Chemistry Materials

Plastic production from CO_2

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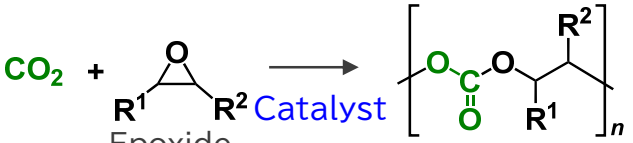
Purpose of Research

To produce useful plastics for our daily lives from carbon dioxide (CO_2) which is known as a main substance of causing global warming. At present, most of the plastics are derived from fossil fuels. However, the depletion of fossil resources and the burning of used plastics releases large amounts of CO_2 into the atmosphere. Instead, our laboratory is working on the production of plastics from CO_2 as a new carbon resource which can replace fossil fuels. CO_2 is abundant in nature and is attractive because it is non-toxic, non-flammable and inexpensive.

Summary of Research

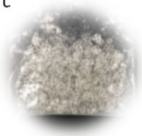
Synthesis of aliphatic polycarbonate



Aliphatic polycarbonate (PC)

【Comparison with Conventional or Competitive Technologies】
・World first inorganic catalyst ($CePO_4$) !
・Easily prepared
・Scarce affection by moisture
・Easily separation of the catalyst

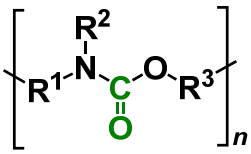
【Expected Applications】
・Raw material of polyurethane
・Binder for ceramic production
・Biocompatible materials



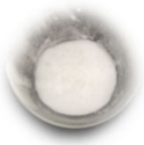
Pellets of PC

【Challenges in Implementation】
・Now promoting scale-up !

Synthesis of marine degradable polyurethane



Polyurethane



【Comparison with Conventional or Competitive Technologies】
・Without using isocyanate
・Not decompose in water
・Decompose only under certain conditions

【Expected Applications】
・ marine degradable polyurethane

【Challenges in Implementation 】
・Now collecting basic data on what kind of chemical structure is decomposed.

※Collaborative research with Iwate Univ.

Points

・CO_2 conversion without hydrogen
・Reacts at about 100-150℃
・Fixing CO_2 by making it useful in our daily life

What We Expect from Companies

We hope that these plastics will be used not only as various products as those, but also as unexpected niche uses.

Future Developments

■ Aliphatic polycarbonate
Apr. 2025 Priority claim, PCT application filed.

■ Polyurethane
Apr. 2025 Collaborative research with Iwate Univ. started.

■Associated grants: Grant-in Aid for Scientific Research, JKA promotion funds of KEIRIN RACE

科研費 KAKENHI　JKA Social Action 競輪とオートレースの補助事業

■Intellectual property: Patent pending
■Prototype: Available
■Sample: A few grams of PC are available

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