

**Title** CO<sub>2</sub> Management by Mixed Matrix Membranes Containing Nanoparticles with Gas Permeable Nano-space

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**Date & Time** Wednesday, December 11, 2019 11:00 a.m.

**Place** I<sup>2</sup>CNER hall, I<sup>2</sup>CNER Bldg.1, Ito Campus, Kyushu University

**Abstract**

Membrane gas separation technology has become a promising alternative to conventional energy-intensive separation processes such as cryogenic method or a sorption approach in a variety of applications including air separation, hydrogen recovery and production, natural gas sweetening, carbon dioxide separation from flue gas. Because the membrane technology has excellent advantages such as greater energy efficiency, simplicity in operation, a smaller footprint, ease of scale-up and environmental friendliness. In particular, CO<sub>2</sub> separation or capture from flue gases by the technology is of great interest from the perspective of greenhouse gas emissions and environmental health. At least approximately 20% of CO<sub>2</sub> reduction is expected to be able to be achieved by applying Carbon dioxide Capture and Storage (CCS) using the membrane technology to the large point sources, such as power plant and ironworks plant.

The fabrication of mixed matrix membranes (MMMs) has been investigated intensively with a view to using for such gas separation applications. We present an MMM containing surface-modified non-porous nanoparticles (NP). The gas permeability of MMM containing NP increased with the increase in NP concentration, and the enhancement effects occurred with the formation of micro and meso pore by the assembly of NPs confirmed using the nitrogen-adsorption/desorption and <sup>129</sup>Xe NMR measurements. The gas permeation data of the resulting MMM exhibited above the 2008 Robeson's upper bound line for the CO<sub>2</sub>/N<sub>2</sub>, CO<sub>2</sub>/CH<sub>4</sub>, and O<sub>2</sub>/N<sub>2</sub> gas pairs. This strategy using anisotropic nanoparticle with large gas permeable space could be applied to the fabrication of MMMs for gas separations.

**About the Speaker**

DEGREE  
 Chemical Engineering (Waseda University)  
 Academic & Professional Experience  
 1991 -1993 Syracuse University, Research Associate

AWARDS  
 The 4th MIZUNO prize (1991)  
 Japan MRS Young researcher award(1996)  
 THE MEMBRANE SOCIETY OF JAPAN Research award (1999)  
 ALA and Porphyrin Research Society Award (2005)  
 Japan Society for Artificial Organs Article award (2005)  
 Who's Who in the World (2009)

**COMMITTEE**

- Advisor for the MEXT media texts production.
- Member for the METI committee for promoting carbon dioxide immobilization and utilization technology as well as the Carbon dioxide capture and storage committee
- Committee members for JSPS programs such as Research Fellowship and international projects
- Reviewers for overseas grants such as the Grant Agency of the Academy of Sciences of the Czech Republic, the National Research Council in Romanian Government and many others.

**Host:** Associate Professor Ikuo Taniguchi

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