The theory of microwave-driven catalysis and its application

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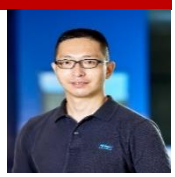
Keynote Speaker



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Short Biography

Shuntaro Tsubaki is currently an Associate Professor at Faculty of Agriculture and International Institute of Carbon Neutral Research (I2CNER), Kyushu University, and a Visiting Associate Professor at Graduate School of Engineering, Osaka University. He is also a member of Platform of Inter-/Transdisciplinary Energy Research (Q-PIT) and Research Center for Synchrotron Light Applications in Kyushu University. He received Ph.D. in Kyoto University in 2010. He became an Assistant Professor at Kochi University (2011-2014) and Tokyo Institute of Technology (2015-2020), then he moved to Osaka University in 2021. He has been a JST PRESTO researcher from 2019 to 2023 (Controlled Reaction by Electrons or Ions, Research Supervisor; Prof. Yasushi Sekine, Waseda University). His expertise is biomass conversion, heterogeneous catalysis and in situ/operando analysis under microwave irradiation. He has managed various projects regarding above research field including Grants-in-aid for Young Scientists (B) and (A) Grants-in-Aid for Scientific Research (B), Grant-in-Aid for Challenging Research (Exploratory), Grant-in-Aid for Transformative Research Areas (A) Transformative Research Areas, Section (II), Environmental Research Comprehensive Promotion Fund (ERCA), and JST PRESTO. His research achievements have been awarded from the Japan Institute of Energy Progress Award (2020), the 8th New Chemical Technology Research Encouragement Award (JACI, 2019), the Tokyo Institute of Technology School of Materials Science and Technology Research Encouragement Award (22018), and the Japan Society for Electromagnetic wave Energy Applications JEMEA Progress Award (2015). He has published more than 70 papers and 30 book chapter/reviews.

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Abstract

Microwaves selectively and instantaneously form a local thermal non-equilibrium and accelerate various chemical reactions. Microwave chemical processes are expected to replace conventional energy-intensive processes by accelerating catalytic reactions, lowering reaction severity, and saving energy consumption. In addition, microwave processes can be used for the production of chemicals and materials by using electricity derived from renewable sources. Although many previous works demonstrated microwave-accelerated catalytic reactions, most of their mechanisms are not clearly understood. This talk is going to introduce our recent research on the mechanistic analysis of catalytic reactions accelerated by microwaves using in situ and operando spectroscopies. We are also applying these microwave effects to various chemical reactions such as CO_2 recovery, water oxidation, and biomass conversion (Figure 1).

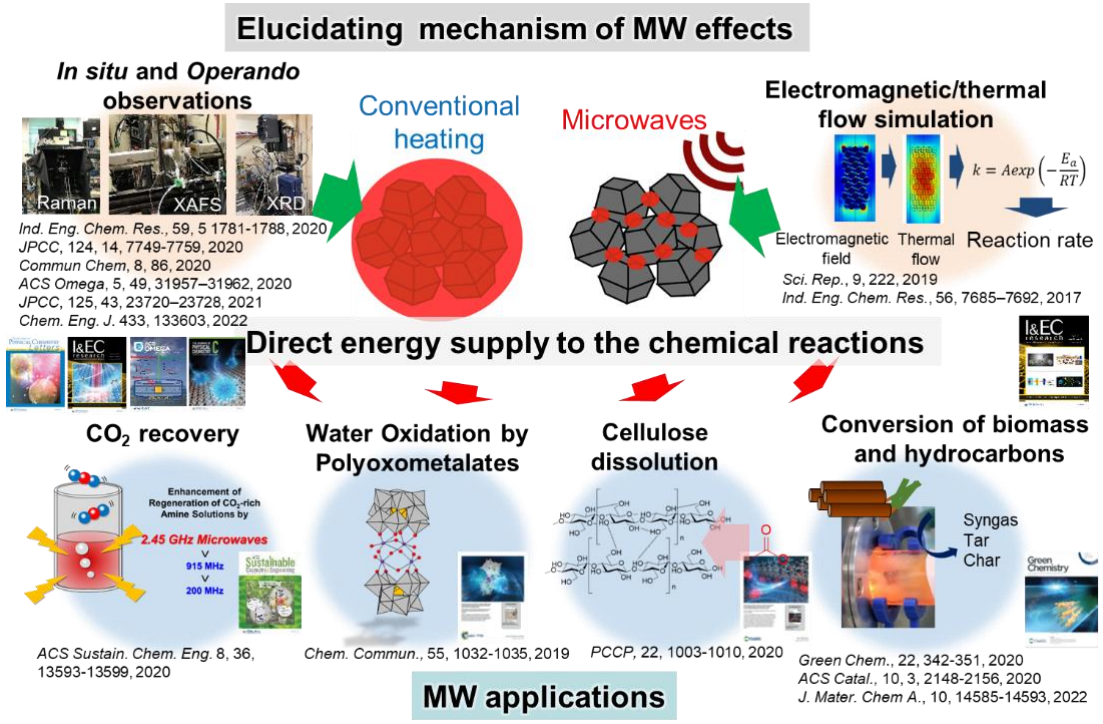

Figure 1. Schematic of microwave chemistry research