Bio-Glitter from Green Mussel Shells

Inventors Kamolchat Thongkorn

Natchaphak Jaiphian

Pornmaysa Tatit

Panya Kaewrod

Kanthanachot Chotkanjanaruang

Saint Louis School Chachoengsao; THAILAND

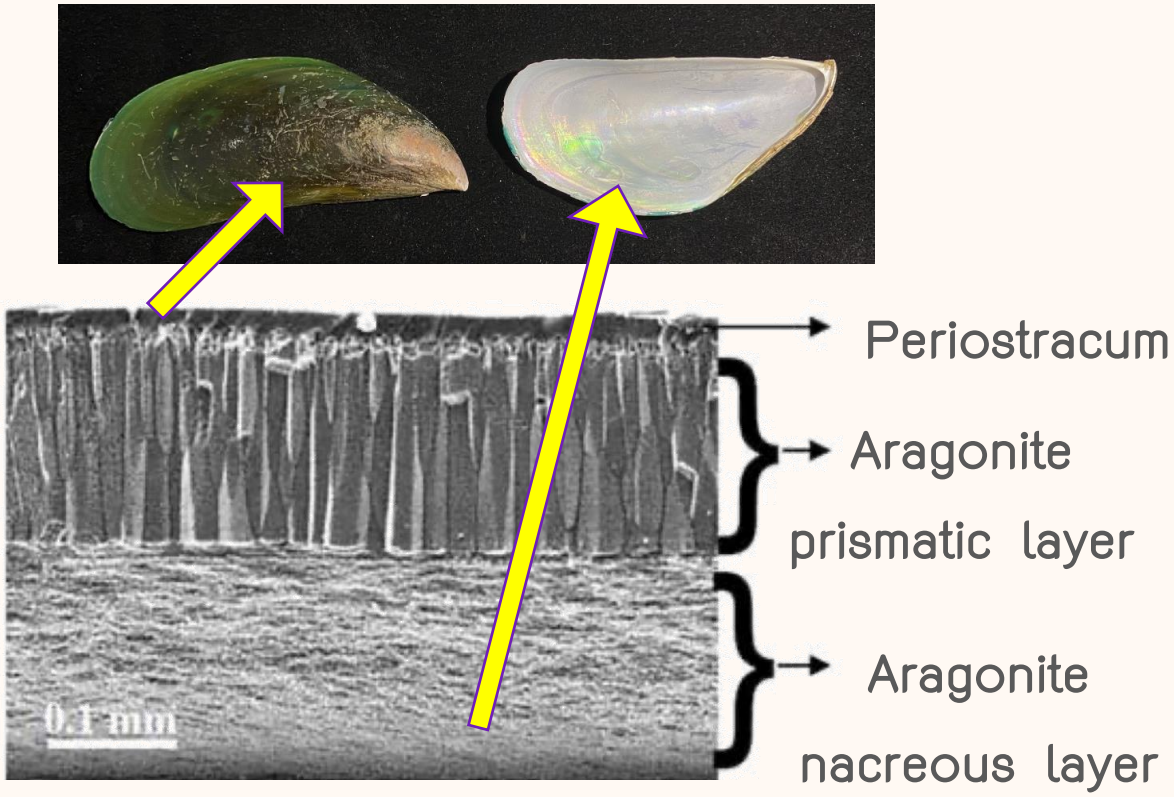
State of Problems

- More than 100,000 tons of green mussel shells become the waste
- Releasing environmental pollution; CO_2, rotten smell, germ propagation

State of Problems

- The green mussel shell consists of inorganic minerals and organic compound.
- Most mineral are calcium carbonate crystals.

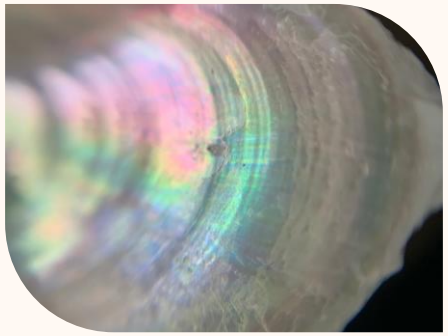
Green mussel shells composition

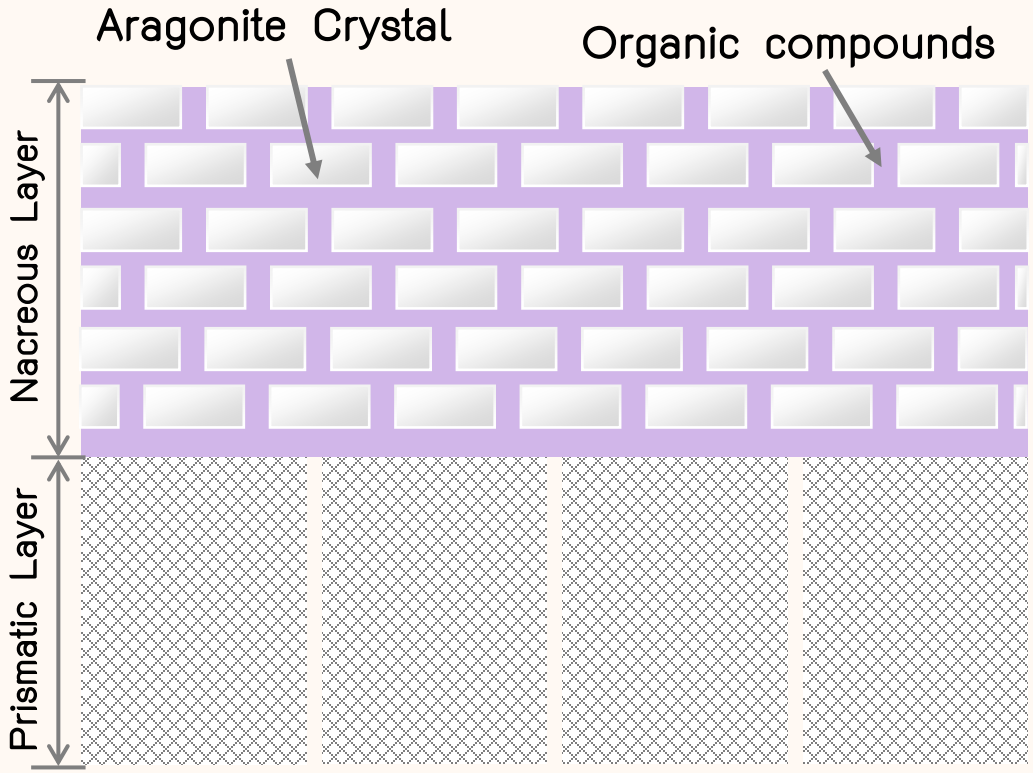


3 layers of green mussel shells

- Periostracum; the outer layer
- Prismatic layer; middle layer
- Nacreous layer

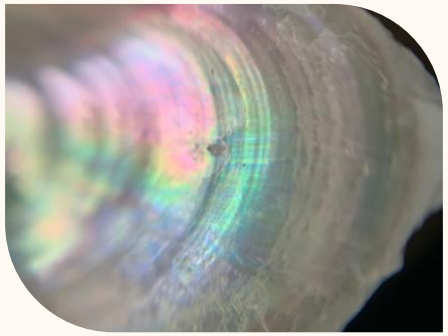
Nacreous layer

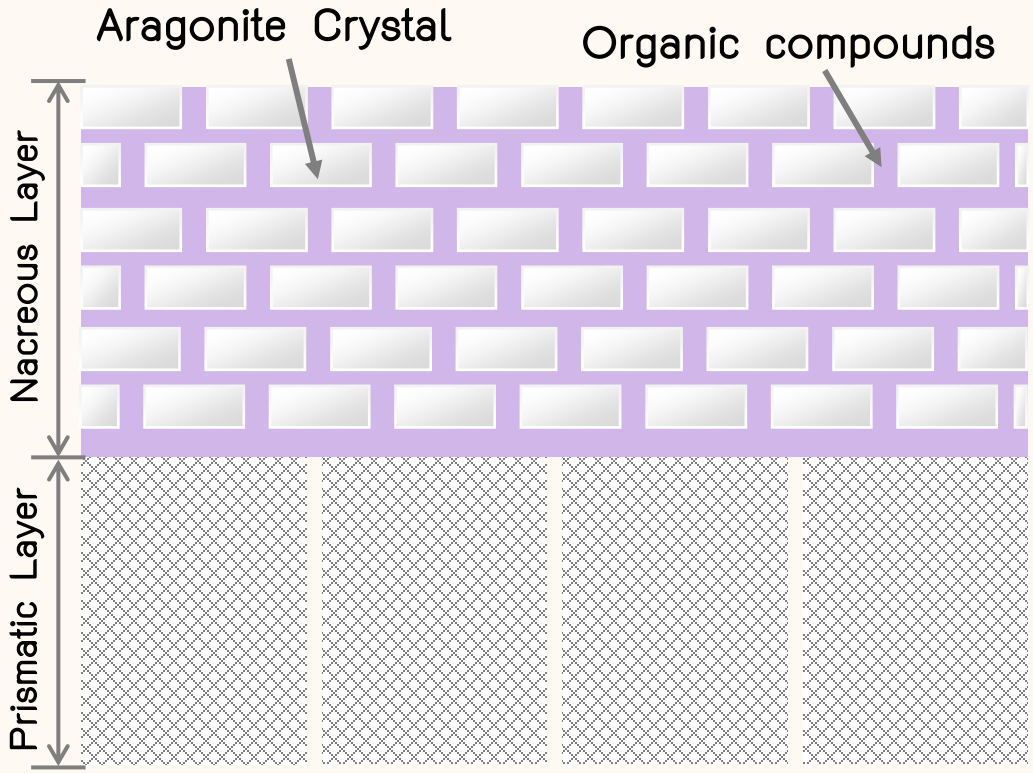




- Aragonite crystal arrange with interlamellar organic compounds in form of brick and mortar like structure bioceramic material.
- Aragonite in nacreous layer arrange like diffraction grating and show pearlescence property.

Nacreous layer





- Pearlescence effect show the reflection and diffraction of light of aragonite bioceramic.
- Aragonite separation from green mussel shells and prepare to glittering powder.

Objectives

1. To separation bio-glitter from green mussel shells
2. To reduce green mussel shells waste and adding value of the green mussel shells.
3. To prepare bio-glitter for cosmetics ingredient.

Experiment

01

Chemical Treatment

02

Thermal Treatment

03

Size Collecting

04

Cosmetic Application

Experiment

01 Chemical Treatment

02 Thermal Treatment

03 Size Collecting

04 Cosmetic Application

- Immerse the shells in 6% available chlorine breaching reagent compare with 2% w/v NaOH

Experiment

01 Chemical Treatment

02 Thermal Treatment

03 Size Collecting

04 Cosmetic Application

- Bring The shells to heat in 300 – 350 °C
- Soak the shells in 18% H_2O_2 24 h.

Experiment

01 Chemical Treatment

02 Thermal Treatment

03 Size Collecting

04 Cosmetic Application

- Sieving by using 100 – 300 mesh

Experiment

01 Chemical Treatment

02 Thermal Treatment

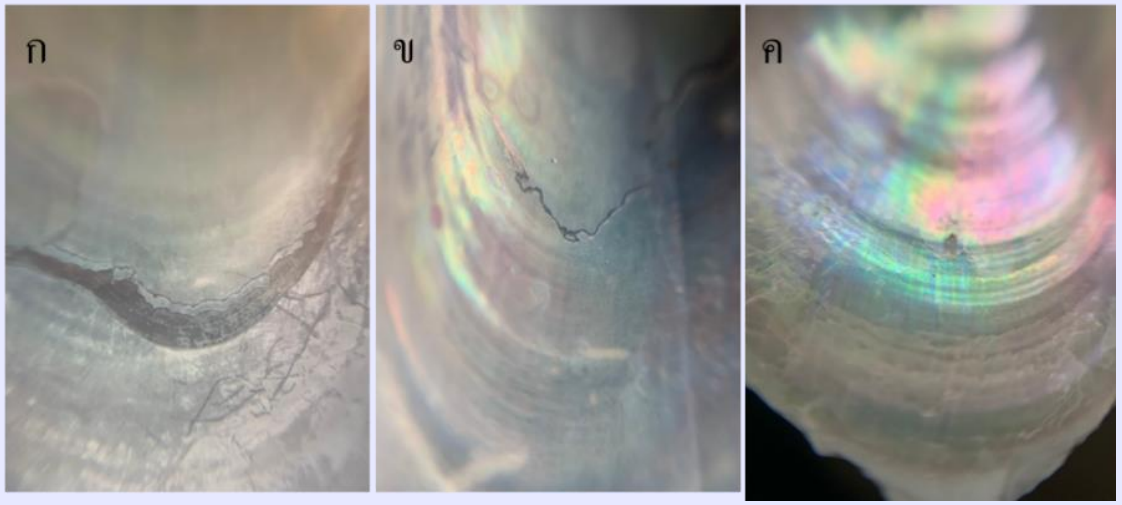
03 Size Collecting

04 Cosmetic Application

Results

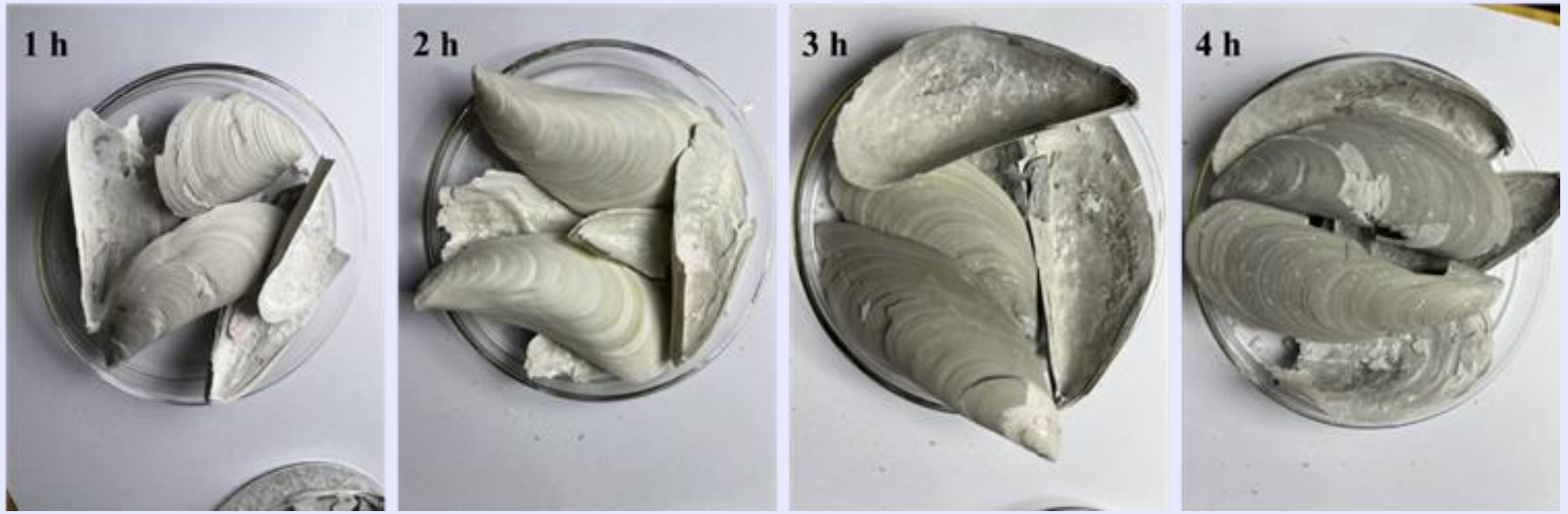
Sodium Hydroxide can change the outermost layer (periostracum) to become a lighter tone. It shows Sodium Hydroxide has hydrolysis reaction with protein and organic compounds. During bleaching reagent can be bleached and make it become white. It shows that organic compounds and pigments in periostracum are removed from this layer.

Results



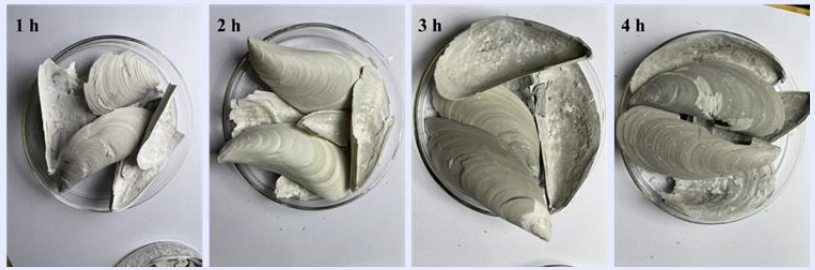
When observing the nacreous layer, we discovered that immersed the shells in 2%w/v NaOH have more glitter and shine than the raw shells. While immersed in the bleaching reagent, the shells are more shiny than NaOH.

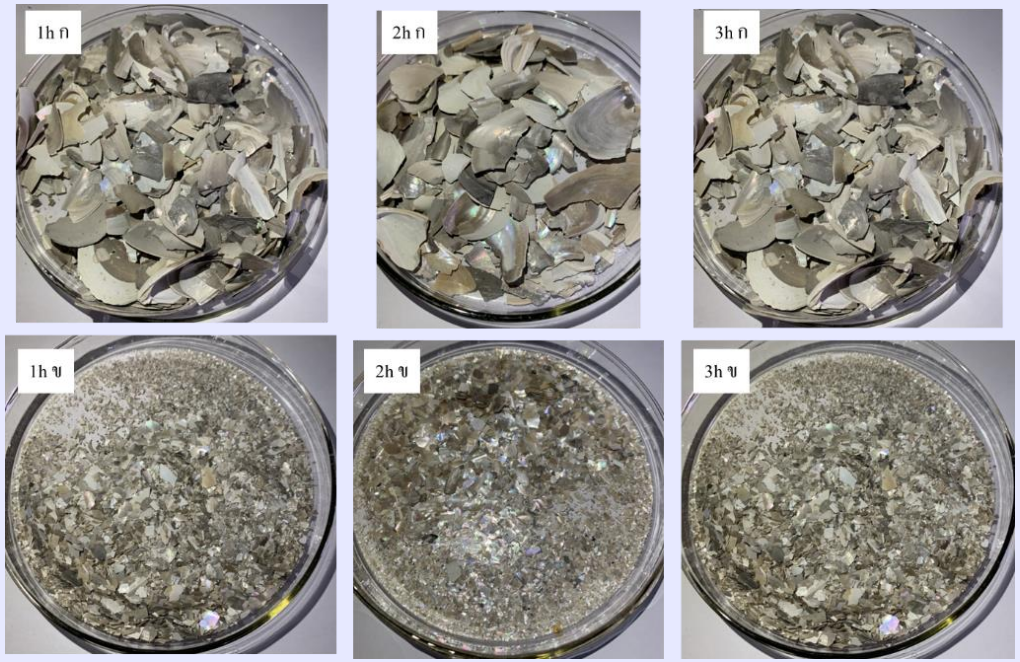
Results



Green mussel shell that heated in 1 hour it still be white ,but more brittle and easy to chapped. But when heated about 2-4 hours ,the shells is change into grey and dark grey. Then the shells have more brittle and break down with lots of pieces

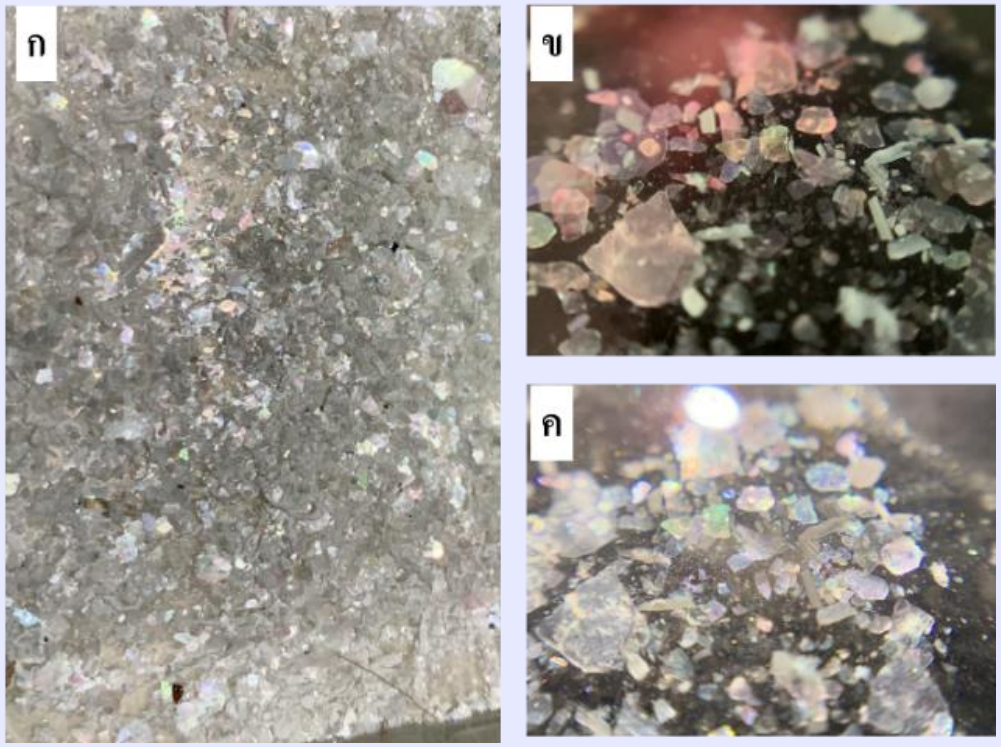
Results





- The brittleness of the thermal treated shells as a result of interlamellar organic decomposition at high temperatures.
- By the way, the heated green mussel shell for about 3-4 hours has less glint and pearlescence effect.

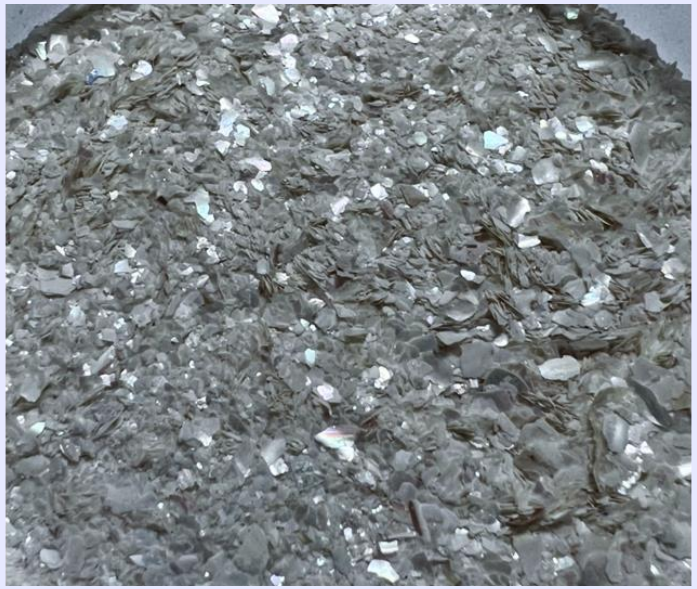
Results



Bio-glitter from green mussel shell, after treating with chemical and thermal treatment, shows the pearlescence effect.

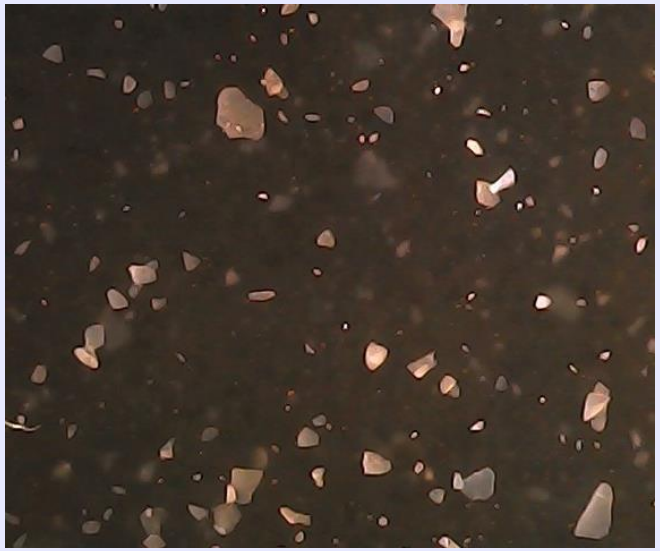
Results

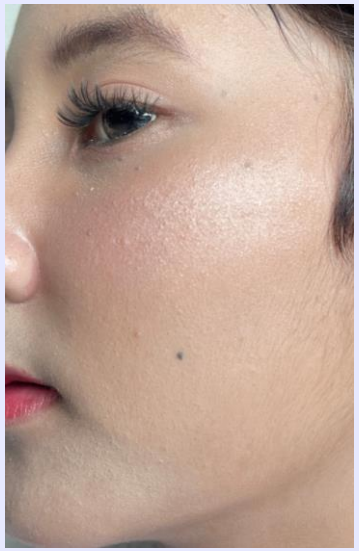
After soaking in H_2O_2 , the bio-glitter was reduced in size by the digestion of interlamellar protein and showed more glint and pearlescence properties.



Results

After sieving for size collection of the bio-glitter and using as ingredient in cosmetic.





Conclusion

- Bio-glitter can separate from green mussel shells by using chemical and thermal treatments for remove interlamellar organic compounds.
- This work show the way to reduce shells waste and adding value of green mussel shells.

Thank you