Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Investigation)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: SBBC134

Project Title: CHITOSAN EXTRACTION FROM BLACK SOLDIER FLIES

Project Type: Investigation

To our best knowledge and after thorough literature research, as at 4/7/2022, there are no* similar works. If there are, the reference links are as below:

The enhancement our project has made for the existing related products or research is summarized as below:

***Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.**

I. Background

It is known that chitosan can be extracted from black soldier flies larvae's exoskeleton. Black soldier fly Larvae (BSFL) can be used to tackle food waste problem, their exoskeleton can be obtained when BSFL turned adult. Their exoskeleton is rich in chitin which can be converted into chitosan. Chitosan is a useful substance for numerous commercial and biomedical uses. The methods to extract chitosan from BSFL exoskeletons are already exist. However, their temperature to extract chitosan is very different from one another. The temperature to extract the highest degree of deacetylation of chitosan will be investigated.

II. Objectives

The aim of our project is to find out how well does the deacetylated BSF compare chitosan and find out the optimum temperature to obtain the highest degree of deacetylation.

III. Hypothesis

Higher temperature in deacetylation process produces chitosan with higher degree of deacetylation. Formaldehyde can be used to test the degree of deacetylation in chitosan since chitosan absorb formaldehyde through its amine group.

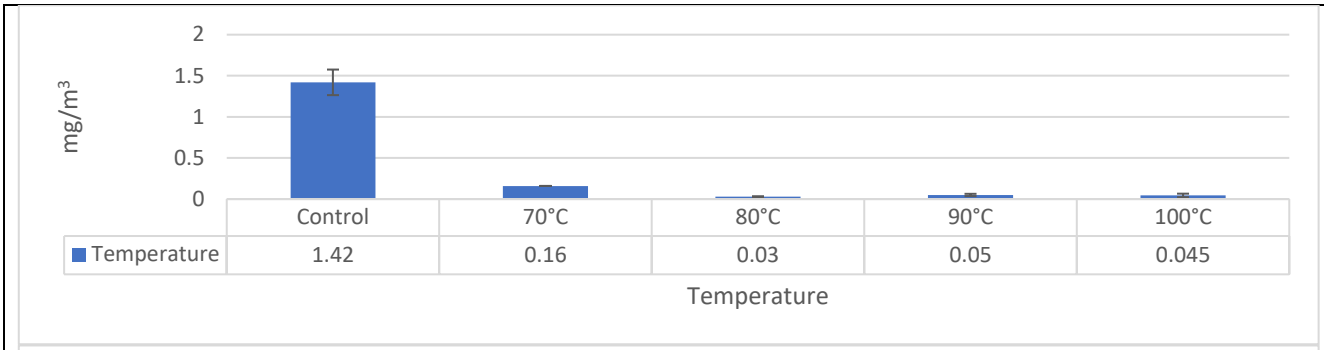
IV. Methodology

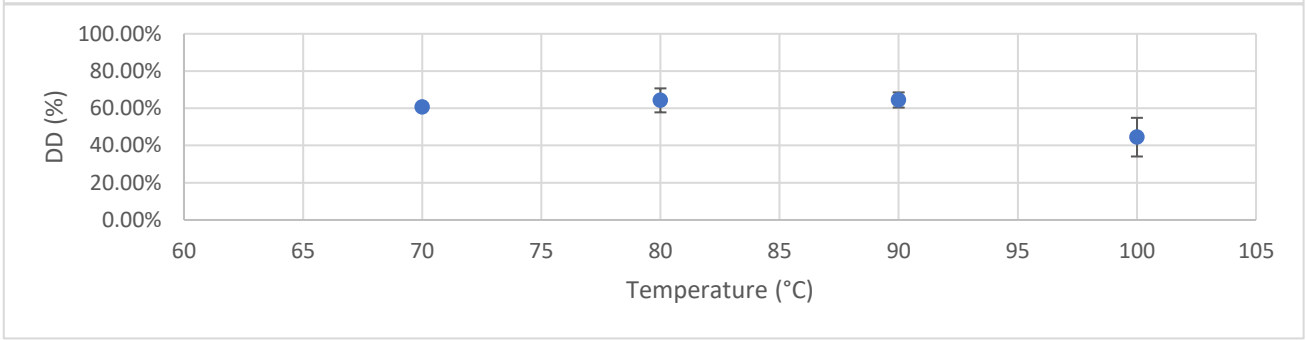
15g exoskeleton of black soldier flies, 100mL of HCl in 6M concentration are prepared. Exoskeleton of BSF is put into a beaker with 6M of HCl to demineralize and 400mL of water at room temperature. The demineralized exoskeleton of BSF is put into another beaker with 100 mL of NaOH in 12M of concentration at 70°C using a heater to deacetylate. 0.2g of chitosan extracted from the exoskeleton of BSF, chitosan gel, bleached chitosan extracted from the exoskeleton of BSF are prepared. They were put in an air-tight box for 48 hours in a fume cupboard respectively with 0.1mL 1:100 formaldehyde. The result was measured by 2 formaldehyde meters for 3 minutes.

0.3g black soldier fly (BSF) exoskeleton is put into a beaker with 150mL 2M HNO_3 at room temperature to demineralize. Then, they are filtered by a filter paper and dried. Dried demineralized BSF exoskeleton is then added to a beaker with 150mL 16.6M NaOH at 70°C, 80°C water bath, and 90°C, 100°C in oil

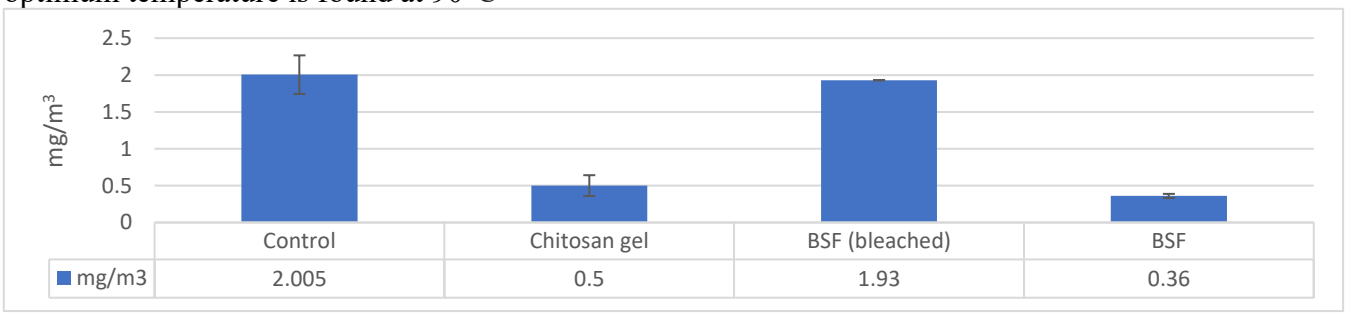
bath respectively for 6 hours. The products are washed with running water in a sieve to remove NaOH remain on the surface of BSF exoskeleton. The product is then analyzed by FTIR before being tested with formaldehyde test. 0.2g of the product produced by different deacetylation temperature is put into an air-tight container with 0.1mL 1:100 formaldehyde in a fume cupboard respectively for 48 hours. The result is measured by 2 formaldehyde meter for 3 minutes.

V. Results





A general trend is observed in the graph. The formaldehyde absorbed by the chitosan increase as higher the temperature they are produced. This implies that the degree of deacetylation is higher in the sample deacetylated in a higher temperature because they have more amine group to absorb formaldehyde. The optimum temperature is found at 90°C



Chitosan extracted from BSF performs similarly to chitosan gel, both show an ability to remove formaldehyde, removed more than 75% of formaldehyde.

VI. Conclusion

Deacetylated BSF performs similarly to chitosan gel and the optimum temperature for deacetylation is found at 90°C

☐ **Our project is developed based on our school's previous project and the enhancement is as below:**