



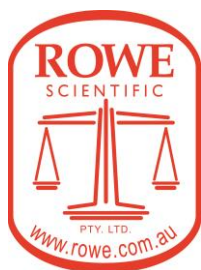
**Prize Winner**

# **Crystal Investigation**

## **Year 5-6**

**Venuki Kodithuwakku**

**Mawson Lakes School**



**Oliphant Science Awards 2023**

**Crystal Investigation**

**5-6**

**Mawson Lakes School**

# **THE EFFECT OF SODIUM CHLORIDE ON CRYSTAL GROWTH**

**Venuki Kodithuwakku**

## Introduction

In 2022, I grew some prize-winning crystals (composed of Aluminium Potassium Sulphate Dodecahydrate) which had two hypotheses:

- I. Growing crystals in different water types can change a crystal's size, clarity, appearance, or colour because of the different mineral concentrations in each water source.
- II. The saltwater crystal will be bigger than the Tap and Distilled water crystals as it has extra iron from the salt.

For the experiment, I used three different water sources; salt water (using table salt), distilled water and tap water. I then realised that a different mineral concentration *did* change a crystal's characteristics.

So, then I decided to investigate that in a deeper hypothesis, aiming for better clarity. Last year, the saltwater one had the best clarity so instead of salt, I decided to use sodium chloride, the purer form of salt.

## Hypothesis

- I. Sodium chloride has an effect on the crystal's clarity.
- II. Sodium chloride has an effect on the crystal's size.
- III. The *amount* of sodium chloride has an effect on the crystal's overall size and clarity.


## MATERIALS

1. Aluminium Potassium Sulphate Dodecahydrate
2. For glass beakers
3. Fishing line
4. A plastic container (to grow the seed crystals in)
5. A spoon
6. A kitchen scale
7. Four black plastic sticks
8. Permanent marker
9. A notebook (as a hard copy logbook)
10. A kitchen stove (to heat up the liquid)
11. Tissue
12. Black paper
13. Plastic

\*Please note that overall, you will need **≈400g of Alum** powder altogether, **≈100g of sodium chloride** and about **2.5L of distilled water** (this is just for you to get an idea of the required amount of ingredients to prevent future delays).

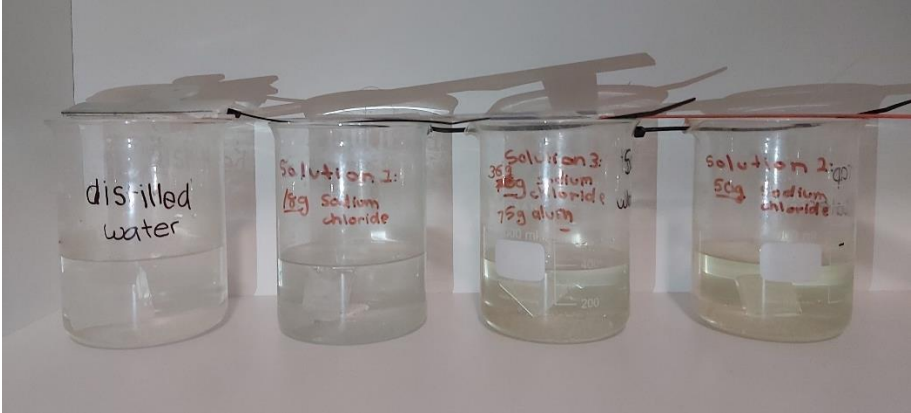


## Logbook

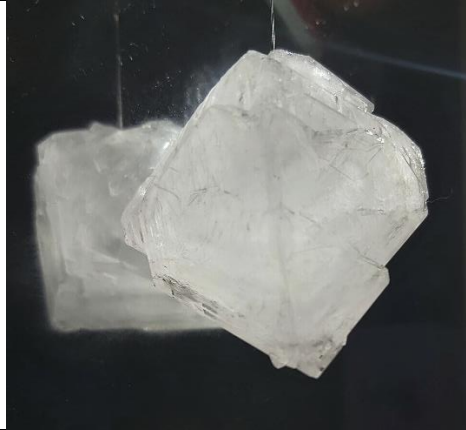

Date		
DAY 1: 18.04.2023	<b>Seed Crystal Preparation</b>	<p>Measured 500 ml of distilled water into a glass beaker and added 65 g of Alum.</p> <p>Stirred with a spoon and heated the glass beaker while stirring to dissolve the remaining Alum.</p> <p>Let it cool. Then, poured the solution into a shallow plastic container to grow.</p>
DAY 4: 21.04.2023	<b>Observation</b>	<ul style="list-style-type: none"> <li>- lots of small crystals, a few have merged together to form clumps</li> <li>- still, there are small Alum particles</li> <li>- water temperature: VERY COOL, might heat it soon</li> <li>- majority of the crystals are transparent</li> </ul> <p>AIM: to get symmetrical and clear seed crystals</p>
DAY 20: 07.05.2023	<b>Picked seed crystals</b>	<p>Selected 4 of the best seed crystals and carefully removed them. Put them on a paper towel to soak all the excess water that could cause unwanted crystal growth. Also allocated them their solutions and labelled them with a piece of paper. I let them be overnight.</p>  <p>The 3 sodium chloride crystals</p>
DAY 21 08.05.2023	<b>Measurements</b>	<p>Got the 4 seed crystals that were on the paper towel. Took some scales and measured each crystals' weight.</p> <p><b>MEDIAN crystal:</b> 1.05 g</p> <p><b>Solution 1 crystal:</b> 0.93 g</p> <p><b>Solution 2 crystal:</b> 1.10 g</p> <p><b>Solution 3 crystal:</b> 1.00 g</p> <p>Also got my fishing line and tied the crystals to them as well, leaving a &gt;10cm remaining line.</p>
DAY 22: 09.05.2023	<b>Saturation Levels</b>	<p>To find the saturation levels. Got a beaker and filled it with 100ml of distilled water. Starting with 5 g of Sodium Chloride, I added a gram each time while stirring to see if all the Sodium Chloride would dissolve without the stove.</p> <p>Conclusion: Saturation levels are <b>21 g/100ml</b></p>

<p>DAY 23: 10.05.2023</p> <p>Crystal Growing Day 1</p>	<p><b>Crystal Growing Preparation</b></p>	<p>Prepare 4 glass beakers and pour 500ml of distilled water into each of them. Got my Alum bottle and sodium chloride bottle, scales and spoon and measured the following:</p> <p><b>Solution (Median):</b> (MEDIAN): 75 g Alum, 0 g sodium chloride  <b>Solution 1:</b> 75 g Alum, 18 g sodium chloride  <b>Solution 2:</b> 75 g Alum, 36 g sodium chloride  <b>Solution 3:</b> 75 g alum, 50 g sodium chloride</p> <p>(Sodium chloride amounts were selected based on:  18 g in 500 ml is equivalent to seawater salt concentration, 36 g is double of that and 50 g is the last year's experimented amount)</p> <div> </div> <p>Solutions 3/4 were super saturated; therefore, put them on stove while stirring with a spoon to fully dissolve the remaining. I let them cool before taking all 4 to grow in my room.</p> <p>After a few hours, I got the 4 crystals and put them into their allocated beaker using a plastic stick. (<i>OPTIONAL</i>) Labelled each beaker and marked the water level. I then let them grow.</p>
<p>DAY 35 22.05.2023</p> <p>Crystal Growing Day 13</p>	<p><b>Observation</b></p>	<p><b>Median:</b>  CRYSTAL: very big, poor clarity, uneven faces  WATER: clear, little or no evaporation  <b>Solution 1:</b>  CRYSTAL: medium size, very clear, smooth and even faces  WATER: clear, little (yet evident) evaporation  <b>Solution 2:</b>  CRYSTAL: moderate-sized crystal but extremely clear  WATER: little or no evaporation, clear water is a little yellow (probably because of the sodium chloride)</p>



		<b>Solution 3:</b> CRYSTAL: small crystal, best clarity, crystalline clear WATER: More yellow yet clear water, evaporation not evident
DAY 37 24.05.2023 Crystal Growing Day 15	<b>Heated Solution</b>	First, took all 4 crystals out of their beakers and let them dry on a paper towel. Heated all 4 beakers on stove, while stirring with spoon, then letting them cool down afterwards. Put back the crystals to the cool solutions.
DAY 40 27.05.2023 Crystal Growing Day 18	<b>Weight Taking</b>	Took the weight of the crystals using the scales: <b>Median:</b> 14 g <b>Solution 1:</b> 5 g <b>Solution 2:</b> 3 g <b>Solution 3:</b> 2 g
DAY 48 04.06.2023 Crystal Growing Day 26	<b>Observation</b>	<b>Median:</b> CRYSTAL: extremely large, obscure crystals with no uneven nor smooth faces, not an octahedron WATER: clear, has lost 90ml of water already <b>Solution 1:</b> CRYSTAL: cloudy with little clarity crystal with more than 8 faces WATER: clearly a lot of evaporation (cannot determine) <b>Solution 2:</b> CRYSTAL: very small with the best clarity (very clear), flattened corners but smooth faces WATER: evident yet the least evaporation <b>Solution 3:</b> CRYSTAL: clarity good however there is some obscurity, smallest crystal and closest to an octahedron WATER: <50ml of water evaporation
DAY 62 18.06.2023 Crystal Growing Day 40	<b>Heated Solution</b>	Took all 4 crystals out and separately put all 4 beakers on the stove to heat up solution. Then, let to cool before placing the crystal back in.

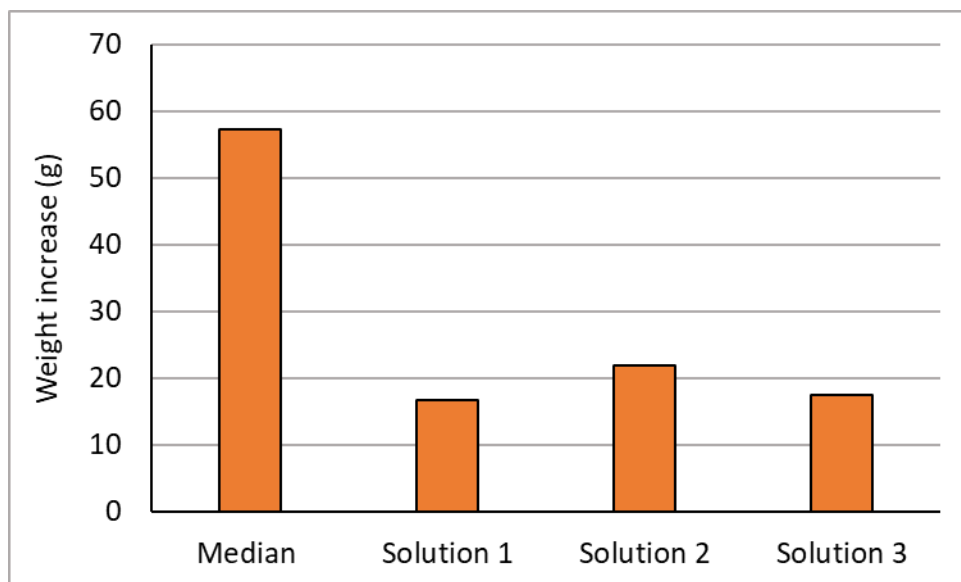
<p>DAY 100 26.07.2023 Crystal Growing Day 78</p>	<p><b>End Crystal Growing</b></p>	<p>Today, ended the project. Took photos, weight and observations and also concluded the hypothesis.</p>  <p>End Crystals</p>
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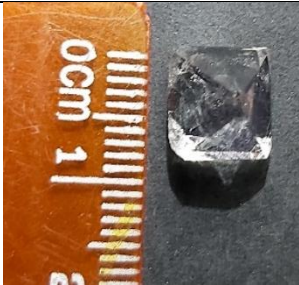
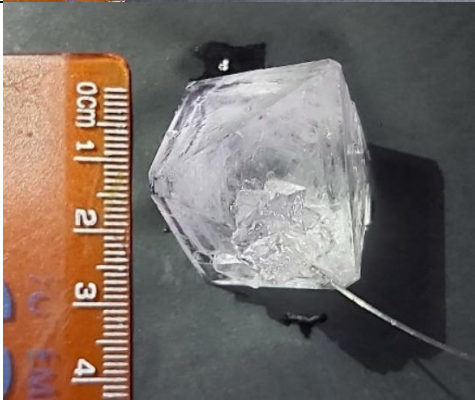
## Results

Crystal	Picture	Features
<b>Median</b>		<p><b>SOLUTION:</b> 500ml Distilled Water, 75g Alum powder, 0g Sodium Chloride</p> <p><b>WEIGHT:</b> Starting Weight: 1.05g End Weight: 58.35g</p> <p><b>CLARITY:</b> Very obscure, barely transparent</p> <p><b>SIZE:</b> Very big</p> <p><b>OBSERVATIONS:</b></p> <ul style="list-style-type: none"> <li>- Irregular shape</li> <li>- Not smooth sides</li> <li>- Not an octahedron</li> <li>- Uneven faces</li> </ul>
<b>Solution 1</b>		<p><b>SOLUTION:</b> 500ml Distilled Water, 75g Alum powder, 18g Sodium Chloride</p> <p><b>WEIGHT:</b> Starting Weight: 0.93g End Weight: 17.67g</p> <p><b>CLARITY:</b> Average. Very cloudy, little transparency shown</p> <p><b>SIZE:</b> Quite large.</p> <p><b>OBSERVATIONS:</b></p> <ul style="list-style-type: none"> <li>- Small crystals growing on the big crystal</li> <li>- Smooth edges and even faces</li> <li>- Octahedron</li> </ul>



<b>Solution 2</b>		<p><b>SOLUTION:</b> 500ml Distilled Water, 75g Alum powder, 36g Sodium Chloride</p> <p><b>WEIGHT:</b> Starting Weight: 1.10g End Weight: 22.94g</p> <p><b>CLARITY:</b> Moderate. Very cloudy, with little clarity</p> <p><b>SIZE:</b> Third largest but overall moderately large</p> <p><b>OBSERVATIONS:</b></p> <ul style="list-style-type: none"> <li>- Crystals growing on the big crystal</li> <li>- Smooth sides and even faces</li> <li>- Octahedron</li> <li>- Some flattened corners</li> </ul>
<b>Solution 3</b>		<p><b>SOLUTION:</b> 500ml Distilled Water, 75g Alum powder, 50g Sodium Chloride</p> <p><b>WEIGHT:</b> Starting Weight: 1.00g End Weight: 17.55g</p> <p><b>CLARITY:</b> Best clarity yet moderate clarity</p> <p><b>SIZE:</b> Smallest size but expected size</p> <p><b>OBSERVATIONS:</b></p> <ul style="list-style-type: none"> <li>- Crystals growing on big crystal</li> <li>- Smooth sides and even faces</li> <li>- Octahedron</li> <li>- Some curved corners</li> </ul>



Solution	Start	End
Median		
Solution 1		

Solution 1		
Solution 1		

## Conclusion:

After conducting the experiment, I can conclude that:

- I. Sodium chloride *does* have an effect on the crystal's clarity.
- II. Sodium chloride *does* have an effect on the crystal's size.
- III. The amount of sodium chloride *does not* have an effect on the crystal's overall size and clarity.

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5-6

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