

Making Snow from Nappies

Nappies are designed to absorb large amounts of liquid, and keep the liquid away from the baby's skin and so prevent nappy rash. The means by which they do this is the use of *sodium polyacrylate*; a polymer which has the ability to absorb many times its own weight of water. Sodium polyacrylate (sometimes called 'waterlock') has the chemical formula $[-CH_2-CH(COONa)-]_n$ and is used in products such as detergents, coatings, thickening agents, fake snow and, of course nappies. It has the ability to absorb as much as 200 to 300 times its mass in water.

MATERIALS

You will need:

- Disposable nappies (several types);
- Zip-lock freezer bags;
- Scissors;
- Plastic cup;
- Water;
- Newspaper;
- Salt;
- Spoon.

HEALTH & SAFETY

Care should be taken with scissors.

All liquids should be discarded in the sink after use.

METHOD

Place a new nappy onto the newspaper. Carefully cut through the inside lining and remove all the cotton-like padding material. Put all the padding material into a clean, zip-lock bag. Then sweep any of the white crystals of sodium polyacrylate that may have spilled onto the paper and pour it into the bag with the nappy padding. Blow a little air into the bag to make it puff up, then lock the bag. Shake the bag, which causes the sodium polyacrylate crystals to fall from nappy padding. Carefully remove the padding from the bag the white powder left at the bottom of the bag is the sodium polyacrylate. This is what you will use for the experiment.

Pour the sodium polyacrylate into a plastic cup and fill the cup to about 1/3 of its depth with water. Mix it with the spoon until the mixture begins to thicken. The water/sodium polyacrylate turns into a type of snow, which will feel dry to the touch. You can even turn the cup upside-down and the snow should stay inside.

Once you have finished examining the water-bound polymer, add a teaspoon of salt to the polyacrylate snow, stir it with a spoon. The snow should 'dissolve'.

You can also try to measure the volume of water that one nappy can absorb by slowly adding water to it – try to see if different brands of nappy at different price levels absorb the same amount or less water – are the more expensive brands better value for money?



EXPLANATION

Sodium polyacrylate is a superabsorbent *polymer*, a long chain of repeating monomers. These expand when they come in contact with water because water is drawn into and held by the polymer molecules. They effectively act like giant sponges. The nappy padding acts to distribute the liquid in the nappy by capillary action so that the liquid is distributed within the body of the nappy. The snow 'dissolved' when the salt was added because salt interferes with the binding between the water and the sodium polyacrylate.

For these reasons normal nappies should not be used in swimming pools since the gel can leak out, and mustn't be disposed of down the toilet since they will block it as they swell up.