Column

Voices from the Front Line of Product Development Tackling Social Challenges
Developing Environment-Friendly Tires with Bio-Based Butadiene

**As the shift toward a circular economy gathers pace, the tire and rubber industry is also being called upon to transform.
Butadiene, a key chemical used in materials such as synthetic rubber, the primary raw material for tires, is currently produced mainly from petroleum.
To decrease CO_2 emissions and promote sustainable sourcing of raw materials by reducing our dependence on petroleum,
we have been conducting demonstration research into producing butadiene from biomass-derived ethanol.**



Prototype butadiene rubber produced in laboratory facilities

Although bio-based butadiene still faces cost challenges compared with conventional petroleum-derived materials, we view it as an essential technology for the transition to a circular economy. In January 2022, Zeon Corporation and Yokohama Rubber's "Development of Manufacturing Technology for Synthetic Rubber Core Chemicals with Carbon Resource Recycling" was selected by the New Energy and Industrial Technology Development Organization (NEDO) as a "Green Innovation Fund Projects / Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources" initiative.

The aim of the project is to establish two advanced technologies capable of producing butadiene and isoprene based on carbon resource recycling at high yields from used tires or biomass resources, with a target of commercialization in the 2030s. Working with the Institute of Science Tokyo (formerly Tokyo Institute of Technology), the Institute of Physical and Chemical Research (RIKEN), and the National Institute of Advanced Industrial Science and Technology, we are pursuing two areas of research: synthesizing butadiene from ethanol using catalysts (catalyst technology), and producing butadiene from plant-based resources using enzymes (bio-technology).

Message from Yokohama Rubber researcher

Dr. Naoya Amino
Associate Officer, Executive fellow and Head of the Materials Performance Laboratory, Research and Advanced Development Division, The Yokohama Rubber Co., Ltd.



The Yokohama Rubber Group has set targets of using 40% renewable and recycled materials by 2030 and 100% sustainable materials by 2050. Reducing reliance on fossil-fuel-derived butadiene, the primary raw material used in synthetic rubber, is one of the central initiatives underpinning the roadmap toward this.

Beginning in 2026, our partner Zeon Corporation plans to begin collecting data related to butadiene synthesis and mass production using bench-scale equipment to be installed at its Tokuyama Plant in Shunan, Yamaguchi Prefecture. This will move the project into a new phase in which the material will actually be used to produce tires, which will then be evaluated. Using prototype butadiene rubber developed by Zeon, we will manufacture prototype tires and conduct driving tests to gather data for demonstration purposes. If we can confirm that the material delivers levels of safety and performance equivalent to conventional products, its lower environmental load will become a meaningful source of added value. Although challenges such as the difference in price remain, we hope to clearly communicate the environmental benefits of these products while delivering tires with distinctive new value.

Message from Zeon researcher

Sadaharu Hashimoto
General Manager, Carbon Neutral Laboratory Research & Development Center, Zeon Corporation



As a synthetic rubber manufacturer, Zeon has supplied tire rubber to Yokohama Rubber for many years. We see great significance in this project because we believe "development of bio-based raw materials will be essential to the continued growth of Japan's synthetic rubber industry." We want to give back to society through these technologies and support Japan's industrial foundation in a sustainable way.

Since ethanol can be supplied stably, and we already have extensive experience with catalyst-based chemical synthesis, we are well positioned to develop technologies for converting ethanol into butadiene as an extension of our existing capabilities. Converting ethanol into butadiene is an extremely difficult process. However, by leveraging our strengths in high-purity extraction and distillation technologies to remove impurities, I see our role as being to establish highly efficient production technologies capable of supplying high-quality butadiene with the same performance and reliability as conventional materials.