

# Engineering

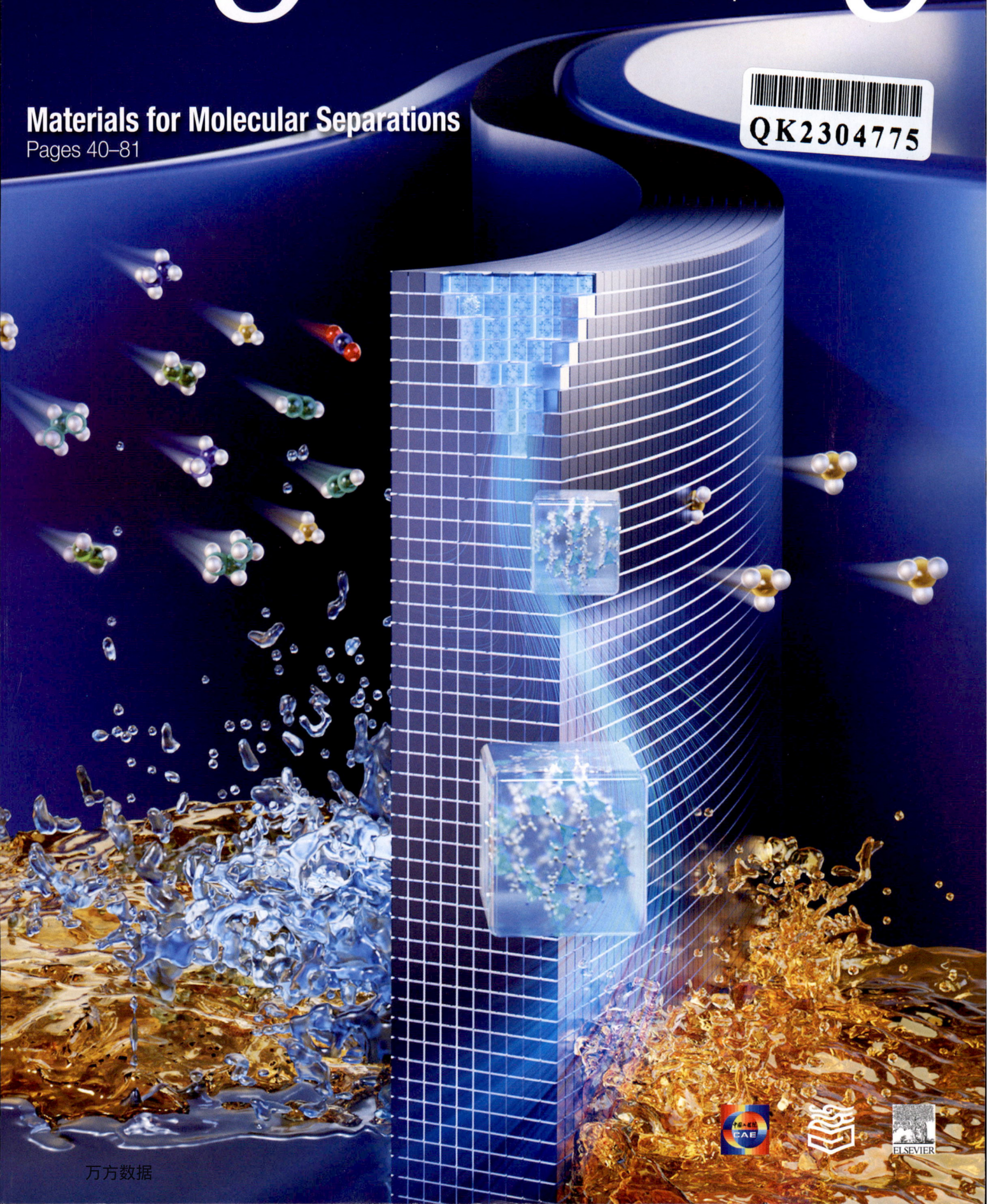
April 2023

**Materials for Molecular Separations**

Pages 40–81



QK2304775





## Editorial

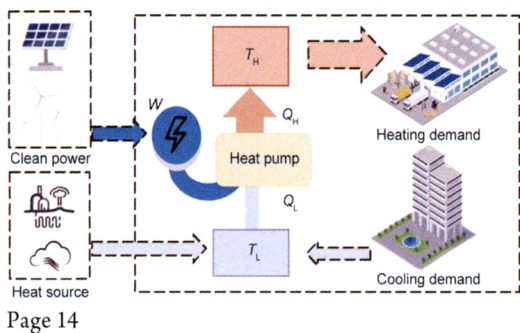
- 1    Advancements in MOF-Based Engineered Materials for Efficient Separation Processes  
Qilong Ren

## News & Highlights

- 3    Genomic Sequencing Costs Set to Head Down Again  
Robert Pollie
- 7    European Union Legislates Charging Port Standard  
Chris Palmer
- 10   First Supercomputer Breaks Exascale Barrier, with More Expected Soon  
Mitch Leslie

## Views & Comments

- 13   The Underestimated Role of the Heat Pump in Achieving China's Goal of Carbon Neutrality by 2060  
Hongzhi Yan et al.



- 19   Photo-Based Advanced Oxidation Processes for Zero Pollution: Where Are We Now?  
Dawei Wang et al.
- 24   Can Food–Energy–Water Nexus Research Keep Pace with Agricultural Innovation?  
Jie Zhuang et al.
- 29   Cannabis, Cannabidiol, Cannabinoids, and Multigenerational Policy  
Albert Stuart Reece et al.

- 33   Thoughts on China's Integrated Circuit Chip Manufacturing in the Post-Moore Era  
Hanming Wu et al.

## Research

- Materials for Molecular Separations—Review**
- 40   Mixed-Matrix Membranes Containing Porous Materials for Gas Separation: From Metal–Organic Frameworks to Discrete Molecular Cages  
Ziqi Yang et al.

- Materials for Molecular Separations—Article**
- 56   Robust Metal–Organic Frameworks with High Industrial Applicability in Efficient Recovery C<sub>3</sub>H<sub>8</sub> and C<sub>2</sub>H<sub>6</sub> from Natural Gas Upgrading  
Shikai Xian et al.

- 64   Guest Solvent-Directed Isomeric Metal–Organic Frameworks for the Kinetically Favorable Separation of Carbon Dioxide and Methane  
Dan Lai et al.

- 73   Membrane Contact Demulsification: A Superhydrophobic ZIF-8@rGO Membrane for Water-in-Oil Emulsion Separation  
Jiahui Gu et al.

- Material Science and Engineering—Article**
- 82   AIE-Active Freeze-Tolerant Hydrogels Enable Multistage Information Encryption and Decryption at Subzero Temperatures  
Xiaojie Sui et al.

- Medical Engineering—Article**
- 90   Bayesian Inference and Dynamic Neural Feedback Promote the Clinical Application of Intelligent Congenital Heart Disease Diagnosis  
Weimin Tan et al.

- Clinical Engineering—Article**
- 103   Novel Genetic Risk and Metabolic Signatures of Insulin Signaling and Androgenesis in the Anovulation of Polycystic Ovary Syndrome  
Xiaoke Wu et al.

# Contents

## Animal Nutrition and Feed Science—Perspective

- 112 Nutrient Sensing for the Future of Land-Farmed  
Animal and Aquaculture Nutrition  
Zongyu Gao et al.

## Food Safety and Health—Review

- 118 Structures and Functions of Cuticular Wax in  
Postharvest Fruit and Its Regulation: A  
Comprehensive Review with Future Perspectives  
Weijie Wu et al.

## Electrical and Electronic Engineering—Article

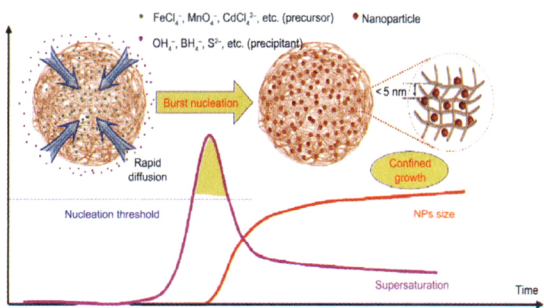
- 130 Lightning Flashover Characteristics of a Full-Scale  
AC 500 kV Transmission Tower with Composite  
Cross Arms  
Qian Wang et al.

## Air Pollution Control—Article

- 138 Trends, Drivers, and Mitigation of CO<sub>2</sub> Emissions in  
the Guangdong–Hong Kong–Macao Greater Bay Area  
Ya Zhou et al.

## Water Pollution Control—Article

- 149 Commercial Gel-Type Ion Exchange Resin Enables  
Large-Scale Production of Ultrasmall Nanoparticles  
for Highly Efficient Water Decontamination  
Sikai Cheng et al.



Page 153

## Advanced Antennas for Wireless Connectivity—Article

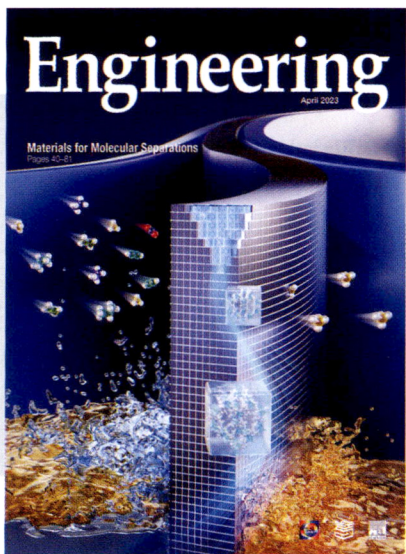
- 157 Diversity Glass Antennas for Tri-Band WiFi  
Applications  
Peng Fei Hu et al.

## Biomimetic Robot—Article

- 170 Flagellar/Ciliary Intrinsic Driven Mechanism  
Inspired All-in-One Tubular Robotic Actuator  
Jiaqi Miao et al.

## Additive Manufacturing—Article

- 181 Predictions of Additive Manufacturing Process  
Parameters and Molten Pool Dimensions with a  
Physics-Informed Deep Learning Model  
Mingzhi Zhao et al.



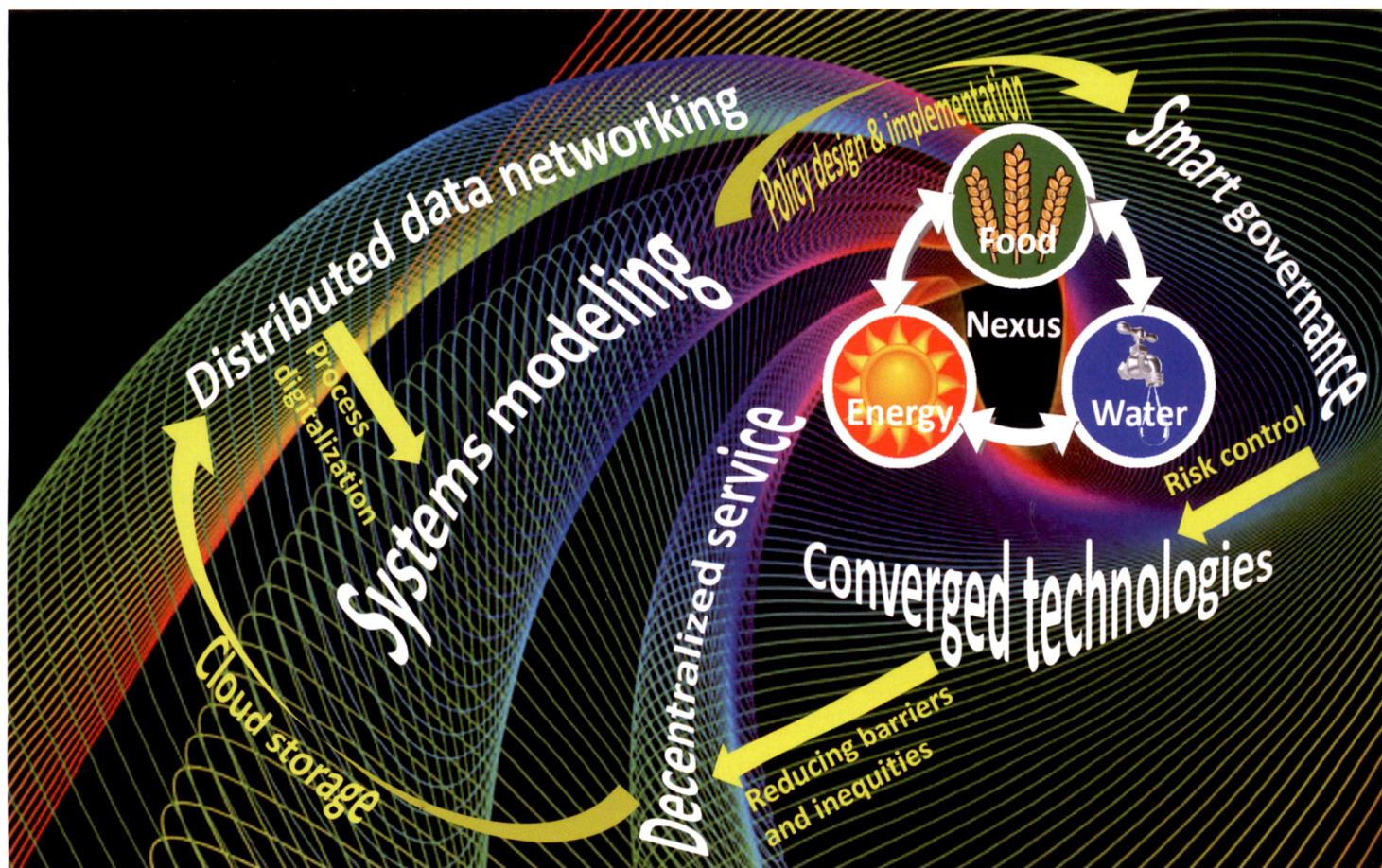
### ON THE COVER

This cover showcases the mixed-matrix membranes (MMMs) incorporating metal–organic framework (MOF) porous materials that are used for efficient gas and oil–water separation in the petrochemical industry. These membranes represent a significant breakthrough and transformation in separation engineering, due to the advancement of engineered materials based on MOFs in recent years. The porous MOF materials endow MMMs with versatility and diversity, as well as superior separation performance. This special issue examines various strategies that integrate porous materials and polymer matrices to enhance interfacial morphology and achieve equilibrium-kinetic combined selectivity.



# Engineering Science and Technology

## Create a Better Future



A system-of-systems approach enables integration of distributed data networking, systems modeling, decentralized services, converged technologies, and smart governance. This approach is transdisciplinary (i.e., convergence across boundaries), actionable (i.e., policy-accepted across sectors), transferable (i.e., practically applicable to different communities), and scalable (i.e., local solutions to regional problems).

**Engineering** is intended to provide a high-level platform where academic achievements of great importance in engineering science and technology can be disseminated and shared.

Supervised by  
Chinese Academy of Engineering  
Administered by  
Center for Strategic Studies, CAE, China  
Higher Education Press, China  
Open Access  
<http://www.engineering.org.cn>  
<http://www.journals.elsevier.com/engineering>

万方数据

Contact Information  
E-mail: [engineering@cae.cn](mailto:engineering@cae.cn)  
Tel: 0086-10-58582511  
Subscription Information  
Print: ISSN 2095-8099  
Online: ISSN 2096-0026  
Published by  
China Engineering Science Press Co., Ltd.

Orders and Inquiries  
China Engineering Science Press Co., Ltd.  
Floor 25, Fusheng Building,  
No.4 Huixindong Street,  
Chaoyang District,  
Beijing 100029, China  
Tel: 0086-10-58582252  
Fax: 0086-10-58582494

ISSN 2095-8099



9 772095 809233

Available online <http://www.engineering.org.cn>

工程 (英文)  
CN 10-1244/N  
Distribution code Q1849  
国内发行代号 80-744