

Recycling waste plastic

From the perspective of carbon neutrality and resource circulation, each company is implementing even more recycling efforts.

In particular, research is underway to reduce the environmental impact of using waste materials as raw materials, such as chemical recycling and material recycling.

DJK will also introduce examples of experiments focusing on chemical recycling and material recycling.

[case 1] Preparation of dynamically crosslinked elastomer using automobile bumper waste



Bumper waste materials (PP+Talc)

• After collecting and crushing automobile bumper waste materials (PP+Talc), we alloyed them with EPDM and modified them into dynamically crosslinked elastomers.



Bumper crushed material



Elastomer sheet

• Dynamically crosslinked elastomer production

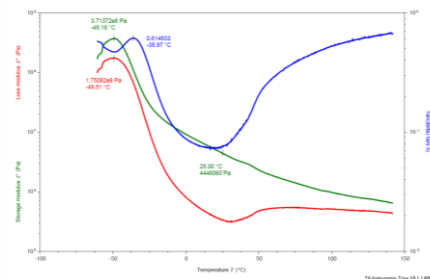
- 1) composition : resin/rubber/oil = 13/52/35
PO addition amount \Rightarrow 0.5phr for rubber
- 2) machine : Tabletop twin screw extruder MC-15 /Made by Xplore
- 3) Kneading conditions : Cylinder temp. \Rightarrow 240°C
Screw rotation speed \Rightarrow 250rpm
Kneading time : 10min

• Evaluation items

- 1) Dynamic viscoelasticity measurement
Frequency; 1 Hz, Temp.; -70°C~150°C
Machine; TA Instruments DMA850
- 2) Tensile test
Temp.; 23°C, Test speed; 50mm/min Machine; Instron 5582



Conical screw
kneading machine



Dynamic viscoelasticity measurement chart

[case 2] Chemical recycling of acrylic plates

• After collecting and crushing the acrylic plate (PMMA) used to prevent splashing, it is monomerized by thermal decomposition.

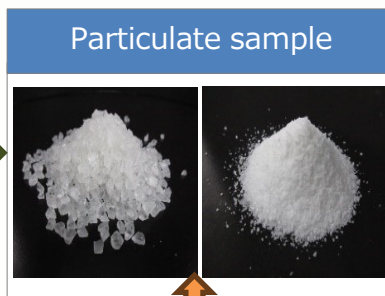
The obtained monomer solution was cast-polymerized and recycled into an acrylic board.



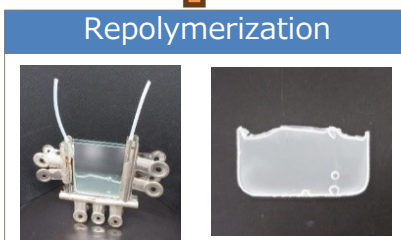
Commercially available acrylic board (PMMA)

Experiment Overview

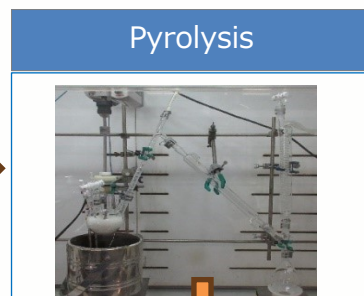
- 1) Sample : Commercially available PMMA board (4mm)
- 2) Crushing : Fine powder by freezing crushing
- 3) Pyrolysis : Decomposition conditions 350°C×3hr
 \Rightarrow Monomer recovery
 \times Purified by distillation
- 4) Repolymerization : Cast polymerization 60°C×18hr
polymerization catalyst AIBN



Particulate sample



Repolymerization



Pyrolysis



Recovered monomer liquid