

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Investigation)

(Word Limit: 1,600 words, Pages: 3 pages only)

Team Number:

Project Title:

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

- Provide background information of project and/or state the problem to tackle
- Provide highlights of the **literature review** with the support of pertinent and reliable references
- Provide an overview of work and mention the **research gap that the project is trying to fill**

Defoamers are widely used in many industries such as manufacture of paints and coatings, paper, detergents and even food.[1] The bubbles formed could seriously hinder the production process and hence the use of defoamer is crucial to maintain an efficient production process. Chemicals such as organic silicone defoamers and polyether defoamers are commonly used in the industries. In our project, rather than using artificial chemicals, we ~~hope to~~ look for readily accessible items to be natural defoaming agents for the industrial processes.

Scientific background

Mechanism of bubble breaking [2]

One of the most well understood mechanisms for breaking bubbles is by stretching and bridging. The defoaming agent with lower surface tension is pulled across the film of foam by Marangoni effect. The defoaming agent, which is hydrophobic, then stretches and causes the ruptures of bubbles.

II. Objectives

- State the **aim(s)** of project
To investigate natural defoamer which is effective.

III. Hypothesis

- Propose an explanation for a phenomenon and stating how the **hypothesis** can be tested by experiments

The substances with the following properties would be more effective.

1. They should have good diffusion ability into the foam.
2. They should have a lower surface tension than the foam.
3. The surfactants can be dispersed in the foam, but not completely soluble in the foam.

IV. Methodology

- List out the materials used
- Describe the **experimental protocol** including the set-up of **control experiment** (if any), **repeated experiment** (if any), and its scientific theory
- Indicate with the support of reasons, the **analysis** used in the investigation

Procedures:

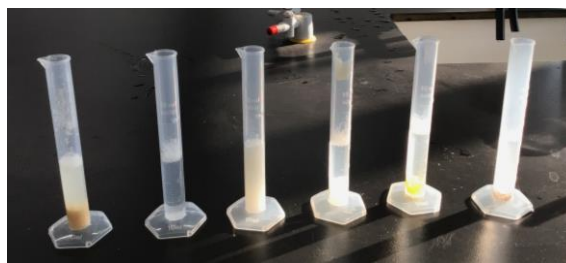
A. Preparation of liquid soap to form bubbles

1. 5 mL dishwashing detergent was mixed with 200 mL water.
2. The mixture was stirred with a glass rod for 10 times to create bubbles.

B. Experiment

1. Soap solution was transferred to the measuring cylinder.
2. The solution level of each measuring cylinder was 6 cm^3 and the thickness of the bubble was about 2 cm^3 .
3. The initial water level and bubble level were recorded.
4. Different substances were added to the measuring cylinders.
5. The solution and the substance were stirred for 10 times.
6. The final water level and bubble level were recorded.
7. The percentage change in the thickness of bubbles were calculated.

Photo of set-up:



V. Results

- Present the **data** with figures, tables or photos

- **Data analysis** (if any, with emphasis on data reliability and the reproducibility based on statistics)
- Interpret the results and its implication
- Discuss **limitation** and compare with existing related works (if any)
- Discuss the importance or impact of the research and how it is applicable to real problems

Results:

Substance	Control	boiled egg white	boiled egg yolk	egg shell	macaroni	corn skin	corn silk
Percentage decrease in bubble thickness	0 %	0 %	0 %	40.0%	50.0%	60.0%	50.0%

From the experimental results, egg shell, macaroni, corn skin and corn silk were shown effective in reducing the thickness of bubbles.

Further investigation:

Dishwashing detergent was used to simulate the processes to create bubbles. However, the natures of bubbles generated in different processes are different. Therefore, the above tests should be repeated with different types of bubbles forming process.

VI. If your team will compete the Sustainable Development Award, please indicate the specific sustainable development goal the project is related to, and provide justification for competing for this award. (Word limit: 300 words)

It reduces the use of chemicals for breaking bubbles.

VII. If your team will compete the Social Innovation Award, please list the target group or social issue the project focuses on, and provide justification for competing for this award. (Word limit: 300 words)

It uses innovative methods to break bubbles.

VIII. Conclusion

- Make a **data-driven** conclusion of the project and the way forward of the research
- Justify if the proposed project meets the objective(s)

Eggshell, macaroni, corn skin and corn silk are efficient natural defoamers.

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