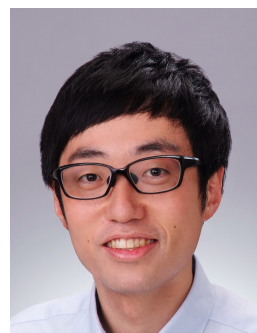


Development of nickel carbide nanoparticle catalysts for the liquid-phase hydrogenation of biomass-derived carbon resources into valuable chemicals



Sho YAMAGUCHI

Department of Materials Engineering Science, Graduate School of Engineering Science, Osaka University, Osaka, JAPAN
Innovative Catalysis Science Division, Institute for Open and Transdisciplinary, Research Initiatives (ICS-OTRI), Osaka University, Osaka, JAPAN

yamaguchi.sho.es@osaka-u.ac.jp

Lignocellulosic biomass is expected to serve as one of the alternatives to fossil fuel as there is no competition with food. Hence, the production of commercially and industrially important materials from lignocellulosic biomass-derived carbon resources is essential to establish chemical processes that do not depend on fossil resources. We have recently reported the highly efficient transformations of lignocellulosic biomass-derived sugars [1-11] or carboxylic acid derivatives [12-14] to useful chemical feedstocks over homogeneous and heterogeneous metal catalysts.

Very recently, we have developed nickel carbide nanoparticles (Ni_3C NPs) as a new class of heterogeneous catalysts for the liquid-phase hydrogenation of nitriles to primary amines [15]. The catalytic performance of Ni_3C NPs significantly differed from that of Ni NPs; Ni_3C NPs catalyst operated well under very mild conditions (1 bar H_2 pressure) and displayed a broad substrate scope and good reusability. Inspired by this finding, in this presentation, I would like to introduce the recent achievements in the application of Ni_3C NPs catalyst to the liquid-phase hydrogenation of lignocellulosic biomass-derived carbon resources to important chemicals.

References

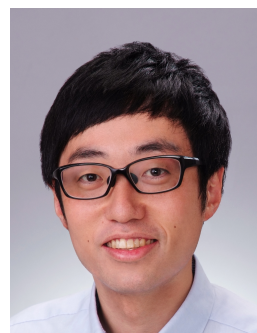
- [1] S. Yamaguchi, S. Fujita, K. Nakajima, S. Yamazoe, J. Yamasaki, T. Mizugaki, T. Mitsudome, *Green Chem.* **23** 2010 (2021)
- [2] S. Yamaguchi, S. Fujita, K. Nakajima, S. Yamazoe, J. Yamasaki, T. Mizugaki, T. Mitsudome, *ACS Sustainable Chem. Eng.* **9** 6347 (2021)
- [3] S. Yamaguchi, T. Mizugaki, T. Mitsudome, *Eur. J. Inorg. Chem.* **2021** 3327 (2021)
- [4] S. Yamaguchi, M. Yabushita, M. Kim, J. Hirayama, K. Motokura, A. Fukuoka, K. Nakajima, *ACS Sustainable Chem. Eng.* **6** 8113 (2018)
- [5] S. Yamaguchi, Y. Kawada, H. Yuge, K. Tanaka, S. Imamura, *Sci. Rep.* **7** 855 (2017)
- [6] S. Yamaguchi, T. Baba, *Molecules* **21** 937 (2016)
- [7] S. Yamaguchi, T. Matsuo, K. Motokura, A. Miyaji, T. Baba, *Chem. Asian J.* **11** 1731 (2016)
- [8] S. Yamaguchi, T. Matsuo, K. Motokura, A. Miyaji, T. Baba, *ChemCatChem* **8** 1386 (2016)
- [9] S. Yamaguchi, T. Matsuo, K. Motokura, Y. Sakamoto, A. Miyaji, T. Baba, *ChemSusChem* **8** 3661 (2015)
- [10] S. Yamaguchi, T. Matsuo, K. Motokura, Y. Sakamoto, A. Miyaji, T. Baba, *ChemSusChem* **8** 853 (2015)
- [11] S. Yamaguchi, K. Motokura, Y. Sakamoto, A. Miyaji, T. Baba, *Chem. Commun.* 50 4600 (2014)
- [12] K. Sakoda, S. Yamaguchi, K. Honjo, Y. Kitagawa, T. Mitsudome, T. Mizugaki, *Green Chem.* **26** 2571 (2024)
- [13] K. Sakoda, S. Yamaguchi, T. Mitsudome, T. Mizugaki, *JACS Au* **2** 665 (2022)
- [14] S. Yamaguchi, H. Kondo, K. Uesugi, K. Sakoda, T. Mitsudome, T. Mizugaki, *ChemCatChem* **13** 1135 (2021)
- [15] S. Yamaguchi, D. Kiyohira, K. Tada, T. Kawakami, A. Miura, T. Mitsudome, T. Mizugaki, *Chem. Eur. J.* e202303573 (2024)

Development of nickel carbide nanoparticle catalysts for the liquid-phase hydrogenation of biomass-derived carbon resources into valuable chemicals

Sho YAMAGUCHI

Department of Materials Engineering Science, Graduate School of Engineering Science, Osaka University, Osaka, JAPAN
Innovative Catalysis Science Division, Institute for Open and Transdisciplinary, Research Initiatives (ICS-OTRI), Osaka University, Osaka, JAPAN

yamaguchi.sho.es@osaka-u.ac.jp



BIO

Dr. Sho Yamaguchi received his Ph.D. in 2012 from Tokyo Institute of Technology under the supervision of Prof. Dr. Takashi Takahashi followed by a post-doctoral fellow at the Max Planck Institute for Molecular Physiology in Dortmund, Germany. In 2013, he became an assistant Professor at Tokyo Institute of Technology (Prof. Dr. Toshihide Baba) and moved to Toyota Central R&D Laboratories, Inc. (Dr. Shinji Inagaki) in 2017. In 2020, he re-started an academic career as an assistant Professor in Osaka University (Prof. Dr. Tomoo Mizugaki). He has published total 53 original publications/review articles and 9 book chapters. Among recent awards and recognition to his scientific career, in 2022, he was honored with "The Award for Young Researchers from Osaka University" and "The Catalysis Society of Japan Award for Young Researchers". His current research explores the design and development of a highly active heterogeneous catalyst and its application to liquid-phase organic reactions.