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## **Cover story**

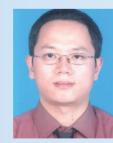
## (Wei Wang, Yanying Wei, Jiang Fan, Jiahao Cai, Zong Lu, Li Ding, Haihui Wang, pp. 793-819)

Membrane-based separation technologies have received increasing attention attributing to lots of advantages such as the low energy consumption, easy operation, and environmental friendliness. Two-dimensional (2D) materials have emerged as a class of promising materials to prepare high-performance 2D membranes for various separation applications. The precise control of the interlayer nano-channel/sub-nanochannel between nanosheets or the pore size of nanosheets within 2D membranes enables 2D membranes to achieve promising molecular sieving performance. To date, many 2D membranes with high permeability and high selectivity have been reported, exhibiting high separation performance. This review presents the development, progress, and recent break-through of different types of 2D membranes, including membranes based on porous and non-porous 2D nanosheets for various separations. Separation mechanism of 2D membranes and their fabrication methods are also reviewed. Last but not the least, challenges and future directions of 2D membranes for wide utilization are discussed in brief.



Author: Prof. Yanying Wei received her Ph.D. degree under the supervision of Prof. Haihui Wang at South China University of Technology in 2013. During 2013–2015, she worked as a Humboldt research fellow in Prof. Juergen Caro's group at Leibniz University of Hannover. She is currently a professor in the School of Chemistry & Chemical Engineering at South China University of Technology. Her research focuses on novel 2D nanosheets membranes, MOF membranes for various separation and catalytic membrane reactors. She has published over 70 peer-reviewed journal papers at *Nat. Sustain.*, *Nat.* 

Commun., Sci. Adv., JACS, Angew. Chem. Int. Ed., etc., 2 co-authored monographs and held 39 patents.



Author: Prof. Haihui Wang received his Ph.D. degree from Chinese Academy of Sciences in 2003. After a two year study as an Alexander von Humboldt Research Fellow in Institute of Physical Chemistry and Electrochemistry, Leibniz University of Hannover, Germany, he continued his study here as a postdoctoral fellow till 2007. During 2007–2020, he worked in South China University of Technology. From 2020, he is a full professor at Tsinghua University, China. His interests focus on inorganic membranes, membrane reactor, and energy materials. He has published over 220 peer-reviewed journal papers at

Nature Energy, Nat. Sustain., Nat. Commun., Sci. Adv., JACS, Angew. Chem. Int. Ed., AIChE J., Adv. Mater., etc. with citation of over 16400, and held 50 patents, H-index of 67.

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