



Prize Winner

Crystal Investigation

Year 9-10

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Crystal Investigation

Logbook

Oliphant Science Awards



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1. Introduction

This logbook reports findings of a crystal growing experiment. The experiment was conducted over a period of 6 weeks.

2. Question

Does increasing the ratio of alum in the mixture make the crystal grow faster?

3. Variables

This experiment works with following variables.

- a. Independent Variable
 - Amount of alum
- b. Dependent Variable
 - Growth of alum crystal
- c. Controlled Variables
 - Same deionised water
 - Same size of beaker
 - Same purity of alum
 - Same dark, dry, and noiseless environment

4. Hypothesis

“Increasing the ratio of alum in water helps it to grow faster but has a negative effect on its clarity”.

5. Materials Required

- a. Alum powder
- b. Deionised water
- c. 2x Beakers
- d. Kettle to boil water
- e. Weighing scale
- f. Filters
- g. Fishing line
- h. Pop sticks
- i. Thermometer

6. Method

I bought alum from an Asian grocery and deionised water from Woolworths. I used a coffee grinder to grind alum and convert it into powder form. I measured a cup of with 100 grams of alum powder and put it aside for my experiment. I then boiled 700 ml of deionised water in a kettle. Once the water was boiled, I poured it into a flat bottom glass bowl, added the alum powder, and stirred it till all of the alum was dissolved and the mixture was clear. Once the mixture cooled down, I put it in a noise free dark cabinet for about 18 hours. When I took the dish out there were many small crystals at the bottom. I used plastic tweezers to pick some good ones out and placed them on a paper towel to dry. I chose some good seed crystal and tied them to a thin fishing line. On the other end of the line I tied a pop stick. From the alum powder, I took 300 grams and divided them in two cups of 100 and 200 grams each. I then boiled 1.5 litres of deionised water in a kettle. Once the water was boiled, I poured 700 ml each into two beakers, which I had labelled as A and B. I then poured 100 grams of alum powder in beaker A and 200 grams in beaker B. I stirred both the beakers, till the time all the powder was dissolved and the mixture was clear. I let both the beakers cool down, at which time I filtered both the mixtures and poured them back in the beakers. I then dipped one seed crystal in each of these beakers. I covered them with cardboard pieces, because I followed 'slow evaporation with suspended method' to grow crystals. I placed both the crystals in a cool, dark, and noise free place over the next six weeks. I checked on the mixture every week and recorded my observations. Each week I checked atmospheric temperature, size and shape of crystal, and level of mixture in the beaker.

7. Final Result

A



Size: 22.3 mm
Weight: 7 grams (Approx.)

B



Size: 26.2 mm
Weight: 10.2 grams

8. Discussion

This experiment was carried out in relatively cooler month; therefore the environmental conditions did not change much. The temperature fluctuated between 5 °C to 20 °C. Both of the crystal growing beakers were placed away from living area, so that they were not affected by heating or other factors like light etc. that affect crystal growth.

I Only ran this experiment for six weeks because by that time my hypothesis was proved. If I had performed this experiment for a longer duration of time, I would have been able to grow much bigger crystals. In in this experiment, it became clear that with a higher alum to water ratio, the mixture runs the risk of being oversaturated. It is the same reason which was creating problems in the first two days. The over saturation of mixture was growing clumps of crystals on the fishing line. Once a thick layer of crystal form at the bottom of the beaker, the mixture attained right level of situation. The mixture still had more alum than the other mixture. After these initial hiccups, both the crystals grew well. Crystal that grew in 100 grammes solution grew slower than the one in 200 grams alums solution. At the same time, it has smooth faces, clear edges, and has better clarity. Whereas the crystal that grew in 200 grams alum solution grew faster and ended up heavier, but with rougher faces, milky composition, and developed a lot more occlusions than the other crystal.

The experiment thus proves the hypothesis that,

“Increasing the ratio of alum in water helps it to grow faster but has a negative effect on its clarity”.

Weekly Logs

Week 1 – ending July 4, 2021

Current Temperature: 11.8 °C

Crystals Characteristics

A



B



Size

A

8.2 mm

B

12.1 mm

Summary Comments

The start to this experiment hasn't been smooth sailing. In the first couple of days the beaker with 200 grammes of alum had a lot of problems. It was continuously developing clumps of crystallised alum on the fishing line, which I crushed with pliers. In addition the seed crystal went all milky and although it was growing at a massive scale, there was no structure or clarity to it. So I took it out and replaced it with another seed crystal. In about 16 hours the same story was repeated. So, I had no choice but to replace it with yet another seed crystal. By this time there was a thick layer of alum at the bottom of the beaker, which suggested that a lot of alum had deposited there. However, this time the seed crystal did not gain mass or grow out of proportion. So, I let it be. Crystal A, which grill in the mixture with 100 grammes of alum did not have any such problems. In terms of shape, both the crystals have started to develop on both sides. On account of clarity, crystal A is clear whereas crystal B is milky.

Week 2 – ending July 11, 2021

Current Temperature: 16.4 °C

Crystals Characteristics

A



B



Size

A

12.6 mm

B

16.8 mm

Summary Comments

Things have established this week. Both the crystals have grown in mass and length. Crystal B is more milky than crystal A. The thick layer of alum at the bottom of beaker B has appeared to settle and I did not see much difference in its size. The mixture volume in both the beakers is low, though not too much.

Week 3 – ending July 18, 2021

Current Temperature: 14.7 °C

Crystals Characteristics

A



B



Size

A

14.3 mm

B

18.7 mm

Summary Comments

Both the crystals have grown steadily. A few crystals appeared on the line in beaker A, but I just crushed them. Beaker did not have any problems.

Week 4 – ending July 25, 2021

Current Temperature: 17.3 °C

Crystals Characteristics

A



B



Size

A

16.3 mm

B

20.5 mm

Summary Comments

There is no significant change from the last week. Both the crystals have grown with their own pace. It is clear that crystal a is growing slower than crystal B, which is not only increasing in size but is also declining in clarity and quality. The only intervention that I made was to clear off some of the blackish brown stuff from both the bakets. I'm not sure if it was fungus. Nevertheless, I filtered both the solutions and put the crystals back in.

Week 5 – ending August 1, 2021

Current Temperature: 13.5 °C

Crystals Characteristics

A



B



Size

A

20.7 mm

B

24.2 mm

Summary Comments

There is no change in the pace of growth of both the Christians. If there is no change, I am planning to terminate the experiment at the end of next week.

Week 6 – ending August 8, 2021

Current Temperature: 111.9 °C

Crystals Characteristics

A



B



Size

A

22.3 mm

B

26.2 mm

Summary Comments

Since the hypothesis has already been proved, I have decided to finish the experiment.

Acknowledgments

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