VIDEO ARTICLE

Vid. Proc. Adv. Mater., Volume 3, Article ID 2203250 **(2022)**

Chemistry of Two-Dimensional Nanomaterials for Energy Storage and Membrane Technology

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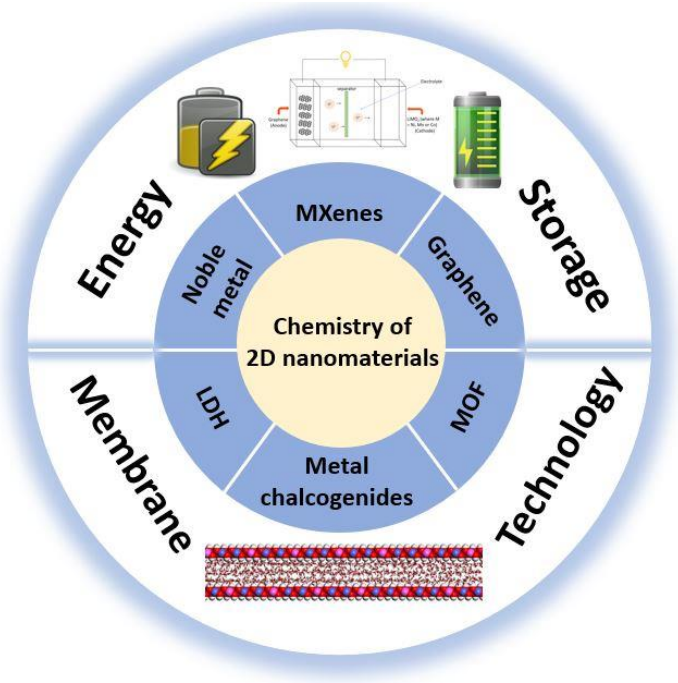
DOI: 10.5185/vpoam.2022.03250

Graphical Abstract



Abstract

The chemistry of two-dimensional (2D) nanomaterials is important in energy storage and membrane technology. The presentation will primarily focus on 2D nanomaterials such as noble metals, MXenes, and graphene for energy storage and conversion, such as traditional Li batteries to emerging Zn batteries, as well as electrocatalysis for clean renewable hydrogen fuel production. Furthermore, porous membranes comprised of 2D interlayers constituted of layered double hydrogen (LDH), metal chalcogenides, and metal organic frameworks (MOFs) will be discussed in applications for water purification and the recovery of valuable organic solvent in pharmaceutical industries. The correlation of the unique properties and rational design of 2D nanomaterials with respect to their performances in energy storage and conversion, as well as membrane technology applications, will be described using experimental data and computational simulations. Finally, an innovative approach to using

advanced three-dimensional (3D) printing technology (i.e., aerosol jet printing) of two-dimensional graphene-based materials for Zn batteries and membrane technology will also be discussed.

Keywords: Nanotechnology; 2D nanomaterials; energy storage; membrane technology.

Acknowledgements

Prof. Edison Ang gratefully acknowledge the NAMIC-NTUitive and NIE-SUG Funds for supporting his research works.

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Biography of Presenting Author

Edison Huixiang Ang is currently an Assistant Professor at the National Institute of Education/Nanyang Technological University. He is also a member of the institutes of higher learning of Singapore Battery Consortium and Singapore Membrane Consortium. He received his PhD from Nanyang Technological University's Interdisciplinary Graduate School and worked as a Postdoctoral Fellow at both the National University of Singapore and Nanyang Technological University of Singapore, as well as a Visiting Scholar at the Technical University of Munich in Germany. Prof. Edison Ang's research interests combine nanotechnology and materials science approaches to develop functional nanostructures for advanced energy storage, electrocatalysis, and membrane technology applications. He is widely recognized for his pioneering design of high-performance nanofiltration membrane based on two-dimensional metal organic framework. This type of membrane allows for ultra-fast water permeation that is up to two orders of magnitude faster than that of commercial polymer membranes, with a rejection percentage of nearly 100 percent. As a young researcher, Prof Edison Ang has published 57 publications with more than 90% of them appearing in Tier 1 journals plus 3 patents and recognized as outstanding scientists and engineers in Southeast Asia in 2021.

Citation of Video Article

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