## SECTION VI - TOXICITY AND FIRST AID

| | | | |
|---|---|---|---|
| ***ROUTES OF ENTRY:*** | ***Inhalation?*** Yes | ***Skin?*** No | ***Ingestion?*** No |
| ***HEALTH HAZARDS ( Acute & Chronic) :*** Inhalation may cause mild irritation of upper respiratory tract. Inhalation experiments with animals on similar polyacrylate polymer (using very small particles of less than 10 microns) produced inflammatory tissue response in the lungs. | | | |
| ***CARCINOGENIOITY:*** | ***NTP?*** No | ***ARC Monographs?*** No | ***OSHA Registered?*** No |
| ***SIGNS & SYMPTOMS OF EXPOSURE:*** Dust may cause reddening, drying of affected area with possible burning or other discomfort. Irritation of the upper respiratory tract and/or eyes. | | | |
| ***MEDICAL CONDITIONS AGGRAVATED by EXPOSURE:*** Existing respiratory and allergic conditions | | | |
| ***FIRST AID TREATMENT:*** Eyes: Flush with water or approved eye wash and obtain medical assistance if irritation persists. Skin: Clean thoroughly with large amount of water. Inhalation: Move to fresh air source. If discomfort continues, consult a physician. | | | |

## SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

| |
|---|
| ***SPILL PROCEDURE:*** Collect material and avoid flushing with water if possible. Polymer becomes slippery if flushed with water. |
| ***DISPOSAL:*** Waste can be gathered and disposed of in accordance with existing local, state and federal environmental regulations. Nonhazardous material suitable for approved solid waste landfills |
| ***PRECAUTIONS FOR SAFE STORAGE & HANDLING:*** Avoid eye contact. Avoid prolonged or repeated skin contact. Do not inhale. Do not ingest. Store in a cool, dry place. Close bags or container when not in use. |
| ***OTHER PRECAUTIONS:*** Dusty conditions may irritate the eyes and respiratory system. Wear safety goggles and nuisance dust mask where dust is created. |

## SECTION VII - CONTROL MEASURES

| | | | |
|---|---|---|---|
| ***RESPIRATION:*** Use high efficiency filter mask for dust particle levels above 0.05 mg/m$^3$. | | | |
| ***VENTILATION:*** Local exhaust to remove airborne particles. | | | |
| ***PROTECTIVE GLOVES:*** | Recommended | ***EYE PROTECTION:*** | Safety glasses or goggles. |
| ***OTHER PROTECTION:*** | None | ***HYGIENIC PRACTICES:*** | Wash thoroughly after handling |

file: squakoop.mud

| | | |
|---|---|---|
| #GB-300 | 100 g | (1/5 lb) |
| #GB-315 | 454 g | (1 lb) |
| #GB-320 | 2270 g | (5 lb) |

# Instant Snow Polymer

**When this granular white powder is added to water, it instantly expands to 40 times its original volume, producing a snow-like material. When more water is added, a slush forms. When allowed to dry, it returns to its powdered form ready to be used again.**

Originally developed as a blood absorber, the unique properties of Instant Snow Polymer make it useful for many other applications. When wet, this polymer has the consistency of snow, adheres well to boots, and is very slippery. It is used as an artificial base for skiers and as an artificial snow on Hollywood sets. One of the first film uses was in Stephen Speilberg's mini-series, Band of Brothers. Because it rapidly absorbs and retains large volumes of aqueous solutions, converting them into gels, it is used for industrial spill containment.

**In the classroom, Instant Snow Polymer is great for showing that there is No Law of Conservation of Volume – a common student misconception!**
*Note: This is a good substitution for the more hazardous ammonium dichromate demonstration, commonly used until recently.*

Instant Snow Polymer is made by cross-linking molecules of the sodium polyacrylate polymer, the material that gives disposable diapers their super absorbent quality. These small individual cross-linked clusters appear as a white powdery substance. When water is added, the individual clusters internally hydrate and expand, forming small, fluffy clusters that do not cling to surrounding clusters. This appears as a powdery snow. When more water is added, the water molecules hydrate the external surface of these clusters and the clusters begin to adhere to one another. This appears as a slush.

Instant Snow Polymer is a Superabsorbent Polymer (SAP). The powder is able to absorb as much as 500 times its mass of pure water within a few seconds. In the dry state, the cross-linked network is folded up on itself, When hydrated, the highly hydrophilic ("water-loving") network quickly absorbs water, unfolds and expands. The hydration is dependent upon the purity of the water. Sodium chloride decreases the absorption due to $Na^{1+}$ ions creating an electrostatic screening between the water and the hydration sites. Divalent ions of hard water, $Ca^{2+}$ and $Mg^{2+}$, highly decrease the absorption properties because they compete with water for the hydration sites on the polymer chain. The maximum absorption with water is between a pH of 4 and 8.

PROCEDURE A

Place 10 g (ca. 1 teaspoon) of Instant Snow Polymer into a beaker. Quickly add 200 ml (ca 2 ounces) of water. The polymer will quickly absorb water and expand into a large quantity of "fluffy snow." Emphasize that this demonstrates that there is No Law of Conservation of Volume! Allow it to pour through your fingers. It even feels fluffy like real snow.

Experiment with different ratios of powder to water. A good place to start is 1 part powder to 20 parts water by mass (10 g powder to 200 ml water). If mixing by volume try 1 part powder to 12 parts water. The following ratios work well.

| Instant Snow Polymer | Water |
|---|---|
| 10 g | 200 g |
| 1 teaspoon | 2 oz. |
| 1/4 cup | 3 cups |
| | |

Sprinkle salt, e.g. sodium chloride, to the snow. Salt will cause the hydrated polymers to release the water. The effect looks very much like melting.

PROCEDURE B

Add different amounts of water to the powdered polymer. As the polymer absorbs more water, it becomes thicker rather than fluffier. Try the following:

1) Compare the water absorbing qualities of the cross-linked polymer to that of the sodium polyacrylate polymer which is not cross-linked (EI #GB-6A (113 g) & #GB-6B (454 g).
2) Experiment with different water qualities. What kind of water works best? Vary the pH, the hardness, or the salt content of the water.

QUESTIONS FOR FURTHER STUDY

1) How is this artificial snow similar to real snow? How is it different?
2) Why does the hydrated snow polymer feel cold?
3) Examine a few clusters under a microscope. How do the "flakes" compare to ice crystals?
4) What happens when you freeze it?

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# MATERIAL SAFETY DATA SHEET OSHA Standard 29 CFR 1910.1200

NE = not established
NA = not applicable

**PRODUCT IDENTITY:** Sudium Polyacrylate Superabsorbent Polymer

## SECTION I

| | | | |
|---|---|---|---|
| ***Manufacture*** | Sumitomo Seika Chemicals Co., Ltd. | ***U.S. Contact:*** | Educational Innovations, Inc. |
| ***Address:*** | The Sumitomo Bldg. No.2,7-28,4 Chome | ***Emergency Telephone:*** | (203) 229-0730 |
| | Kitaham, Chuo-ku, Osaka, JAPAN | ***Date Prepared:*** | June 17, 1998 |
| | telephone: 011-816-220-8539 | | |

## SECTION II - Hazardous Ingredients/Identity Information

| ***Chemical Identity/common Name(s)*** | ***OSHA PEL*** | ***OSHA STEL*** | ***ACGIH TLV*** |
|---|---|---|---|
| Poly (sodium acrylate) homopolymer or sodium salt of polyacrylic acid CAS # 9033-79-8 | NE | NE | NE |
| ***Other Limits Recommended:*** | 0.05 mg/m³ recommended exposure limit (small, less 10 microns respirable polyacrylate). See section VI | | |
| | **SARA Section 313 Reportable Toxic Chemicals - None** | | |

## SECTION III - Physical Data

| | |
|---|---|
| ***Appearance:*** White, Granular Powder | ***Odor:*** slight acrylate odor |
| ***Boiling Point:*** Solid N/A | ***Melting Point:*** decomposes above 500° F |
| ***Vapor Pressure:*** Less than 10 mm Hg | ***Vapor Density:*** N/A, >1 |
| ***Evaporation Rate:*** Less than 1 | ***Specific Gravity:*** N/A, Bulk Density <1 |
| ***Solubility:*** Insoluble, swells in water | |

## SECTION IV - Fire and Explosion Hazard Data

| | | | |
|---|---|---|---|
| ***Flash Point:*** None | ***Flammable Limits:*** N/E | ***LEL:*** N/E | ***UEL:*** N/E |
| ***Extinguishing Agents:*** Water, $CO_2$, Dry Chemical Extinguishants and Halon | | | |
| ***Special Fire Fighting Procedures:*** None | | | |
| ***Unusual Fire Hazards:*** Very slippery when product is in contact with water. | | | |

## SECTION V - Reactivity Data

| | |
|---|---|
| ***Stability:*** Stable | ***Conditions to Avoid:*** None Known |
| ***Incompatibility:*** Avoid contact with strong oxidizing agents. | |
| ***Decomposition Products:*** Carbon, oxides of carbon & sodium, water | |
| ***Hazardous Polymerization:*** Will Not Occur | ***Conditions to Avoid:*** None Known |