the reaction.

Goldenrod Color-Changing Paper (SM-925)

True goldenrod paper is made from a dye which is an acid-base indicator. This paper turns bright red in bases such as ammonia, baking soda or washing soda and returns to bright yellow in acids such as vinegar or lemon juice.

Educational Innovations has many hydrophilic materials that can be used in follow-up lessons. Hydrophilic Growing Spheres, Cubes, Spikes, Dinosaurs, Frogs, and Crystals are 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)