Room-temperature decomposition of PET

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1, Introduction

Reaserch Background

- **Plastic**→stay in nature (**400～1000 years**)
- **Plastic disposal**

Burning → Huge Cost / **CO_2**,NOx

Thrown into the ocean(8M tons/year)[1)]

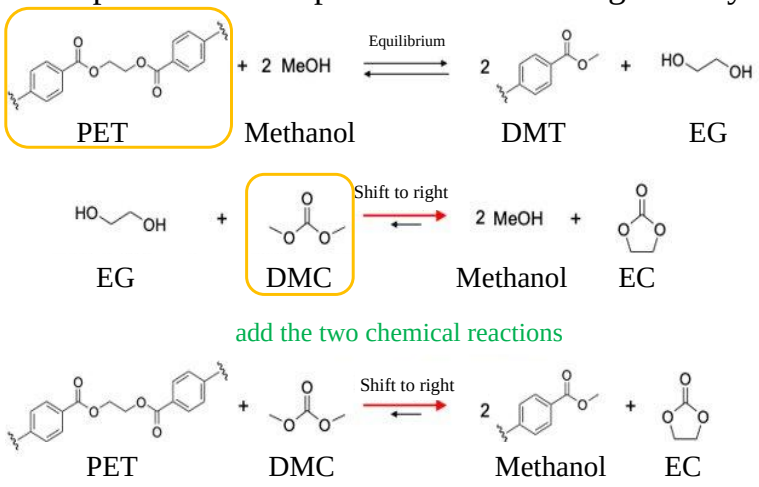
Marine Pollution(Microplastic)

We need a ,,,

Lower-energy **Less-CO_2** method

Previous Reaserch

Room-temperature decomposition of PET using a catalyst[2)]



add the two chemical reactions

Our Difficulty ➡ **Low reproducibility**

Reseach Objective To explore
- the causes of reaction failure
- the possibility of decomposition of other polymers

2, Experiment 1 :Repeated experiments(about 25℃)

Materials
- **PET bottle pieces:4g**
- Methanol:27ml
- alkoxide catalyst(NaOMe):2.3g
- **DMC(**Dimethyl carbonate**)**:200ml

Result

1 success out of 3 tries

Low Reproducibility

Other factors may prevent this reaction

Shifted equilibrium based on Le Chatelier's principle

3, Experiment 2

Lower tempreture (about **5℃**)
Materials : same as Exp.1

Result **No reaction**

4,Experiment 3

Higher tempreture (about **85℃**)
Materials : same as Exp.1

Result **No reaction**

5, Consideration ～Reason why the reaction wasn't promoted?～

Tempreture ↓↑ to promote the reaction

But...

No effect was observed

Other reasons

1. Substances
- Methanol
- Stain of PET

2. Condition
- Humidity

Solutions

Dehydrated methanol
Control conditions more strictly

6, Future challenge

1 To make this experiment successful
2 To Apply to other polymers>>(PEN,PEG,etc)

Innovative plastic recycling method

CO_2-free × Low-energy = Sustainable

References
(1)ambeck, J. R., et al. (2015). *Plastic waste inputs from land into the ocean.* Science, 347(6223), 768–771.
(2)Shinji Tanaka et al(2021) Capturing ethylene glycol with dimethyl carbonate towards depolymerisation of polyethylene terephthalate at ambient. Green Chem., 2021, 23, p9412–9416.