Chemical kinetics and CFD for carbon resource conversion

Koyo Norinaga
Department of Chemical Systems Engineering
Nagoya University

The seminar will be focused on our recent approaches toward better understanding of thermochemical conversions of carbon resources such as coal and biomass are presented. The topics will include:

- detailed chemical kinetic model for whole process included in biomass thermochemical conversion, where the detailed chemical kinetic model of primary pyrolysis of lignin was integrated with that of the secondary pyrolysis by providing rate constants for monolignol decompositions with quantum chemical calculations;
- coupling a detailed chemical kinetic model with fluid dynamics where the coke oven gas reforming in a 3 m long bench scale reactor is predicted by a Large Eddy Simulation coupled with an extended flamelet/progress variable approach;
- power-to-gas (CH₄) process development toward closing carbon cycle, where we are developing an in-house code based on the OpenFOAM, which handles the chemical reaction and the multi-phase heat transfer in a shell and tube type CO₂ methanation reactor.

Short Bio
1999 Ph.D Hokkaido University, Sapporo, Japan
1999 Assistant Professor, Tohoku University, Sendai, Japan
2002 Humboldt fellow, Karlsruhe Institute of Technology, Karlsruhe, Germany
2006 Associate Professor, Hokkaido University
2009 Associate Professor, Kyushu University, Fukuoka, Japan
2017 Professor, Nagoya University, Nagoya, Japan
2018 Director, Institute of Materials Innovation, Nagoya University

References