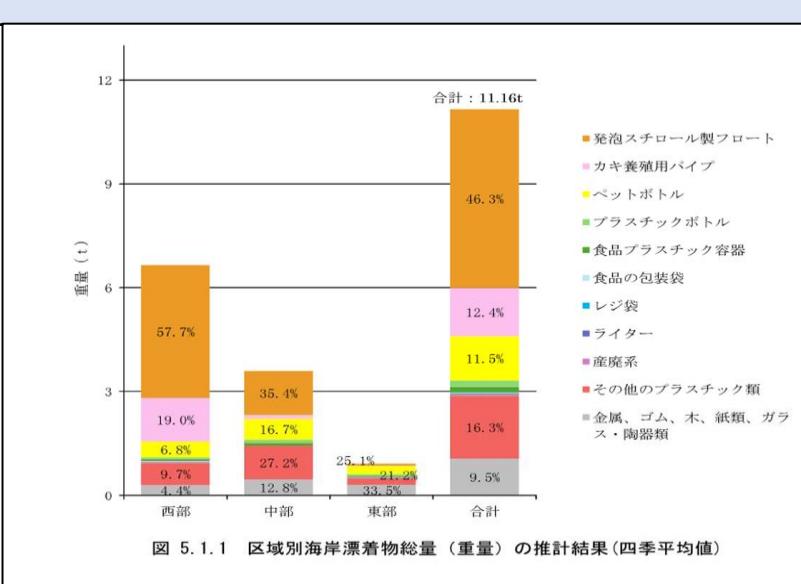


Achieving Sustainable Oyster Farming from Plastics

Hirosima Prefectural High School

Introduction

Hirosima Prefecture is known as Japan's top oyster producer. However, it has been confirmed that over half of the drifting waste from aquaculture. This waste causes significant damage to the ocean and contains microplastics. So, I decided to do research how to reduce the emission of microplastics.



Aim

Clarify the way which can reduce microplastic's emission.

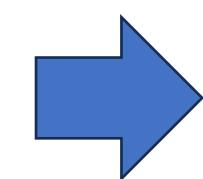
Research Question

What is effective alternative material?

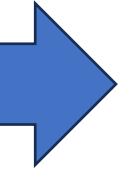
What kinds of process can reduce microplastic's emission?

Mechanism of Action

1.Ultraviolet rays degrade plastics.



2. Plastics are shaved off by waves.



3. They get into microplastics.

The plastics which is used for oyster farm is likely to be degrade because of its long-term use outside.

Method 1. Interview

Background

When I search for a solution of marine plastics, I found biodegradable plastics are studied. However, it is not general.
⇒ I want to know detail of biodegradable plastics.

Aim

⇒ To know why biodegradable plastics is not spread.
⇒ I did interviews with experts on plastics.

Result

Q. What is the problem on putting biodegradable plastics into practice?

A. High cost and limited usage.

- The biodegradable plastics is by far more expensive than conventional plastics.
- ⇒ Using a lot is difficult for local oyster farm.
- Biodegradable plastic can be used in limited places, because it depends on existence of specific bacterium whether they are decomposed.

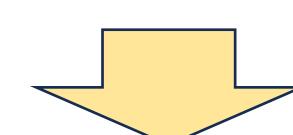
Q. What do you think about biodegradable plastics?

A. It doesn't lead to fundamental solution.

- The most important thing is collecting used plastics perfectly.
⇒ However careful we are, some accident break them and they will pollute the ocean.
- The second important thing is changing conventional plastics into harder one.
- At last, we use biodegradable plastics in the just case that other two way doesn't work well.

Discussion

- ① Biodegradable plastics are far from practical use.
- ② We should consider the way of improving plastics materials before biodegradable plastics' use.

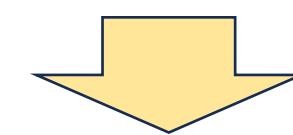


To make oyster farm more eco-friendly, we should research how to improve conventional plastics, polyethylene.

Further Research

I suggest **mixing porous materials in polyethylene** because porous materials are confirmed that they can protect plastics from ultraviolet rays.

⇒ However, doing ordinary experiments is impossible for high school students because it needs very expensive machine.



Confirming whether actually even high school student can observe existence of microplastics is needed.

Method 2. Experiment

Aim

⇒ To examine the effectiveness of the suggested experiment.

Preparation

UV light, HDPE, PET, cup, microscope and filter.

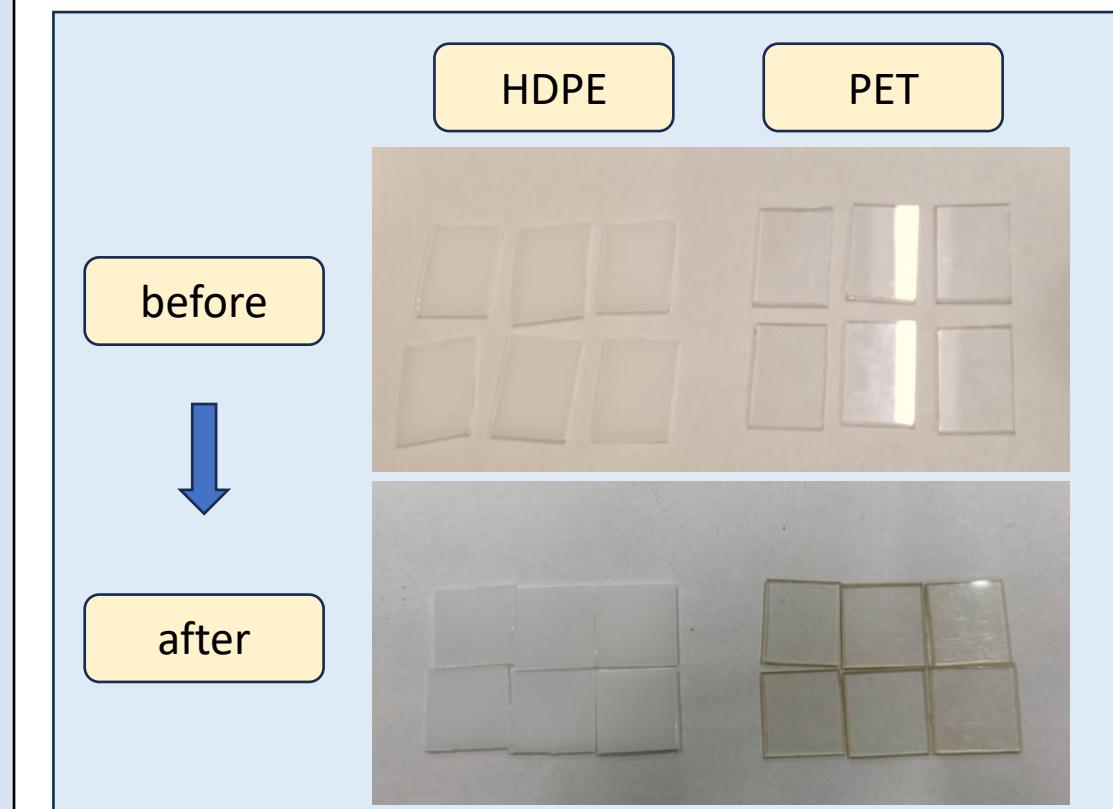
Procedure

1. Cut each plastics into 2 millimeters square.
2. Fasten UV light 5 centimeters above plastics.
3. Expose plastics to UV for a week.
4. Observe surface of each plastics.
5. Add 50 milliliter water and shake plastics 200 times.
6. Filter them and observe residue.



Observation

1. Surface



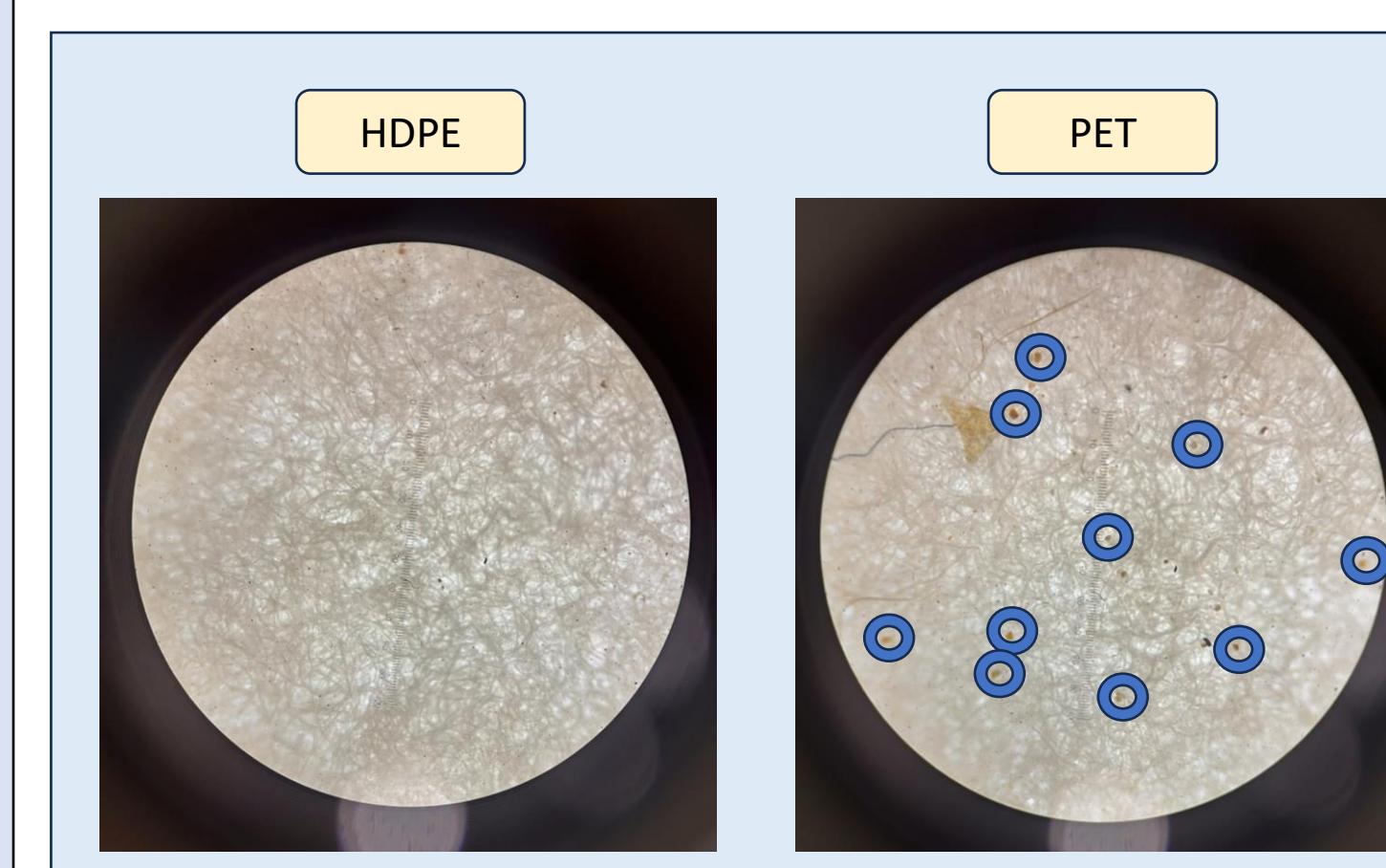
HDPE

Color: it remains white.
Surface: I can't find any remarkable cracks.

PET

Color: it turned yellow from clear.
Surface: there are some cracks.

2. Filter



HDPE

⇒ There is nothing on the any filter.

PET

⇒ There is something small and yellow on every filter.

Discussion

PET turned yellow and small particles are confirmed on the filter. On the other hand, any difference were not confirmed in HDPE.

What made this difference between PET and HDPE?

⇒ HDPE is much tougher material than PET. Therefore, it is less likely to be degraded and shaved off.



Through this experiment, we can evaluate degradation and microplastic of soft plastic materials, such as PET. However, there are still problems in considering tough materials, such as HDPE.

Conclusion

Improving conventional plastics is more appropriate than introducing biodegradable plastics because of its high cost and limited usage. Additionally, the current experiment is enough to examine only soft materials. Therefore, further research is needed to examine a possible modification of the method for testing hard materials as well as the effect of porous materials.

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