

Key Stage 3 Worksheet



Swansea
University
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Abertawe



The Chemistry of Making Water Disappear

With Dr Pamela Styles

Introduction

In this video, Swansea University's Dr Pamela Styles reveals the chemistry behind her science magic trick of making water disappear. She uses an absorbent salt called sodium polyacrylate, which can be found in babies' nappies.

Watch the video here:
youtu.be/d53q5xgHCkc

Open the file in your
web browser to click on
the links.

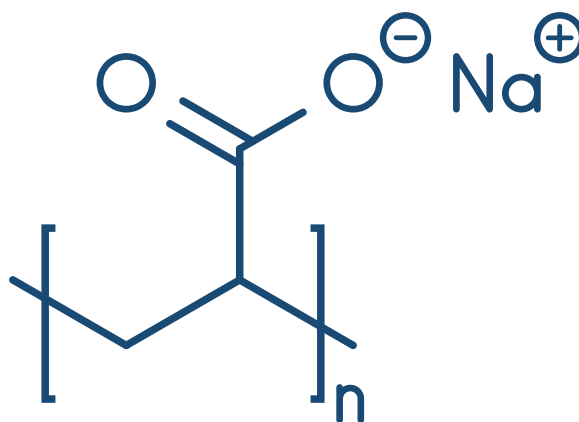
What is a sodium polyacrylate?

Sodium polyacrylate is salt made from two types of **ions**.

What is an ion?

An ion is an atom or molecule which has either a positive or a negative charge.

Sodium polyacrylate is made from positive sodium (atom) ions and negative polyacrylate (molecule) ions.



sodium polyacrylate

Sodium polyacrylate continued...

Sodium polyacrylate is a polymer, which means it has long molecules which are made from lots and lots of repeating units, called monomers, all stuck together, a bit like beads on a necklace. Plastics are also polymers. Usually when a molecule is a polymer its name will start with the word poly-.



Each molecule is able to attach itself to lots of water molecules and hold on to them, forming a firm gel.

How does this work?

When the sodium polyacrylate is a powder, the positive sodium ions are packed tightly together and surrounded by a barrier of negative polyacrylate ions.

When water is added, the water molecules are attracted to the sodium ions, so they pass through this barrier through a process called **osmosis**.

This causes the salt molecules to unravel and swell as the water is absorbed. The molecules have changed shape, so the material will behave differently – it turns from a powder into a gel.



Sodium polyacrylate is a super absorbent polymer, which can soak up hundreds of times its own weight in water! It is put into babies' nappies to trap any liquid as a gel, so it can't leak out.

Exercise – try this yourself at home

If you have access to a baby's nappy, this is a fun experiment to try! Nappies are designed to absorb and hold on to lots of liquid. They're very good at this because they're full of sodium polyacrylate.

Safety:
Only do this experiment with adult supervision.

You will need:

- A baby's nappy
- Scissors
- A spoon
- A cup
- Water



Method:

1. Very carefully open up a nappy and take out some of the powder (sodium polyacrylate) inside using a spoon.

Warning: Be careful not to get the nappy or powder near your face: remember this chemical is very good at absorbing water so it can dry out the membranes in your nose, mouth and throat, and irritate them.

2. Add a small spoonful of the powder to a cup.
3. Add a few spoonfuls of water to the cup.
4. After a few seconds, you should be able to turn the cup upside down without anything falling out – the water will seem to have disappeared!

If you look inside the cup, you will see the firm gel that has formed at the bottom. Why not try an experiment to calculate exactly how much water a certain amount of the powder can absorb?

You could also try an experiment to see what happens when you dissolve table salt in the water before you add it to the sodium polyacrylate powder. The powder is very good at holding onto salt too, so this should mean it has fewer places available to hold onto water, so it won't be as absorbent.

Interactive: Click on the box to start typing

Questions

Use the information above, and the video, to answer these questions about polymers and sodium polyacrylate.

What does the term polymer mean?

Which household product contains sodium polyacrylate?

What is an ion?



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