Resource Circulation

R&D Project Title: Highly Effective Chemical Recycling of Mixed Polymer Wastes using Hydrogen Gas

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Summary:

To achieve efficient recycling of mixed polymer wastes, chemoselective cleavage of certain chemical bond in a polymer material enables chemical recycling of the material and, at the same time, recovery of other polymer materials. To this end, we investigate the below subjects in this project.

- Hydrogenative cleavage of C–O bond in polyurethanes
- Re-polymerization of the degraded compounds, formamides and alcohols
- Chemoselective degradation of polyurethanes over polyesters and polyamides
- Development of chemoselective catalytic systems and understanding their design principle

By achieving these subjects, we enable chemical recycling of polyurethanes via addition and elimination of hydrogen gas and realize 100% atom-economy recycling process. In addition, the selective degradation of polyurethanes in mixed polymer wastes realizes facile separation of other polymer materials such as polyesters and polyamides, which can be subjected to material recycling. Therefore, the chemoselective degradation of certain polymer material enables a novel direction of mixed polymer waste recycling and contributes the circular economy and carbon neutral.

https://www.cstf.kyushu-u.ac.jp/~iwasaki-lab/en.html