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HU-ACE NEWS LETTER

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Activities of the Core

Dec. 4, 2025	The 124th Hiroshima University Biomass Evening Seminar (co-organized by HU-ACE)
Dec. 6, 2025	Higashihiroshima Energy & Eco Seminar – 7th Session: “Clean Power from Sunlight – Solar Cells” (co-organized by HU-ACE)
Dec. 9, 2025	Special Course on Carbon Recycling (NEDO Project) –10th Session: Analysis/Measurement and System Training [Practical Course] (co-organized by HU-ACE)
Dec. 11, 2025	The 110th HU-ACE Steering Committee Meeting

HU-ACE Co-hosts the Asian Conference on Biomass Science (ACBS 2025)

HU-ACE co-hosted the 13th Asian Conference on Biomass Science (ACBS 2025) on November 18, 2025, at Hirosaki University in Hirosaki City, Aomori, Japan. More than 60 participants attended the conference. The program included one keynote lecture, 18 oral presentations, and 20 poster presentations. While this year’s conference was held in Japan, we were pleased to welcome many participants from China and Thailand. Through a wide range of presentations on biomass utilization, we were able to deepen discussions on biomass in Asia. Thanks to the tremendous cooperation and support of the organizing committee and the members of the Biomass Division of the Japan Institute of Energy, the conference was a great success. We extend our sincere appreciation to everyone involved.

Related Events

・Wed., Jan. 14, 16:20-17:50 The 125th Hiroshima University Biomass Evening Seminar
・Tue., Jan. 20, 16:30-18:00 The 20th Hiroshima University Biomass Premium Evening Seminar (conducted in Japanese.)
■Contact & more information: https://hu-ace.hiroshima-u.ac.jp/en/

Research consultation and joint research are welcome.

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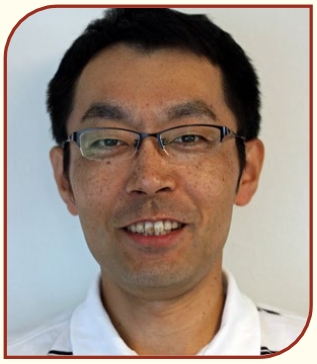
Do You Know Energy? No. 8

Simple Enzyme Catalyst



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Research fields:
Biochemical engineering, Biotechnology

Keywords:
Bio-manufacturing/Bio-based production, Enzyme catalysis, Psychrophilic microorganisms/bacteria, Enzyme engineering

What is a Simple Enzyme Catalyst?

Biotransformation using microorganisms or enzymes differs from chemical synthesis in that reactions can proceed under ambient temperature and pressure. This enables energy saving and reduces CO_2 emissions, making it an attractive approach for modern bio-manufacturing.However, in microbial production, low yields have been a major issue. This is because both metabolic enzymes within the cell and the target production enzymes function simultaneously, competing with each other. As a result, various by-products are generated, making it difficult to obtain the desired compound in high yield. Although removing genes encoding unnecessary metabolic enzymes may solve this problem, deleting those essential for cell growth is not feasible. To address this challenge, we developed the Simple Enzyme Catalyst, which is prepared by first cultivating microorganisms to express the enzyme of interest and then applying heat treatment to inactivate metabolic enzymes so that only the desired production enzyme remains active.

How is the Simple Enzyme Catalyst Prepared and Used?

The preparation process consists of three stages: enzyme expression, heat treatment to isolate the production enzyme, and the production reaction. The enzymes used are selected so that their activity is retained at a temperature higher than that required for microbial growth. During heat treatment, metabolic enzymes of the host cells are inactivated, allowing selective retention of only the production enzyme. In our research group, we use psychrophilic (cold-adapted) bacteria as hosts to express mesophilic enzymes and prepare Simple Enzyme Catalysts. Using cold-adapted hosts enables heat treatment at moderate temperatures, making it possible to utilize a wide variety of mesophilic enzymes derived from microorganisms, plants, and animals.

Why is the Simple Enzyme Catalyst Important?

Because only the production enzyme functions in this system, it generates exclusively the desired compound without forming by-products. In addition, by simply mixing a high concentration of substrate with the Simple Enzyme Catalyst, high concentrations of the target compound can be produced easily and simply, reducing the energy required for downstream concentration and purification.

Future Prospects for the Simple Enzyme Catalyst

We have demonstrated that the concept of the Simple Enzyme Catalyst is applicable to a variety of useful chemical conversion reactions, and collaborative research with chemical companies is currently underway. In the future, we aim to expand this technology toward multi-step reaction systems and repetitive use without enzyme immobilization.