



# Innovative Heterogeneous Catalysis Unit

## Overview

The Innovative Heterogeneous Catalysis Unit aims to develop and commercialize innovative catalysts that surpass existing concepts. Catalysts are used to accelerate chemical reactions when synthesizing compounds from ingredients, and have supported industrialization in the form of food and petrochemical production. Still, new catalysts must be developed and improved to preserve natural and other scarce resources, and to prevent environmental pollution. The unit sets the goal of developing and realizing mass production of environmentally friendly solid catalysts.

## Research goals

To replace petroleum as an ingredient in a broad range of products, the Innovative Heterogeneous Catalysis Unit aims to develop catalyst technology capable of producing glucose from organic resources made from biomass such as weeds, waste wood, and inedible parts of plants, and converting the glucose to a wide range of chemical resources. The unit aims to secure resources that serve as alternatives to petroleum while reducing CO<sub>2</sub> emissions. In addition, the Innovative Heterogeneous Catalysis Unit also works on improving the efficiency and commercialization of new electrified catalysts produced from ammonia, catalysts discovered in joint research with Professor Hideo Hosono at the Materials Research Center for Element Strategy. These new catalysts can be produced at atmospheric pressures and temperatures lower than those required for the Haber-Bosch process. Requiring only half the energy compared to conventional methods, the unit is looking to implement downsized plants for electrified catalysts in ammonia synthesis that can be operated in developing countries and countries without adequate infrastructure. The Innovative Heterogeneous Catalysis Unit is also promoting the development of new solid catalysts and research to clarify their mechanisms.



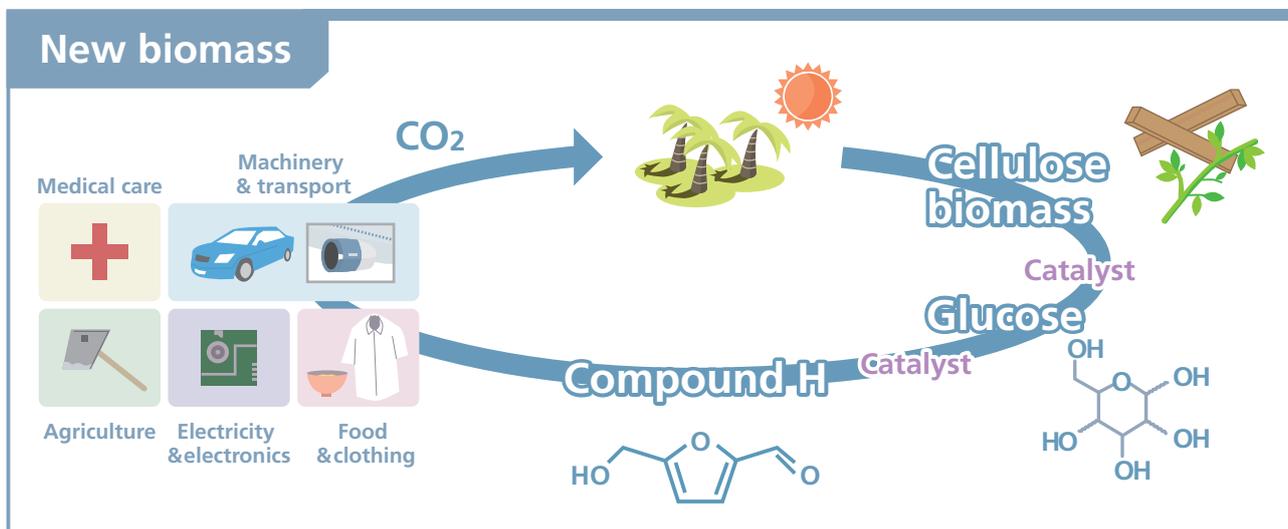
Research Unit Leader

**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

## New biomass





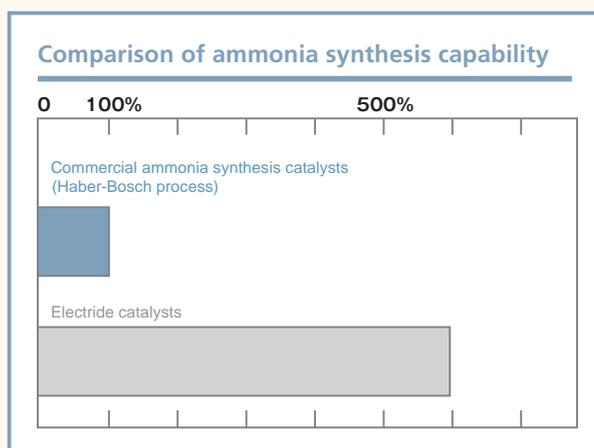
## Developing new catalysts and establishing new theories together with students and other researchers

### Q Why was this research unit established?

We want to accelerate collaboration with companies, develop biomass conversion catalysts, and improve and commercialize electrified synthetic ammonia catalysts. Companies play a significant role in the commercialization of projects as their strengths lie in market research and cost planning. Small plants and large laboratories are necessary to ensure safety, and the Innovative Heterogeneous Catalysis Unit can provide such an environment.

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

The unit can work on a series of processes, from the development of advanced catalyst materials to their commercialization and utilization in society. Although existing catalysts and production methods have been improved, there are many other problems that cannot be solved through improvement alone. In order to solve these problems, the unit will develop new catalysts and establish new theories working together with students and other researchers. Commercialization in cooperation with companies will help Tokyo Tech return the benefits of the Institute's research to society. This meaningful research will lead to solutions to population problems, food shortages, and environmental issues.



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

In terms of making chemical resources from biomass, the processes required to produce glucose from inedible parts of plants are in the final stage of development. Currently, we are engaged in the development of catalysts to produce polyester, heat-resistant resin, and plastics utilizing materials made from glucose.

Electrified ammonia synthesis catalysts are now being verified with private companies at plant sites in a joint project promoted by the Advanced Low Carbon Technology Research and Development Program (ALCA) of the Japan Science and Technology Agency. Within a few years, the Innovative Heterogeneous Catalysis Unit is planning to commercialize small, decentralized ammonia plants with the goal of implementing them in regions with food shortages in a period of five years.

#### Contact us

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