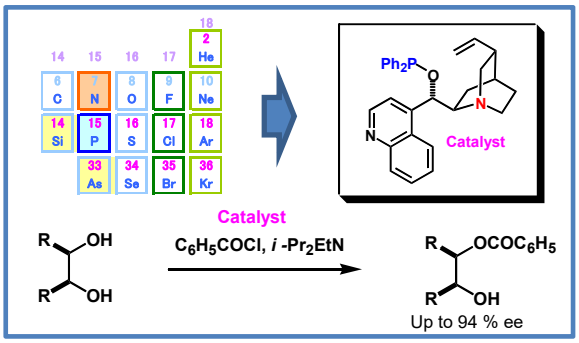
Department of Chemistry and Materials

Developing novel organocatalysts for highly stereoselective synthesis of organic molecules

Organic molecules sometimes come in a chiral form with an enantiotopic relationship. I am carrying out research focused primarily on the development of an asymmetrical catalyst to selectively synthesize one side of a chiral molecule. My goal in doing so is to create new catalysts that are highly selective and highly activated, that do not use rare metals, and that can be synthesized simply.

A view of the lab. Numerous reagents, solvents, and glass containers are used to synthesize the target organic compounds, yielding substances whose structure can be confirmed using NMR.



An asymmetric esterification solution designed based on atomic principles, and associated reactions. Esterification proceeds by differentiating between the two symmetrical hydroxyls in the diol.

Associate Professor
Tetsuya Fujimoto

Associate Professor Fujimoto first completed a Shinshu University Graduate School of Engineering research course specializing in the study of functional polymers. His area of research is organic synthetic chemistry, and his work focuses on new methods for organic synthesis and the development of new catalysts.

Outlook for research

Expected applications include the functionalization of glycerin, a type of biomass, using the asymmetric esterification reaction and the easy supply of optically active alcohol and amine, in addition to the carbon-carbon bond-forming reaction that is important for organic synthesis.

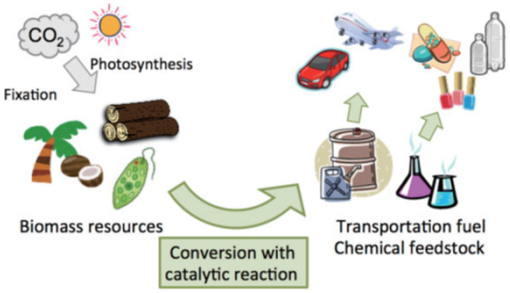
Outlook for students after graduation

Graduates have gone to work for manufactures of low-and high-polymer products and pharmaceuticals.

Department of Chemistry and Materials

Realizing a sustainable society through the effective utilization of biomass resources

Various biomass resources such as lipid, wood, and microalgae have potential as sustainable alternative fuels. However, it is essential to improve the efficiency of conversion to realize the energy utilization of biomass resources. Our laboratory aims to efficiently convert biomass resources to high-grade fuels and chemical raw materials using an inexpensive process. We are working on the elucidation of catalytic reaction mechanism and design of new catalyst to achieve these goals.



Energy and material uses of biomass resources. Optimizing catalytic reactions is the key to practical application.

Lecturer
Iori SHIMADA

Dr. Iori Shimada graduated from The University of Tokyo and obtained his doctorate in environmental studies in 2013. He took his current position in 2018 after working as a research fellow at the Japan Society for the Promotion of Science and an Assistant Professor at Faculty of Textile Science and Technology, Shinshu University. His specialty is chemical reaction engineering.

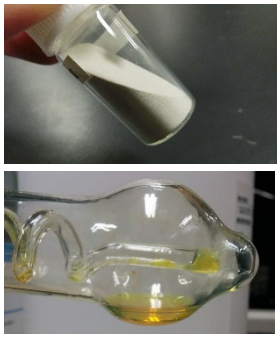
Outlook for research

My goal is to help develop a society powered by clean and sustainable energy that does not rely on exhaustible resources such as fossil fuels. Further, I hope to develop methods for synthesizing useful substances using biomass to replace the many chemical products that are currently synthesized from oil resources.

Outlook for students after graduation

Chemical engineering can be useful in various fields of manufacturing including chemicals, energy, materials, plant engineering and so on. In our laboratory, we want to acquire knowledge of chemical reaction engineering as well as wear it through research on how to utilize the knowledge.

Catalytic activity test reactor



Catalysts and reaction products from microalgae. The products can be used as gasoline additive.