Development of Silica-Based Microporous Membranes for Advanced Molecular Separations

Hiroki Nagasawa
Chemical Engineering Program, Graduate School of Advanced Science and Engineering, Hiroshima University

Abstract:
Membrane-based separation is an essential unit operation to achieve sustainable chemical production because of its simple process, small footprint, and high energy efficiency. To make the membrane-based separation more competitive, the development of membranes with both high permeance and high selectivity is highly desirable. Silica membranes are a class of microporous inorganic membranes, which have been utilized in many molecular separation applications. Since the molecular sieving mechanism governs the separation through these membranes, precise control of microporous structure is fundamentally essential to achieving efficient separation. In this talk, I will introduce our research on the design and development of silica-based microporous membranes and their applications to challenging molecular separations, such as hydrogen separation at high temperature, organic solvent dehydration, and ultra-high-pressure reverse osmosis. I will also introduce the application of silica-based membranes for catalytic membrane reactors.

Biography:
Dr. Hiroki Nagasawa is an assistant professor of Chemical Engineering Program at Hiroshima University. He received his B.S. in chemical engineering (2007), M.S. (2009), and Ph.D. (2012) in Environmental Studies from the University of Tokyo. His research activities involve the development and application of microporous inorganic membranes for molecular separation. His specialization is in the facile synthesis of inorganic membranes and thin films such as silica, organosilica, titania, and carbon via plasma-assisted processing. He has also looked into the transport mechanisms of gases and liquids through microporous membranes for designing novel membrane-based separation processes. He has published 125 SCI journal papers, including *Journal of the American Chemical Society*. He received The SCEJ Award for Outstanding Young Researcher (2018) from The Society of Chemical Engineering.