

Synthesis of Fuels and Chemicals by Catalytic Conversion of Inedible Biomass

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【Outline of survey】

Great attention has been paid to the utilization of biomass as chemical resources to combat global warming and a rapid increase of crude oil price. Our goal is the efficient use of resources and energy in chemical processes by using heterogeneous catalysts, and we have recently succeeded in the first selective cracking of cellulose under hydrogenolysis conditions over supported metal catalysts. Purpose of this project is to synthesize metal nanoparticles and acid/base sites in ordered mesoporous materials and to evaluate their catalysis in conversion of inedible biomass into fuels and chemicals. Until now, biomass conversion has been studied using enzymes, sulfuric acid, etc., but we aim to develop new environmentally-benign catalytic processes with high efficiency. Research items include the development of selective conversion of cellulose, hemicellulose, glycerol and sorbitol and the design of multifunctional catalysts consisting of metal nanoparticles and acid/base sites in the mesoporous materials.

【Expected results】

Heterogeneous catalysis takes advantage of wide application scope of chemical processes, and we can expect to develop highly efficient reactions for conversion of biomass and sugar-related compounds. The catalytic processes for utilizing inedible biomass will be extremely effective to combat global warming. Furthermore, the synthesis of the multifunctional catalysts consisting of acids, bases and metal nanoparticles would show general guidelines for rational design of environmentally-benign green catalysts.

【References by the principal investigator】

- A. Fukuoka, J. Kimura, T. Oshio, Y. Sakamoto and M. Ichikawa, "Preferential Oxidation of Carbon Monoxide by Platinum Nanoparticles in Mesoporous Silica", *J. Am. Chem. Soc.*, **129** (33), 10120-10125 (2007).
- A. Fukuoka and P. L. Dhepe, "Catalytic Conversion of Cellulose into Sugar Alcohols", *Angew. Chem. Int. Ed.*, **45** (31), 5161-5163 (2006).

【Term of project】 FY2008—2012

【Budget allocation】

143,700,000 yen (direct cost)

【Homepage address】

<http://www.cat.hokudai.ac.jp/fukuoka/index.htm>