



Biomass Plastic

Biomass is a concept representing the quantity ("mass") of biological resources ("bio") and refers to renewable and bio-derived organic resources. Biomass plastics are plastics that utilize renewable organic resources, such as corn and sugarcane, among other plants. Products containing plant-derived carbon do not impact the fluctuation of atmospheric CO₂ during their lifecycles because the amount of CO₂ atmospherically emitted through incineration and other reasons equals the quantity of CO₂ absorbed and fixed through forests and other plant resources, in turn bringing about a state of neutrality. This concept is called carbon neutrality and has been receiving attention in recent years. The use of plastics made with biomass materials allows for the development of eco-friendly products through, for example, fossil fuel conservation, suppression of greenhouse gas increase, and the creation of a recycling-based society.

RIKEBIO® is RIKEN TECHNOS's plastic product that uses biomass materials for mixed resins as well as plasticizers and other additives. The biggest feature of the brand is its applicability to a wide range of hardness requirements and its capability to achieve quality and performance levels equivalent to conventional petroleum-derived products. The newly launched series Natural RIKEBIO® aims to reduce waste by effectively utilizing natural resources, which would otherwise be discarded, as molding materials.

As part of its responsibility as a chemical manufacturer to contribute to achieving a sustainable society, RIKEN TECHNOS is developing products that use renewable biomass materials.

Special Feature: Dialogue among R&D Members

Biomass Plastics Contributing to Realizing a Circular Economy and a Decarbonized Society



In June 2022, RIKEN TECHNOS launched RIKEBIO®, a biomass plastic that utilizes renewable plant-derived materials to contribute to realizing a sustainable society. For the occasion of this Integrated Report, four researchers who were involved in the development of RIKEBIO® brand products came together for a round-table talk. The participants exchanged their views on the social background behind the development of RIKEBIO®, the types of social issues the brand can contribute to solving, and the direction for RIKEN TECHNOS's value creation efforts.

Participants: Hiroaki Wakayama (R&D Center General Manager), Ryota Nakanishi (Group 1, Material R&D Department No. 2), Koichiro Itagaki (Group 2, Material R&D Department No. 2), Shoko Nakajima (Group 3, Material R&D Department No. 2)

Held on June 30, 2023 at RIKEN TECHNOS's R&D Center (Tokyo). The affiliations and titles of the participants are current as of the talk.



Issues in the Development of Products Using Biomass Materials

Nakanishi: The development of RIKEBIO® started by searching for and selecting biomass materials, but there were issues inherent to the plant-derived materials. First of all, we needed to secure a stable capability for supplying biomass as its raw materials. There was also a need to collect information from diverse angles, such as whether the used plants were grown for food. These processes required a lot of effort.

Itagaki: Natural RIKEBIO®, which I was in charge of, contains husks as well as shells of oyster, scallop, and other shellfish which previously had to be discarded. This means that the product doesn't exclusively consist of plant-derived materials, but regardless, we emphasized how to utilize materials that were difficult to dispose of, and that the materials could be procured stably.

Wakayama: The ability to procure materials, however, is a strength of ours, and we have procured various materials throughout our accumulated history. So, I would say that procuring biomass materials is actually an area where we can take advantage of our strong suits.

Nakanishi: The ability to procure such diverse biomass materials might indeed be a characteristic feature of RIKEN TECHNOS. As I mentioned earlier, the next issue was whether the performance of plant-derived materials could bear comparison with petroleum-derived ones. I personally believe that the adjustment technology to achieve a performance level equivalent to petroleum-derived products is precisely where we can best utilize our strengths.

Wakayama: I agree. Anybody can mix different materials together, but where we shine most is our expertise on comparing and evaluating the performance and, accordingly, deciding whether to choose the best material or change chemical compositions.



Hiroaki Wakayama

R&D Center General Manager

Wakayama is involved in the development of compound products designed particularly for use in consumer goods. As the manager, he worked on the development and use of PVC and TPE grades during the development process of RIKEBIO®.

as our theme, I want to discuss our R&D efforts that bring about social sustainability.

Nakanishi: The goal of RIKEBIO® wasn't to be an edgy product that would take consumers by surprise; rather, it was to transition from finite petroleum-derived materials to renewable plant-derived materials. There was no need for edgy features, and instead we aimed for a performance level equivalent to that of petroleum-derived products.

Itagaki: That's right. The genesis of the project was a concept that we came up with through a lively conversation we had around 2019 about making a plastics product containing wasted resources and biomass materials.

Wakayama: In May of the same year, the Japanese government devised the Resource Circulation Strategy for Plastics based on the concept of "3Rs + Renewable." The term "renewable" was a perfect match for our biomass plastics development endeavor, and this was one of the driving factors for our project.

Nakajima: RIKEN WRAP BOTANICAL, which I was responsible for developing, is a product that applied RIKEBIO® to wraps for food packaging. There had been a similar development effort in 2015 but it had stalled. The major reason was consumers'

lack of high demand for environmental friendliness around the time, meaning that the product didn't meet the needs of the times.

Wakayama: The focus of RIKEN WRAP BOTANICAL is the exclusive use of biomass materials and the omission of any petroleum-derived additives. The public probably would not have been calling for this level of environmental friendliness yet in 2015.

Nakajima: Indeed. Today, people regularly carry around their own reusable shopping bags, restaurants offer paper straws, and society regards the environmental load of disposable plastics as a problem, but things were different in 2015. For this initiative, we confirmed that general society had grown more environmentally conscious, and we accordingly decided to develop a design that focuses on biomass content.

Itagaki: RIKEN TECHNOS's basic business model is to offer users a product customized for their desired quality and performance level, which means that it is very important to determine whether there is a need for product development.



Ryota Nakanishi

Group 1, Material R&D Department No. 2

Nakanishi established the foundation of RIKEBIO® formula designs and was responsible for the table to mass-production scale technical validation processes. He is currently involved in development projects revolving around customization.

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Nakajima: My issue was the marketing aspect. Wraps for food packaging are products designed for consumers, which means that unlike compound and film products for which we can meet customers in person to ask about their needs, and we had to design and develop the product while looking at the needs of the market. Greenlighting the product launch while reading the trends of the times was no easy task.

Wakayama: There is also a major issue in price-setting for the spread of products in addition to market needs. Since plant-derived materials are costly, they push up product prices. Costs are currently hampering consumers' willingness to act eco-consciously. This is why a trend needs to be created with the national and local governments' support—for instance, offering incentives for the purchase of environmentally friendly products—and we should take proactive action to achieve this kind of society as well.

Nakanishi: More inquiries about RIKEBIO®-related products appear to be coming in, which definitely shows an increasing level of attention from society. Still, the reality is that we have yet to arrange a lineup to move away from all petroleum-derived products. The range of types of biomass materials that we can offer is rapidly growing, so perhaps further boosting the number of our products from here on is another issue.



RIKEBIO® Series That Can Contribute to Carbon Neutrality and Regional Development

Wakayama: Natural RIKEBIO® definitely contributes to a circular economy, as the series utilizes resources that would have otherwise been discarded. The use of biomass materials fixes the CO₂ that plants have been storing, so we should regard circular economy and carbon neutrality as concepts that go hand-in-hand.

Nakanishi: I agree. RIKEBIO® has its biomass content available to the public as an indicator to promote its environmental performance, and the product has attained the Biomass Mark, a label certified by the Japan Organics Recycling Association (JORA). Biomass content indicates the amount of C14 contained—carbon only found in biologically derived substances—which means the higher the content, the higher the contribution to decarbonization. JORA's website also states that biomass can be used sustainably as it is a plant- and animal-based renewable resource.

Nakajima: RIKEN WRAP BOTANICAL has a 90%-plus biomass ratio design. This fact is clearly indicated on the packaging,

and I think we're successfully promoting to consumers in a readily understandable manner the fact that they can contribute to the environment by purchasing and using the product. RIKEN WRAP BOTANICAL has received the certification from the Japan BioPlastics Association (JBPA) and the certification mark is the equivalent of JORA's mark in terms of biomass content. I think the product represents its environmental performance in an easy-to-understand way with the number "90" on the packaging.

Wakayama: Absolutely. Let's continue our R&D based on an approach that contributes to the achievement of carbon neutrality through the use of biomass materials and the promotion of circular economy-related activities.

Itagaki: I think RIKEBIO® can provide to the world not only environmental but also social value. Natural RIKEBIO® uses many biomass materials whose disposal is regarded as a social issue. For example, illegal scallop shell dumping is apparently a social issue, so we're thinking that producing bioplastics with the shell content could contribute to regional development down the line.



Koichiro Itagaki

Group 2, Material R&D Department No. 2

Itagaki was involved in the development of Natural RIKEBIO®. To effectively use wasted natural resources, he examined various biomass materials and explored their potential effectiveness as molding materials and developed formulations.

Value Creation That RIKEN TECHNOS Should Aim for

Wakayama: Our discussion so far has allowed each of us to deepen our understanding of the value RIKEBIO® can offer to society. But sustainability entails constant pursuit, so we need to keep creating new value. What kind of R&D project would you like to work on going forward?

Nakajima: Wraps and other products for food packaging are areas that can help solve food loss issues. I hope to work on a design that can decompose or release ethylene gas produced by the ripening and decomposition of fruits and vegetables, and accordingly maintain their freshness to extend their expiration and best-before dates.

Itagaki: As I referred to earlier, I want to contribute to creating a new local industry. If neglected bamboo forests are a problem in a certain region, developing and producing bioplastic products with bamboo powder content and partially using them in local companies' products is one example of what can be done.

Nakanishi: I want to engage in development efforts that align not with conventional approaches but with RIKEN TECHNOS's progress in sustainability management. RIKEN TECHNOS supports the TCFD's recommendations, undertakes initiatives and information disclosure in line with the recommendations, and establishes and manages the progress of materiality topics. I hope to work on R&D that directly ties into such Company-wide movements.

Wakayama: You all are usually involved in different product development projects, but coming together for this discussion and sharing your thoughts and opinions helped to clarify RIKEN TECHNOS's course of value creation. Thank you for sharing your valuable opinions today.



Shoko Nakajima

Group 3, Material R&D Department No. 2

Nakajima is an employee who engages in R&D while balancing childcare. She was in charge of the development of wraps for food packaging, and contributed to commercializing RIKEN WRAP BOTANICAL.



RIKEBIO® Compounds

In these compound products, we have replaced petroleum-derived materials with biomass materials. We have a lineup of PVC and TPE products, and some grades have acquired the Biomass Mark. The biomass content is adjustable based on the application and requirements to develop grades that can obtain the Biomass Mark.

RIKEBIO® compounds are sustainable and practical products, as they can be applied to extensive purposes with performance levels on par with conventional petroleum-derived products. They are establishing a track record through their use in everyday items and industrial material hoses.

RIKEBIO® Films

Utilizing the development of RIKEBIO® compounds, we are expanding the technology into film products and developing new film grades.

Natural RIKEBIO®

Natural RIKEBIO® aims to reduce waste by using our original formulations and manufacturing technologies to compound natural resources that would otherwise be discarded, and effectively utilize them as molding materials. Some types of base resin can contain 50% or higher levels of natural resources, allowing for reduction of the usage volume of petroleum-derived plastics. Adjusting the quantity of added natural resources can add new value while keeping the feel, color, and other original features of natural resources. Other than the development, marketing, and sales promotion activities as to molding materials, we are exploring the possibility of developing sheets by applying film manufacturing technologies.

RIKEN WRAP BOTANICAL

This is a wrap for food packaging that uses sugarcane-derived biomass polyethylene resin to reduce the usage volume of petrochemical raw materials. Designed with over 90% biomass content, we are proposing new ideas applicable to people's daily lives.

