Tokyo Tech Research Units

# Sustainable Chemical Resource Production Unit

## Overview

Our aim is to produce chemical raw materials in a sustainable way without using limited fossil resources such as coal, oil, and natural gas in order to establish industrial processes that are better for the environment and realize non-petroleum plastics. The Innovative Heterogeneous Catalysis Unit, which existed until Fiscal 2018, created an innovative catalyst process. This made it possible to produce raw materials for plastics and high-performance polymers from biomass, and established a roadmap toward a non-petroleum plastic society. This research unit will work to establish the world's first industrial process for the mass-production of polymer raw materials, etc., by utilizing the developed catalysts in collaboration with companies.

## Research goals

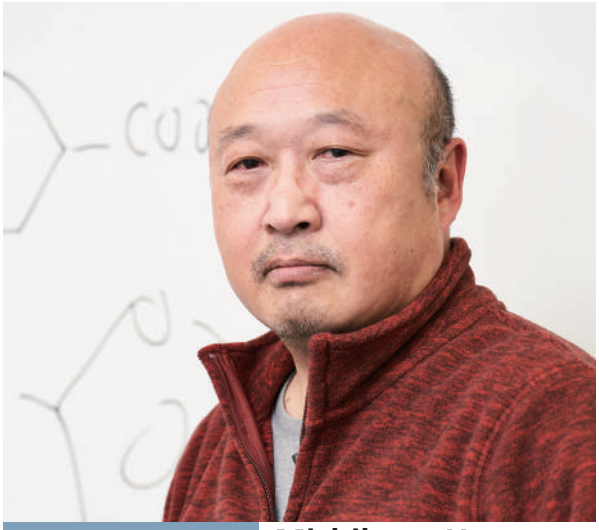
To establish a mass production method utilizing the developed catalysts for the following useful materials made from organic resources such as waste wood and other biomasses as well as uneatable portions of plants instead of petroleum in order to create a new industry.

**(1) Commercial production of high-performance carbohydrates like mannose, which has an antiviral activity-promoting effect, using the unused portions of foods such as food peelings and coffee grounds**

Mannose has been used for pharmaceuticals, but production costs are high and its usages are limited. If this technology becomes practical, it will be possible to reduce costs to a third, and this would have a major impact on society.

**(2) Commercial production of engineering plastics and high-performance polymer raw materials from carbohydrates to realize non-petroleum plastics**

It will be the world's first industrial process for production of polymer raw materials from carbohydrates. The market for polymer raw materials is over 200 billion yen, so the impact on the industry is great.




**Research Unit Leader** Michikazu Hara

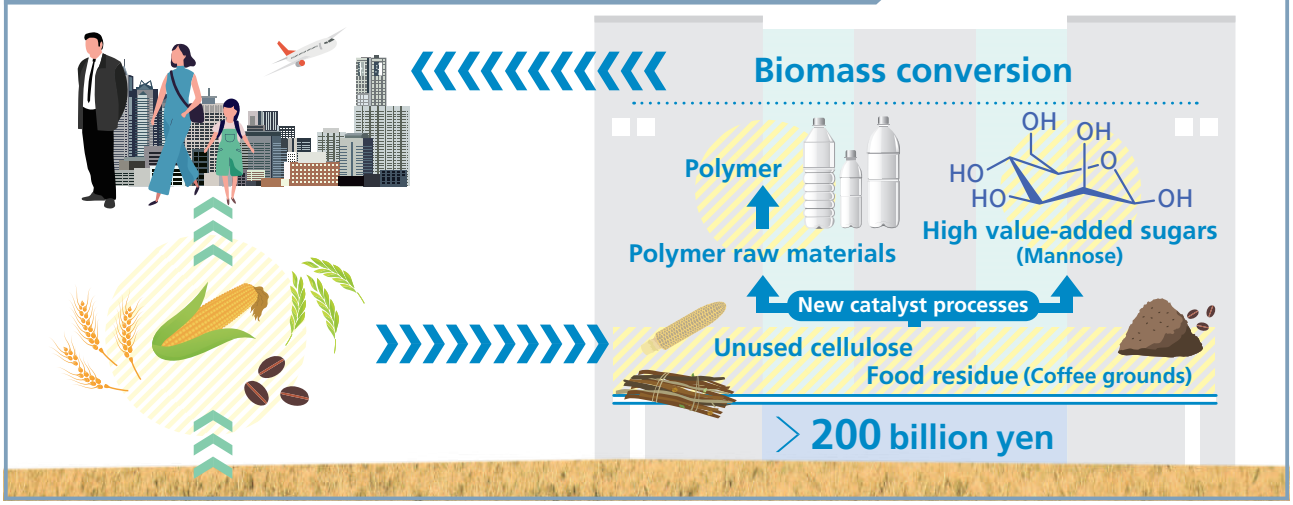
**Profile**

2016 Professor, Institute of Innovative Research, Tokyo Institute of Technology
2006 Professor, Materials and Structures Laboratory, Tokyo Institute of Technology
2000 Associate Professor, Chemical Resources Laboratory, Tokyo Institute of Technology
1999 Postdoctoral fellow, Pennsylvania State University
1995 Assistant Professor, Chemical Resources Laboratory, Tokyo Institute of Technology
1992 Corporate Research and Development Center, Toshiba
1992 Doctor of Science, Interdisciplinary Graduate School of Science and Engineering, Tokyo Institute of Technology

**Unit members**

● Associate Professor Debraj Chandra ● Assistant Professor Masashi Hattori


## Biomass conversion by new catalyst processes



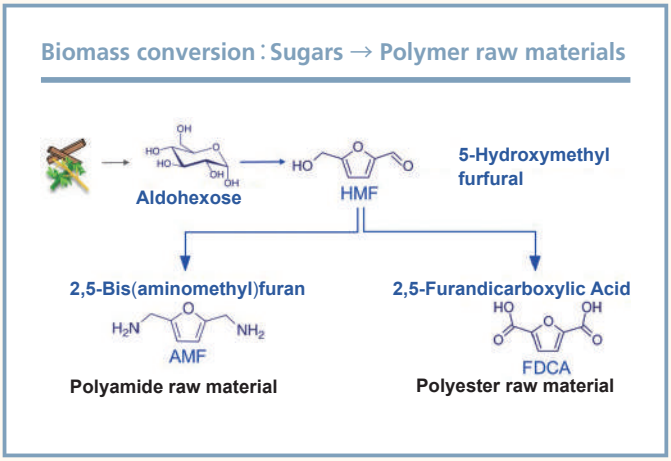
# Effective use of waste to realize defossilization Forming the ideas of researchers and students to promote implementation and give back to society

## Q Why was this research unit established?

Petroleum is an indispensable part of our lives. Petroleum is used not only for transportation fuel, it is also used in clothing. But if society relies solely on that, resources will be depleted. Therefore, our predecessor, the Innovative Heterogeneous Catalysis Unit, established a technology to produce carbohydrates, high-performance polymers, and engineering plastics from biomass such as waste wood and the "leftovers" from the food industry. For example, they succeeded in extracting mannose from coffee grounds. Mannose is able to activate immune cells (macrophages), so if it could be manufactured at lower cost and in large quantities, it could be used not only for pharmaceuticals but also for food and drinks, and for animal feed. Our unit is aiming to establish industrial processes for mass production and to create new industries by cooperating with companies regarding these technologies.

## Q What are the strengths of this research unit?

The strength of this unit is its ownership of unique catalysts. Because we have these catalysts, it is possible for us to create world-first industrial processes. The catalyst for producing mannose from coffee grounds is also innovative. Currently, in Japan, more than 1 million tons of coffee grounds are disposed of each year as valueless waste. This catalyst allows us to produce the useful substance mannose, which has an antiviral activity-promoting effect. In addition, these catalysts are the result of the flexible ideas of students and postdocs. The limitless potential from our young members is another of our strengths.




## Q What is the path to achieving the unit's goals?

Regarding the industrial process for polymer raw materials and the mannose production process developed in this unit, we are proceeding with research at one location in collaboration with companies for implementation to society. We will ask manufacturers, trading companies, and others to join in order to quickly develop suitable processes for commercial production. If these production processes can be put to practical use, it will be possible to reduce the consumption of fossil resources, which will help protect mankind and our planet.

Contact us

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