Salt Names

Introduction

Dissolving is the act of a solvent breaking up a solid (crystal). Each solvent has a maximum amount of a substance it can dissolve, at this point the solution is saturated. If it exceeds this the substance precipitates or crystallises out of the solution. Participants will be using a super-saturated solution of saltwater to paint with. As the water evaporates, the solution becomes more saturated and the salt crystallises out to display the painted shape.

Set up

Boil the kettle and pour the boiling water into a pot. Add salt until no more dissolves (start with around 4 g per 10 mL of water) and then carefully pour the liquid into a second pot, making sure you don't let any of the remaining salt carry over. Set up a 'painting' station.

Equipment and consumables:

- Paintbrushes
- Pots (beakers work fine but non spill paint pots are recommended, particularly with younger age groups)
- Kettle
- Hair dryer(s)
- Clothes pegs
- Black card approx. 1/3 A4 sheet per child plus a few spares
- Salt
- Water
- Kitchen towel or similar for spills

Activity instructions

1. Participants need to paint their name (or another design) onto black card using the concentrated salt solution. They should apply 2 or 3 coats of the solution to their lettering.
2. Participants should attach a clothes peg to each end of the card to be held onto while the card is being dried. This is to avoid burns by keeping fingers out of the way of the hot air.
3. Cards should be dried using the hair dryer. We have found we get the best results by drying from underneath the card, as this gives the participants a clear view of the crystallisation and also prevents spread of the salt solution

Discussion Points

- Where is the salt coming from? Where has the water gone? Discuss evaporation and the salt crystals growing from the solution.
- How might we grow bigger crystals of salt?
- What do they think the salt crystals look like are they all the same?
- You can leave the remaining water in an open jar on a windowsill to slowly evaporate to grow large salt crystals.

Contact us

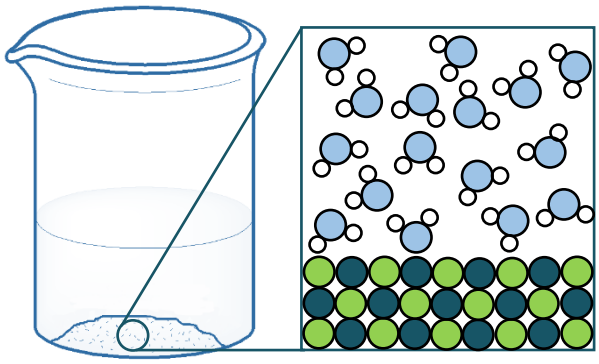
We would love to see how you got on with the activity! Please share any feedback or pictures with us at info@ncs.ac.uk with "SOTSEF 2020" in the subject line or tweet us @UK_NCS using #SOTSEF.

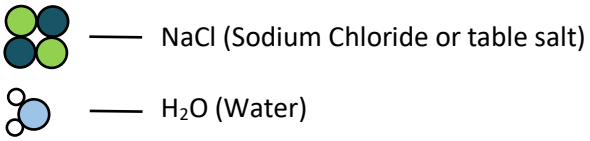
Salt Names – Explanation

Each of these further discussions points is to help teach a little more around the topic that the activity is based on. To help select appropriate discussion points these have been colour coded:

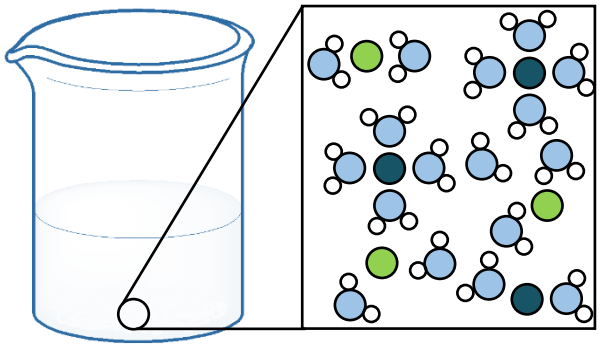
Beginner | Intermediate | Advanced

Dissolving and Precipitation





Salt (NaCl) is made up of sodium (Na) and chlorine (Cl) atoms. These pack together tightly to form a solid crystal. When the salt is initially placed in the water it sits at the bottom of the water in this crystalline form. Molecules of water (H_2O) begin to interact with the surface of the crystals. You can try repainting over your dried artwork. Can you see the salt dissolving again? What does it look like if you evaporate the water again?

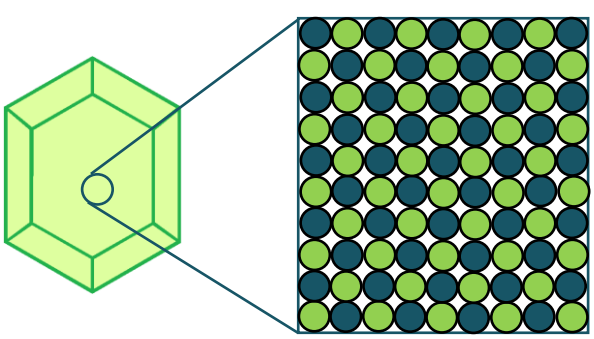


Stirring and heating the mixture allows more of the water to interact with the salt breaking up the crystal into smaller parts, this process is called ‘dissolving’. As the water cools or evaporates the solution becomes more concentrated with salt. At a certain point the water can no longer hold all that salt and the salt ‘precipitates’ or comes back out of the water as a solid. This process is called precipitation.

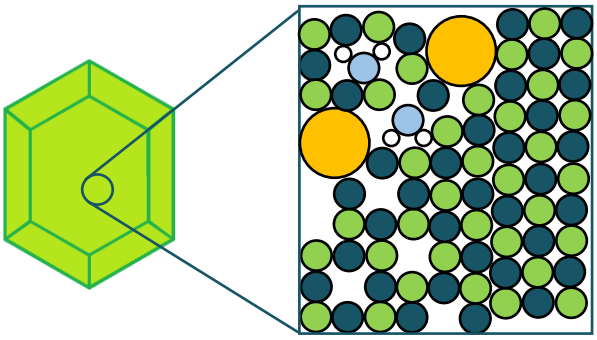
Crystallisation

When precipitation occurs slowly materials can form crystals, this process is called ‘crystallisation’. Scientists use crystallisation to clean up or purify products and crystals can be useful for analysis. If a solution precipitates out too quickly defects in the crystals can form, this makes a ‘disordered crystal’.

Below is an example of a nicely ordered crystal on the left and a disordered crystal on the right.



An ordered (perfect) crystal



A disordered (imperfect) crystal

The atoms on the left are neatly packed in a regular order. This happens when solutions are allowed to crystallise slowly. We crystallise materials by cooling hot solutions, slowly evaporating solutions or adding an ‘antisolvent’ which is a solvent which less readily dissolves our material.

On the right is an example of a disordered crystal. Disorder happens when a material is precipitated too quickly. This can happen if a hot solution is cooled too quickly, if there was powder in the solution already, if there are a lot of impurities in the solution or some other reason. There are a few types of disorder shown here. Water, or other impurities shown by the large orange atoms, can become trapped in the crystal. Holes can appear as shown in the bottom left. Two crystals can grow together, as shown on the right where the two don’t quite match up. These defects can impact the purity but also the size, shape and colour of a crystal. Using this information think about how you could grow larger and clearer salt crystals.

Risk Assessment –

The risks for this activity are listed below and are taken at your own risk. Ensure the activity is undertaken under the supervision of a responsible adult. If you are running this activity as part of an organised group a full risk assessment can be found at – http://learn.crystallography.org.uk/downloads/

Kettle – Electrical hazard

Electrical leads – Trip hazard

Hot water – Burns and scalds

Hair drier – Burns

NaCl (table salt) – Irritant