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New Technology Developed Jointly with RIKEN and Yokohama Rubber for Producing Biomass-Derived Butadiene
Successful Creation of Cells with Excellent Butadiene-Producing Capability Based on a New Artificial Metabolic Pathway and Enzyme

Zeon Corporation (president: Kimiaki Tanaka) has developed the world's first technology that efficiently produces butadiene from biomass (biotic resources), under a collaborative research project with RIKEN and Yokohama Rubber Co., Ltd. and at the Bio-monomer Production Laboratory. Butadiene is a raw material for synthetic rubbers used mainly for automobile tires, and industrial butadiene is produced as a byproduct of naphtha pyrolysis. The new technology will reduce future dependence on petroleum and contribute to reducing carbon dioxide (CO₂), which is associated with climate change.

Zeon has participated in joint research with RIKEN Center for Sustainable Resource Science (CSRS) and Yokohama Rubber since 2013 with the aim of developing a technology that can produce monomer (a raw material of synthetic rubbers) from biomass. Additionally, the Bio-monomer Production Laboratory was established under RIKEN's Integrated Collaborative Research Program with Industry in April 2020 to accelerate research on the practical implementation of the technology. The laboratory has been advancing its research by integrating the respective expertise and technologies of its team to develop enzymes with high productivity and establish an efficient purification technology.

In this latest development, the team was able to produce cells with excellent butadiene-producing capability based on the creation of a new artificial metabolic pathway and enzyme. This made it possible to develop a process that involves muconic acid* produced through microbial synthesis as an intermediate. In addition, the new process is also expected to significantly reduce the cost of the fermentative production of butadiene by incorporating knowledge the laboratory has gained during its prior development of enzymes.

The results of the joint research have been published in *Nature Communications*, a London-based online journal of research papers from the biology, chemistry, and other academic fields.

The Bio-monomer Production Laboratory also became the first in the world in 2018 to produce isoprene, another raw material for synthetic rubbers, by designing a new artificial metabolic pathway and creating highly active enzymes for the production of cells with excellent isoprene-synthesizing capability. The team achieved in-vivo creation of isoprene from a biomass (sugar) as the starting material.

The Zeon Group will continue to engage in research that transcends the boundaries of industry, government, and academia to contribute to achieving the Sustainable Development Goals (SDGs).



*An unsaturated dicarboxylic acid expressed by the rational formula $(\text{HOOC})\text{CH}=\text{CH}-\text{CH}=\text{CH}(\text{COOH})$. Exists in three isomeric forms: *trans,trans*-muconic acid, *cis,trans*-muconic acid, and *cis,cis*-muconic acid. This research used *cis,cis*-muconic acid, produced from the enzymatic degradation of various aromatic chemical compounds by certain types of bacteria.

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