

Important notes:

Do **NOT** write outside the grey boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this form. Simply enter your information into the boxes. The form will be automatically processed – if you alter its structure your submission will not be processed correctly.

Do not include keywords – you can add them when you submit the abstract online.

Title:

Bottom-Up Assembly of Highly Oriented MOF Membranes with MOF Nanosheet Gutter Layers for H₂/O₂ separation

Authors & affiliations:

Please do not include Personal Data (email address, postal address, etc.) in this field. Include only author names & affiliations

Y. Kimura¹, K. Nakagawa², S. Tanaka*¹
¹Kansai University, Japan; ²Kobe University, Japan

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

Preparation of Your Abstract

1. The title should be as brief as possible but long enough to indicate clearly the nature of the study. Capitalise the first letter of the first word **ONLY** (place names excluded). No full stop at the end.

2. Abstracts should state briefly and clearly the purpose, methods, results and conclusions of the work.

Introduction: Clearly state the purpose of the abstract

Methods: Describe your selection of observations or experimental subjects clearly

Results: Present your results in a logical sequence in text, tables and illustrations

Discussion: Emphasize new and important aspects of the study and conclusions that are drawn from them

Metal-organic framework (MOF) nanosheets are promising candidates for molecular sieve because of their structural diversity and minimized mass transfer barrier. However, design of appropriate MOF nanosheets and preparation of high-performance MOF nanosheet-based membranes, especially for gas separation, remains great challenges. Structural degradation may simultaneously occur with conventional exfoliation method, which has hindered its widespread application in high-performance molecular sieve membrane preparation. Even if nanosheets could be stacked, grain boundaries would form between the nanosheets, which could be applied to liquid separation but not to gas separation.

To address these challenges, we applied bottom-up growth of Zn₂(benzimidazole)₄ nanosheet to fabricate defect-free membranes. Zn₂(benzimidazole)₄ is composed of benzimidazole-zinc tetrahedral units and layers are connected by van der Waals interaction (**Figure 1left**). At first, the Zn₂(benzimidazole)₄ nanosheets were deposited onto a porous support to prepare gutter layer. Next, Zn-based amorphous layer was coated on the gutter layer and crystallized by benzimidazole vapor treatment (**Figure 1right**). Highly oriented Zn₂(benzimidazole)₄ nanosheet-based membranes were fabricated by anisotropically controlling crystallization. The prepared Zn₂(benzimidazole)₄ nanosheet-based membranes show separation performance in hydrogen purification with H₂/O₂ selectivity over 10 and H₂ permeance over 5000 GPU.

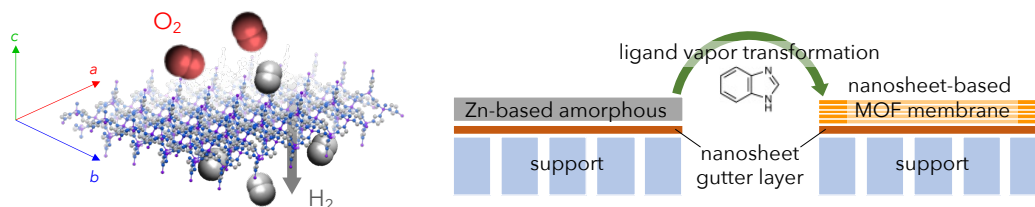


Figure 1 Schematic of Zn₂(benzimidazole)₄ nanosheet membrane (left) and concept of gutter layer assisted nanosheet-based membrane fabrication (right).