

# INNOVATIVE TECHNOLOGIEN FÜR DIE ZUKUNFT

## Chemie

### 16302 Switching of gas transport through metal-organic framework membranes by electric fields

#### Einleitung / Abstract

Als Anwendungsgebiete für die Erfindung werden gesehen: Sensorik, Speichern und Freisetzen von Gasen, Biomedizintechnik, Air Conditioning, CO<sub>2</sub> Capture and Storage, Paraffin/Olefin Trennung, Triggered Release

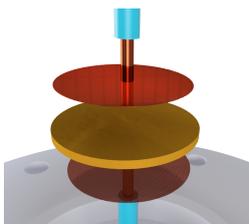


Abb. 1: Membrane is used as capacitor, when applying an electric field the MOF lattice is stiffened, thereby the material is altered.

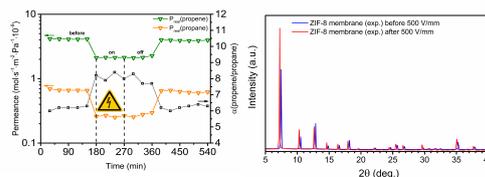


Abb. 2: Improvement of gas separation properties through enhanced molecular sieving.

Abb. 3: XRD of the lattice before and after polarization. Strain is induced in the lattice, which improves stiffness and reduces flexibility.

#### Technology Readiness Level (TRL)

TRL 8

#### Patentsituation

Land: WO

Code: 2018010951 A1

Status: regionalisiert in EP

Land: EP

Code: 3445476 A0

Status: anhängig

#### Service

Lizenz zur gewerblichen Nutzung

Industriekooperation

Patentverkauf

#### Stichworte

CO<sub>2</sub> Capture And Storage, Electric Fields, Energie- und Energiespeichertechnik, Gas Separation Membranes, Metal-Organic Frameworks, Molecular Sieving, Nanotechnologie, Paraffine / Olefine Separation, Triggered Release, Umwelttechnik, Verfahrenstechnik

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#### Hintergrund

Processes for the production of MOF membranes as supported thin layers are known.

The application of electric fields in membrane separation is described in US 6043066: biological cells with an electrical charge are separated by a membrane under the influence of an electric field.

There are examples to control and switch the transport of charged molecules through membranes by means of electric fields.

#### Problemstellung

A disadvantage of the separation performance of the metal-organic framework material membranes mentioned above is that they show flexibility and gas separation performance is lowered by that. Furthermore, the MOF membranes are called "molecular sieves" but they show no clear molecular sieving properties.

### Lösung

It is an object of the present invention to provide a technique for the control of gas transport through the membrane which makes it possible to fine-tune gas flux and gas composition which go through the membrane.

This goal is achieved by using electric fields, sharpen molecular sieving and stiffen the network.

### Vorteile

- In the novel process, gas transport through a supported MOF membrane, a self-supporting MOF membrane and a Mixed Matrix Membrane containing MOF crystals as filler can be controlled.
- The novel process is particularly suitable for the production of gas mixtures with a certain composition and for the switch of the amount of gas passing the membrane.
- By applying the electric field, gas flow through the membrane can become higher or lower and the selectivity of the separation can become higher and lower.
- The passage of the components of a gas mixture through the membrane can be tuned by electric fields.

### Anwendungsbereiche

Chemical Synthesis and Purification, Industrial Membrane Separation Processes, Triggered Release of Substances