

## Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Investigation)  
(Word Limit: 1,600 words, Pages: 3 pages only)

**Team Number: JBBC093**

**Project title: “Microplastic Collection Through Coagulation” Proposal**

**Project Type: Investigation**

*To our best knowledge, there are / are no \*similar works in the field; (if there are, ) related research links are as below:*

**The enhancement our project made / the difference with related research are:**

*\*Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

### **I. Background**

- Microplastics are a large problem in oceans. There are two types of sources: primary and secondary sources. The primary sources are tiny particles designed for commercial use, such as personal care products, plastic pellets, marine coatings, etc. The secondary sources are enormous plastic items like plastic bottles and fishing nets. Plastic bottles are biodegradable, they can degrade for 350-600 years into small plastic pieces under long exposure of ultraviolet, air and seawater. With 14 million tons of plastics released into the sea every year, the impact of plastics is very disastrous and damageable.
- These tiny pieces of plastic do much harm to the environment. Fish may mistakenly think of microplastics as food, which may result in an accumulation of microplastics in their tissues. If the fish is eaten, we will be self-inflicted by our pollution! Our microplastics will accumulate in our bodies. These microplastics are not a nuisance to us, as we can expel them from our bodies naturally, and they can also be carriers of deadly diseases and heavy metals. Approximately 0-2.2g of microplastics are in healthy tissues, which might carry germs, viruses, and heavy metals. The effect of microplastics on human health is currently unknown. But as these small particles are harmful to our environment, we shouldn't do cutthroat actions toward the ocean.

### **II. Objectives**

- To find out the best coagulant and the amount of coagulant required to get the highest efficiency rate.

### **III. Hypothesis**

### **IV. Methodology**

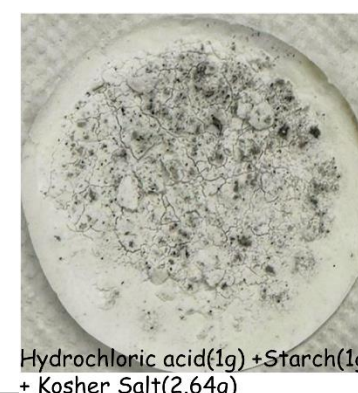
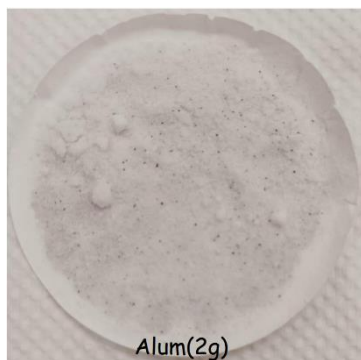
#### **Materials used.**

- Filter Paper
- Deep Cleansing Facial Wash
- Ethanol
- Kosher Salt
- Aluminum Potassium Sulphate

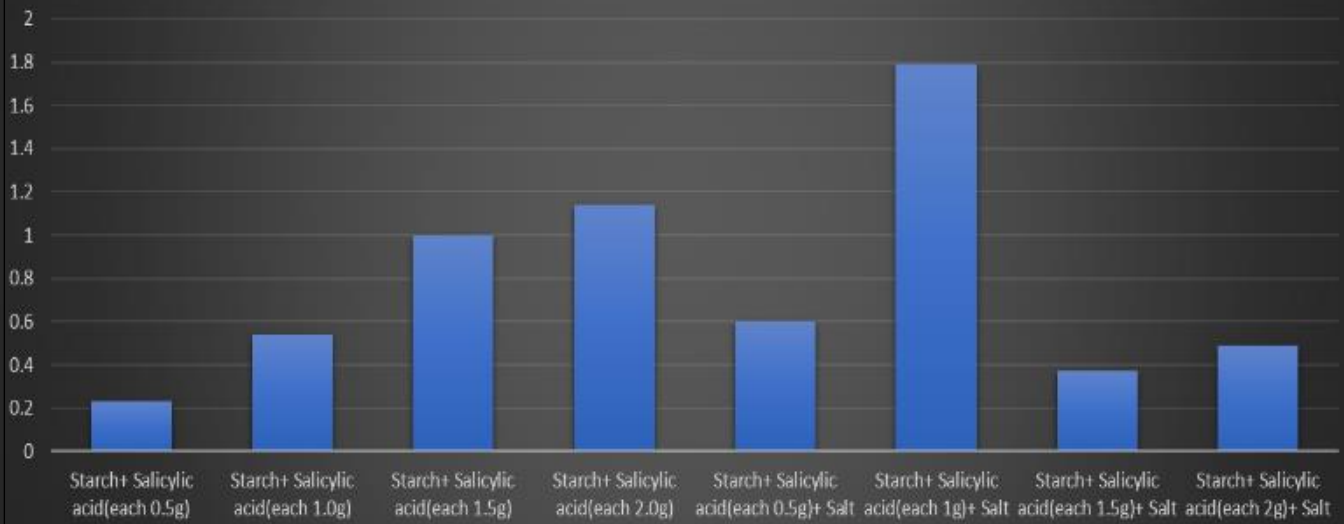
- Starch
- Salicylic Acid
- Hydrochloric Acid Solution
  
- Experiment 1: Study how many grams of alum is better for microplastic coagulation and the difference between water with salt and water without salt
- Experiment 2: Study how many grams of starch and salicylic acid is better for microplastic coagulation and the difference between water with salt and water without salt
- Experiment 3: Study how many grams of starch and hydrochloric acid is better for microplastic coagulation and the difference between water with salt and water without salt.

## V. Result

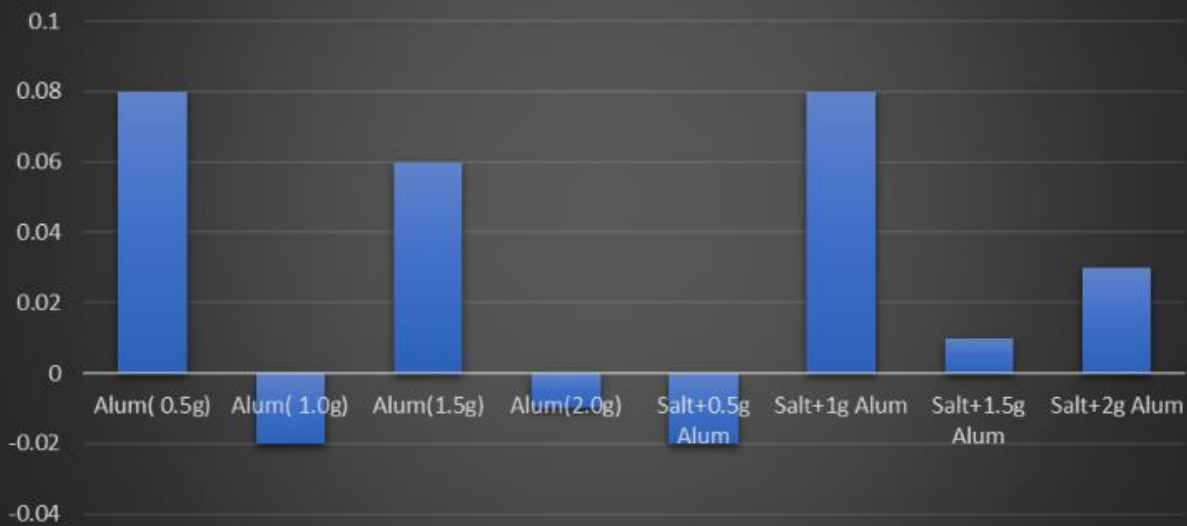
- In the experiment, we use various chemical compounds to test the weight of microplastics that they can successfully coagulate.
- About the result of the experiment using alum: The result is full of fluctuations with no actual pattern. The coagulation ability of alum has slight decline from alum(1.5 g) and salt(2.64g)+ alum(0.5 g) There are two optimum amount in this experiment: 0.5 g(without salt) and 1 g(with salt).
- About the result of the experiment using starch and salicylic acid( both using the same amount): The result shows a continued gradual increase in the microplastics that can be collected when the amount of starch and salicylic acid use also increases. When we use starch, and salicylic acid with kosher salt, it can't give a positive insight to us. In this experiment, we found that adding 2.64 g of salt inside the combination of starch and salicylic acid is the best for microplastic elimination.
- About the result in the experiment using the hydrochloric acid solution: If we use 1 to 2 g of hydrochloric acid in the microplastic coagulation in foam, the experimental result is quite good. For the experiment using hydrochloric acid, starch and salt together, the more coagulants we used, the more it coagulated. It can support our hypothesis.
- The limitations: There are some negligent errors and random errors in the experiment. For example, there maybe a few coagulants and microplastics left in the Buchner funnel and porous plate that has washed to the side of the moistened filter paper.
- Photos as your references



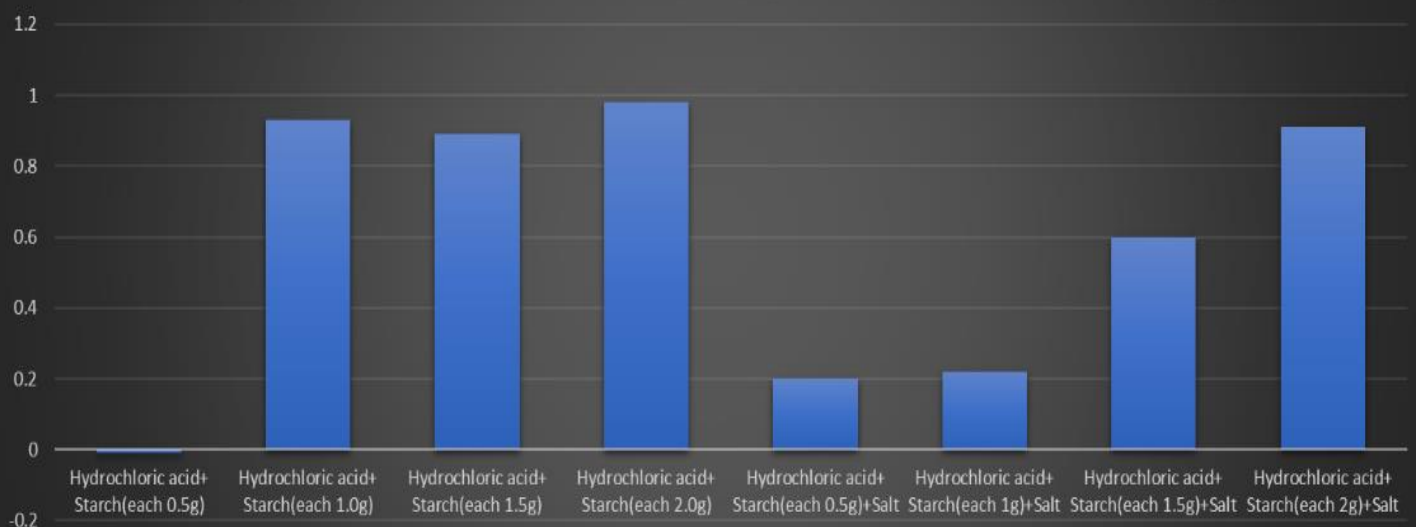
Display of the Result of the Final Weight of the Second Experiment(g)



Display of the Result of the Final Weight of First Experiment(g)



Display of the Result of the Final Weight of the Third Experiment(g)



## VI. Conclusion

Average weight of 1 <sup>st</sup> experiment	Average weight of 2 <sup>nd</sup> experiment	Average weight of 3 <sup>rd</sup> experiment
0.02625g(26.25 mg)	0.77 g( 770 mg)	0.59 g( 590 mg)

- Our experiment aims to discover the best coagulant and the coagulant amount we should use. The average final weight of the experiment using alum is 0.02625g, the average final weight of the experiment using starch and salicylic acid is 0.77g, and the average final weight of the experiment using hydrochloric acid and starch experiment is 0.59g. Through experiment 1, we discovered that adding salt has no direct effect on the experimental result. If we use alum as a coagulant, it is not good for the coagulation of microplastics. Through our 2<sup>nd</sup> experiment using starch and salicylic acid, we discovered that adding starch has a considerably high efficiency of microplastic coagulation, so the final weight of microplastic removal through coagulation is heavier. Without adding salt, the result has illustrated an apparent positive correlation. When the amount of starch is larger, the microplastics that can collect are heavier in weight. With 2.64 g of kitchen salt, the combination of salt and starch and salicylic( each 1 g) has recorded the heaviest weight. Through experiment 3, we discovered that adding hydrochloric acid and starch( each 2 g) can coagulate the most. According to the results we measured, we have a conclusion that starch and salicylic acid are very effective coagulants for microplastics.

- Our project is developed based on previous project and the enhancement is below:

