

Hair Gel Collapse Experiment

Safety and First Aid

This section will only deal with the specific safety issues regarding the chemicals involved; there are likely to be other safety issues that will need to be addressed outside the scope of this section. A full risk assessment should be performed prior to undertaking the experiment.

- Students should not ingest any of the experiment; good lab practice starts young!
- There are no specific safety hazards associated with any of the chemicals used in this experiment
- *First Aid* – wash the affected area with water

Glossary

- *Polymer / plastic* – a very long molecule that is made up of thousands of repeating subunits

Suggested Teaching Points

- *Roles of plastics* – the hydrogel used in this experiment is a synthetic plastic
- *States of matter* – this experiment involves gels, solids and liquids

What to Expect

Please see the video for a detailed depiction of the experiment.

This experiment will demonstrate one application of hydrogels; this experiment is analogous to the Nappy Powder experiment that can also be found on the website. Hydrogels are networks of long polymer chains that attract and store large volumes of water. It is not uncommon for 90% of a hydrogel to be water. As water molecules are attracted and stick to the polymer chain network, this causes it to swell forming a gel.

As salt is added to the gel, ions present in the salt are attracted and replace the water in the gel because they are more strongly attracted to the polymer chain than water. As a result of this loss of the water, the gel shrinks and collapses in on itself.

This process of replacing the bound water with salt can be reversed to regenerate the gel. By adding a vast excess of water, the salt can eventually be removed and replaced with water. However, we

found that the volume of water required for this to occur was very large and proved difficult to observe the resulting reformed gel.

Equipment and Chemicals

- Hair gel; the cheaper the hair gel the better! Cheaper hair gel tends to have few additives that interfere with this process
- Table salt
- A teaspoon or spatula
- Container

Supplementary Instructions

- Ensure that as much of the hair gel surface is covered with salt as possible; this will speed the process up.
- You may need to add additional salt to the hair gel as the reaction occurs. The salt tends to dissolve in the released water and washed off the hair gel.

Suggested Questions for Students

- *What other uses for hydrogels can you think of?* – hydrogels are found in a variety of commercially available products. Any product that requires a gel or absorbent properties could be performed by a hydrogel. Hydrogels are commonly used as thickening agents in products such as paint.
- *Why are hydrogels used instead of pure chemicals?* – water is a cheap, safe additive to products that increase its volume.

Suggested Improvements / Student Challenge

- *Estimate volumes* – students could estimate the volume of the starting of hair gel in addition to estimating the volume of water released.
- *Investigate alternatives to salt* – students could investigate alternative additives to investigate if they can displace the water better or worse than salt (e.g. sugar; this won't work anywhere near as well because sugar is not attracted to the polymer chain)
- *Investigate experiment variables* – students could investigate the effect the amount of salt has on the rate of water loss, etc.

Clean up and Waste Disposal

No specific waste protocols are required for this experiment; all the waste can be either washed down the sink or disposed of in a bin.

Spillages can be cleaned with soapy water and paper towel.