

ENERGYPOLIS SEMINAR

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Synthesis of MOF membranes via facile deposition in aqueous medium for different applications

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Metal-organic frameworks (MOFs) are porous crystalline materials built by metal clusters coordinated to organic ligands. Synthesis of MOFs have attracted great attentions in the last decade owing to its potential for a wide range of applications such as gas separation, dye adsorption, and catalysis etc. The development of MOF membrane further enhances the potential of this material in industrial applications. Membrane fabrication methods including in-situ growth, secondary growth, interfacial growth, dip-coating, spin coating, and electrochemical synthesis have been widely studied. However, most of these methods either require complicated operations or are time consuming. Therefore, there is still a strong demand to develop facile and time efficient deposition methods to fabricate MOF membranes.

In the first part, we employed surfactant-assisted synthesis for creating stable MOF suspension. Following by spin coating or dip coating, MOF membranes can be directly deposited on the α -aluminum oxide substrates or Al_2O_3 tubes. The high-quality MOF obtained were tested for dye adsorption. In the second part, we used cathodic deposition to fabricate MOF membrane without addition of any supporting electrolyte. The defect-free membranes were synthesized in 60 min without any post-treatment. The membrane showed the best combination of permeance vs. selectivity in the separation of C_3H_6/C_3H_8 mixture.

References:

- [1] H.-Y. Chi,[‡] S.-H. Hung,[‡] M.-Y. Kan, L.-W. Lee, C. H. Lam, J.-J. Chen, and D.-Y. Kang, Metal-Organic Frameworks for Dye Sorption: Structure-Property Relationships and Scalable Deposition of the Membrane Adsorber. *CrystEngComm*, 2018, 20, 5465-5474.
- [2] H. Ting,[‡] H.-Y. Chi,[‡] C. H. Lam, K.-Y. Chan, and D.-Y. Kang, High-Permeance Metal-Organic Framework-Based Membrane Adsorber for Removal of Dye Molecules in Aqueous Phase. *Environ. Sci. Nano*, 2017, 4, 2205-2214.



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Born in 1994 in Keelung, Taiwan, Heng-Yu graduated with a BSc in Applied Chemistry at National Chiao Tung University (NCTU) in 2016. From 2016-2018, she joined Prof. Dun-Yen Kang's group as a research assistant in the field of MOF membrane for dye adsorption at National Taiwan University (NTU). Currently, she is a master student at King Abdullah University of Science and Technology (KAUST). Her master research focuses on the cathodic electrochemical deposition of MOF membrane for propylene/propane separation.