Transverse Flow Carbon Nanotube Membrane (TFCM) - An innovative ultrapermeable membrane design

Elisa Y.M. Ang [1],*, Teng Yong Ng[1], Jingjie Yeo [2,3], Rongming Lin[1], Zishun Li [4], and **K. R. Geethalakshmi[1]**

[1]Nanyang Technological University, Singapore

[2]Massachusetts Institute of Technology, USA

[3]A*STAR, Singapore

[4]Xi'an Jiaotong University, P. R. China

The transverse flow carbon nanotube (CNT) membrane (TFCM) is a membrane design based on CNTs stacked horizontally one on top of another, forming hourglass slits that allow fast water passage while blocking solutes. Using molecular dynamics, we show that TFCM offers permeability a few orders of magnitude larger than conventional polymeric membrane, and even more than twice that of two-dimensional graphene slit membranes. In this presentation, we will delve into the reasons why this simple design enables such high permeability and good rejection performance. We will also look at the TFCM's performance with variation in CNT size and CNT layers. Though our simulations, we show that the TFCM design has much advantage over its axial flow CNT membrane counterpart. Our computational work provides evidence that transverse or outer flow CNT membrane is a simple and innovative design that could significantly improve future membranes' performance, reducing the energy cost of membrane separation process like desalination.

Biography

Elisa Ang is a PhD student in the School of Mechanical and Aerospace Engineering at Nanyang Technological University, Singapore. She received her Master's degree in Applied Mathematics from Delft University of Technology and Computer Engineering from the University of Erlangen-Nuremberg in 2015. Her current research topic is on the analysis of one- or -two dimensional materials in desalination processes. In this topic of 2D materials membrane design, she has published 6 papers in reputed journals and presented in 3 conferences over the past 3 years.

Notes: