澳門大學
UNIVERSIDADE DE MACAU
UNIVERSITY OF MACAU

應用物理及材料工程研究院
INSTITUTO DE FÍSICA APLICADA E ENGENHARIA DE MATERIAIS
INSTITUTE OF APPLIED PHYSICS AND MATERIALS ENGINEERING

IAPME Seminar

Current research trends for target-oriented WGS reactions dealing with diverse types of resources

9 January 2025

Prof. Hyun-Seog ROH
Yonsei University

Venue: N23-4018
Time: 15:30 – 16:30
Hosted by: Prof. Hui PAN

Abstract

Extensive studies are being carried out for new and renewable energies. Hydrogen is receiving special attention, and research on upcycling energy resources, including natural gas, coal, waste, and biomass, is in the spotlight. Catalytic reactions are often essential for producing high-value chemicals from these resources. The water–gas shift (WGS, $CO + H_2O \rightarrow CO_2 + H_2$) reaction is one of the most useful catalytic pathways for upcycling various types of synthesis gas. Currently, the application range of WGS reactions has further expanded to the upcycling of waste, biomass, and coal-derived synthesis gas. However, the reaction conditions and catalysts should be carefully customized for each resource by considering their characteristics. In this study, we have focused on the reaction conditions and catalysts for the WGS reactions that have dealt with various types of feed gases over the last 10 years to understand the development progress. Based on the categorization (by the type of feed gas), we carefully compare the tested catalysts, capacity, temperature, feed gas composition, steam-to-carbon ratio, and catalyst performance. We provide insight into the current research trends and perspectives for target-oriented WGS reactions in each type of feed gas source, which can give clues for customization.

Biography

Professor Hyun-Seog Roh received his Ph.D. in Chemical Engineering from Yonsei University in Seoul, South Korea, in 2001. Currently, he is a Director of the BK 21 FOUR project and a Full Professor of the Department of Environmental and Energy Engineering at Yonsei University in Wonju, South Korea. He began his career at Yonsei University in 2008, after a research career at the Korea Research Institute of Chemical Technology, Pacific Northwest National Lab. in Richland, and the Korea Institute of Energy Research. Professor Roh serves on the editorial boards of Journal of CO2 Utilization, Catalysts, and Applied Sciences. His achievements include the publication of more than 237 papers in scientific literature and 29 patents. For the fourth consecutive year, he has been named in the world's top 2 percent of scientists list selected by Professor John Ioannidis from Stanford University published in PLOS Biology. His research interests are primarily in environmental catalysis, including catalyst design, manufacture, characterization, and application, as well as reactor design for hydrogen production through reforming and the water-gas shift reaction.