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Atomically thin graphene membranes for novel separation processes

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Atomically thin 2D materials offer transformative opportunities as ultra-thin barriers and membranes for molecular separations. Pristine graphene and h-BN are impermeable to species larger than protons but the introduction of nanoscale defects in the 2D material lattice allows for the creation of size-selective nanoporous atomically thin membranes.
Here, I will discuss advances in 2D material synthesis and processing routes to realize i) large-area atomically thin gas barriers, ii) fully functional nanoporous atomically thin membranes for dialysis based molecular separations, iii) novel approaches for in-situ growth of nanopores in 2D materials, and iv) the development of methods to probe sub-nanometer to nanometer defects over centimeter scale single crystalline 2D materials. Specifically, I will focus on the role of defects and associated engineering challenges with quality and scalability for membrane applications.

References

Cheng et al. 2020 submitted
Kidambi P.R. et al. Adv. Mat. 2018
Prozorovska L. and Kidambi P.R. Adv. Mat. 2018
Kidambi P.R. et al. ACS App. Mat. & Int. 2018
Kidambi P.R. et al. Adv. Mat. 2017
Kidambi P.R. et al. Adv. Mat. 2017
Kidambi P.R. et al. Nanoscale 2017
Kidambi P.R. et al. Chem. Mat. 2014
Kidambi P.R. et al. Nano Letters 2013