

WIPO GREENへの技術登録例



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POLLUTION & WASTE > CARBON CAPTURE & STORAGE

1 Membrane Separation Technology 1: Carbon Dioxide Separation

3 This study investigated the polymer membranes used in carbon dioxide (CO₂) separation. Carbon dioxide capture and storage (CCS) is a process of separating and collecting CO₂ emitted from large-scale CO₂ sources, such as industrial plants, and storing it in the ground or ocean. CCS is a CO₂ reduction countermeasure. However, this process entails a high cost of CO₂ separation and recovery. The polymer membrane separation method for CO₂ separation and recovery is an alternative to CCS that has generated wide interest. This technology is based on fluorine-containing polyimide composed of 4,4'-hexafluoroisopropylidene diphthalic anhydride (6FDA) and 2,3,5,6-tetramethyl-1,4-phenylene diamine (TeMPD). 6FDA-TeMPD, which is an imidazolium salt-based ionic liquid, has a higher CO₂ permeability and separation performance than the other polyimides. The composite membranes are prepared using polyimide, zeolite, and ionic liquid. In general, a void is generated between the polymer material and the inorganic material because of interface defects. Consequently, this void weakens the gas separation performance. By contrast, this technology achieves a high CO₂ separation performance by using the void caused by interface deficiencies as the fixed field for the ionic liquid.

4 TECHNOLOGY FEATURES

Technology categories Pollution & Waste > Carbon capture & storage

Benefits

Inclusion of CO₂-affinity liquid in a polymer membrane is one of the methods for improving CO₂ separation performance. However, adding large amounts of liquid in a polymer is generally difficult, and in many cases, the liquid leaks from the membrane. Even if large amounts of the liquid is added, withstanding the high pressure in the membrane is challenging because membrane strength decreases as liquid content increases. By contrast, in this technology, interface defects are intentionally formed by including zeolite in the polyimide. In addition, this technology restrains the effects of nonvolatile ionic liquids with high CO₂ affinity. The ionic liquids are kept in the voids with appropriate combination of polyimide, zeolite, and ionic liquid. As such, large amounts of ionic liquids and robust film strength can be possibly achieved. For example, 6FDA-TeMPD as the ionic liquid [BMIM][Tf₂N] and ZSM-5 as the zeolite can be combined. This combination can be used to improve the interface defects of the composite membrane and prepare a strong CO₂ separation membrane with ionic liquid over 50 wt%.

5 DEVELOPMENT STATUS

Readiness level (TRL) Technology development / prototype (TRL 5-6)

6 CONDITIONS FOR USE

Collaboration type R & D Contract or Research Collaboration

7 INTELLECTUAL PROPERTY

Type	Office	Number	Info
Registration	Japan	5283311	[Title of the invention] The modified porous support film and manufacturing method thereof
Registration	Japan	4647431	[Title of the invention] The gas separation membrane is crosslinked

8 ADDITIONAL INFORMATION

Reference papers [Download](#)

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Owner
Meiji University Center for Polymer Science

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Type Technology

Source Native

ID 10765

Meiji University Center for Polymer Science

EMAIL OWNER NO WEBSITE

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WIPO GREEN
トップページ

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(※2021年6月末時点のデータベース情報)

①技術タイトル

②書誌情報および図面
登録者情報、登録技術の公開日および更新日、図面。登録者について、コンタクト情報やホームページ情報等を登録可能。

③技術の要約

④技術の特徴
技術のカテゴリーや、技術のメリットの説明等について登録できる。

⑤開発段階
基礎研究段階から実装段階まで、複数の段階より選択できる。

⑥コラボレーションタイプ
ライセンス、販売、サービス、ジョイントベンチャー、研究協力等から選択できる。

⑦知財情報
特許に関する情報（公開番号や登録番号）を登録できる。**必須ではない。**

⑧追加情報
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