

Feature

Contributing to the Development of Prototype PET Bottles Made from 100% Plant-Derived Raw Materials

Toyobo group is actively promoting the switch to biomass raw materials and the utilization of recycled raw materials, with its goal to increase the ratio of green film products¹ to 60% by 2030. We have used our core technologies to develop a variety of eco-conscious products.

In December 2021, Suntory Group and Anellotech, Inc. jointly developed a prototype PET bottle made from 100% plant-derived raw materials (100% bio-based PET bottles) using one of our core technologies, polymerization.² Generally, PET resin is produced by the

polymerization of terephthalic acid and ethylene glycol, which are both derived from fossil fuel resources. Anellotech's technology enabled to produce terephthalic acid efficiently from plant-derived raw materials. The group's success in polymerizing 100% bio-based PET resin from bio-based terephthalic acid and bio-based ethylene glycol contributed significantly to the development of 100% bio-based PET bottles.

¹ Promotion of the use of biomass and recycled raw materials, and volume reduction
² Chemical reactions to produce desired polymers

always watching for any abnormalities in each and every process. As a result, we were able to obtain the same quality. It was a true relief when all of the polymerization was completed.

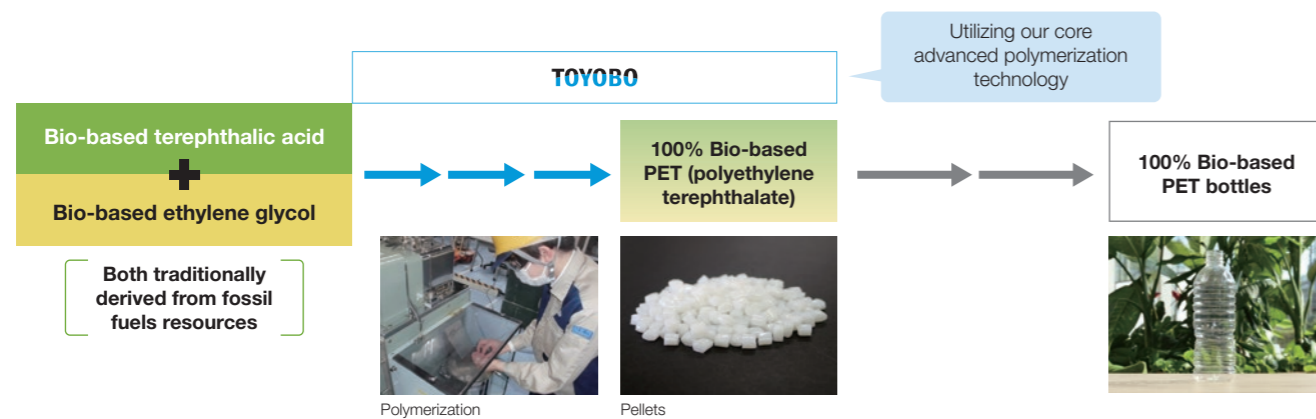
I believe that the skills I cultivated since joining the company and the abundant PET-related data and expertise that was accumulated over many experiences were key to this success. In working on polymerization, I learned many things from my managers and those in my department. I believe that it was this warm support that enabled us to succeed even while being pressured not to fail.

I would like to continue engaging in various projects to further increase confidence in Toyobo's technological capabilities, and contribute to the development of products that positively contribute to society.



Team members of 100% bio-based PET resin project

Manufacturing Flow of 100% Bio-Based PET Bottles



Polymerization of 100% bio-based PET resin

Key to success is a thorough preliminary examination leveraging cultivated knowledge and technical capabilities



Yuichiro Matsuura
Polymers Development Center,
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Creating bio-based terephthalic acid has been considered difficult. While it was successfully generated using Anellotech's technology, it resulted in only a few dozen kilograms as a polymerization sample, which was much smaller quantity than anticipated. When implementing polymerization, we normally expect some failures, but with such a small amount, not even a single failure is acceptable. For this reason, after thoroughly analyzing and preparing the raw materials and equipment, respectively, the team determined the polymerization conditions after numerous discussions. The actual polymerization was repeated more than a dozen times in small quantities in order to disperse the risk and produce as much 100% bio-based PET resin as possible. However, the increased frequency requires an awareness of variations in quality. Each operation to adjust the temperature or pressure was performed carefully step by step to avoid such variations, and then fine-tuned according to differences among lots of raw materials and in the daily temperature and humidity. I remember

Creating an organization that can pass on skills

Fostering a culture of nurturing young engineers throughout Functional Materials Production and Technology Operating Department



Gaku Maruyama
General Manager of Tsuruga
Polymers Plant
and Manager of Polymers
Development Center,
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Production Center

I am very happy to have contributed to the development of a 100% bio-based PET bottles prototype with Toyobo's technology, and I am proud of the members who accomplished this.

Toyobo's facilities enable consistent technological development, from basic studies like those in university laboratories to condition studies for commercial production in plants. Our strength lies in our extensive facilities and wealth of data and know-how based on many years of experience. We have earned the confidence of customers in our polymerization technology, and they often entrust us with various polymerizations.

In such a privileged environment, our department actively assigns large projects to young engineers in the second and third year of their careers in order to encourage them to grow as professionals. We know that there is a lot of pressure and anxiety associated with "can't-fail" projects such as these, and we do our best to support them.

Throughout the projects, engineers deal with advanced technology in addition to the polymerization work itself. As a result, I feel that the young engineers have learned and adapted the technologies that were inherited from predecessors at Toyobo.

I feel rewarded when I hear feedback such as, "I am glad I had this experience even though I made some mistakes," or when I see young participants in this project using their knowledge to help engineers who are less experienced.

The Functional Materials Production and Technology Operating Department as a whole has this kind of "culture of nurturing young engineers." I would like to continue to develop human resources and contribute to the company's growth by giving younger engineers work they are responsible for, and providing them with the support to do so.