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Research Fields

Chemical Reaction Engineering
Catalytic Reaction Engineering
Catalyst & Environmental Chemical Process

Keywords

Solid catalyst, Micro-meso Porous material, Biomass Petrochemical, Efficient utilization of fossil resource

1. Scope of Research

Our focuses are to synthesis functional materials including solid catalysts and to design the catalyst based on chemical & catalytic reaction engineering. We synthesize new materials, by which catalytic reaction processes are developed for solving the environmental/energy problems.

2. Research Topics

Synthesis of nano-zeolites and their application

Zeolite, crystalline aluminosilicate, possesses solid acidity with ordered-microporous structure. Preparation for nano-zeolites with crystal size below 100 nm and their application to light olefin synthesis are examined.

- Preparation of mono-dispersed nano-zeolite
- Preparation of aluminoferrisilicate
- Synthesis for C_2～C_4 light olefins by nano-zeolite catalyst

Birdcage-type catalyst encapsulating metal nanoparticle

Amorphous silica and zeolite are porous materials with the pore sizes of below 1.0 nm. Preparation of "Birdcage-type catalyst" encapsulating metal nanoparticles is examined.

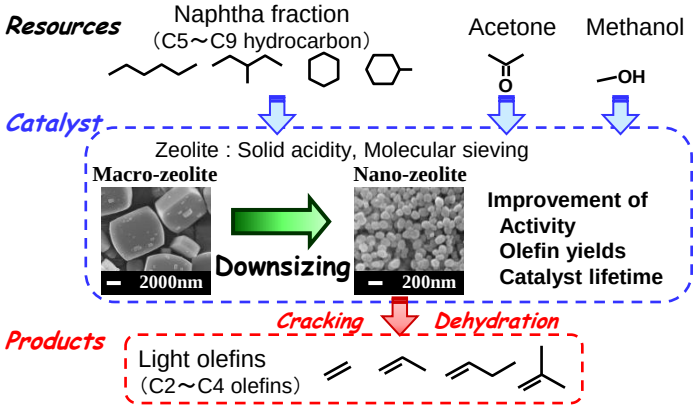
- Preparation of Birdcage-type catalyst in emulsion solution
- Verification of resistance to sintering
- Confirmation of molecular-sieving effect

Production of useful chemicals from untreated hydrocarbon resources

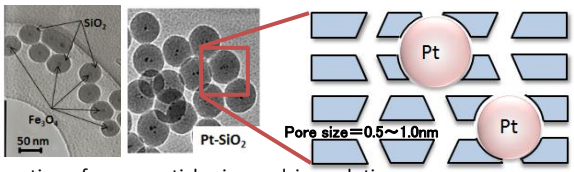
Conversion of unused hydrocarbon resources into useful chemicals is one of the most important issues. Petrochemical-related useful chemicals are produced by catalytic decomposition and hydrocracking of the untreated hydrocarbon resources.

- Dehydration of polyol
  Propylene and allyl alcohol production from glycerol
  Butadiene production from erythritol
- Hydrocracking of C-C bonds in biomass molecules
  Aromatics and phenols production from lignin and low-rank coal

light olefin synthesis over nano-zeolite catalyst

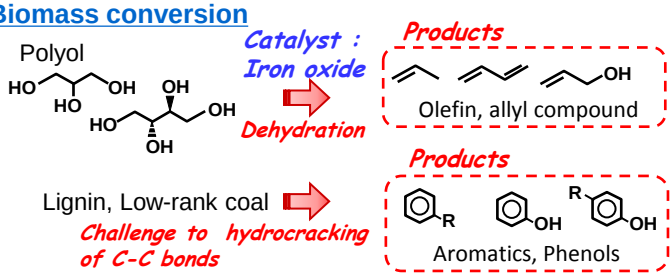


Birdcage-type catalyst



Preparation of nano-particles in emulsion solution
→Formation of porous materials (silica or zeolite) on the nanoparticle

Biomass conversion



3. Publications and Activities

Papers	H. Konno, T. Tago, *et al.*, Catal. Sci. Technol., 4, pp. 4265–4273 (2014); A. Konaka, T. Tago, *et al.*, Appl. Catal. B, Environ., **146**, pp. 267-273 (2014); T. Tago, et al., Catal. Surveys from Asia, **16**, pp. 148-163 (2012); T. Tago, et al., Appl. Catal. A, Gen., **403**, pp. 183– 191 (2011)
Patent	Japan Patent 4680515 "Nano-crystalline zeolites and their synthesis method", *etc.*
Project	NEDO Industrial Technology Research Grant Program (2008-2010), *etc.*
Award	Award for Young Scientist, the Catalysis Society of Japan (2009), Award for Young Scientist, Hokkaido University (2015) , *etc.*