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Graphene transmembrane nanofluidic devices: fabrication strategies and ion transport

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Propositions

Accompanying the Ph.D. thesis

Graphene transmembrane nanofluidic devices: Fabrication strategies and ion transport

1. To understand the mechanisms regulating proton transport across graphene, fabrication challenges should be solved first (Chapter 2 of this thesis).
2. Graphene delamination occurs because water intercalates between graphene and the hydrophilic substrate. Turning the substrate hydrophobic should prevent graphene flakes from lifting off (Chapter 3 of this thesis).
3. Proton transport in graphene competes with ion transport between the substrate and graphene. Isolating each factor is essential to shed light on the transport mechanisms (Chapter 4 of this thesis).
4. Microtome slicing would be a scalable method for producing graphene nanoribbons if graphene could be stably embedded in an epoxy matrix during the slicing process (Chapter 6 of this thesis).
5. In practical applications, devices require not only exceptional separation performance but also sufficient stability to withstand harsh conditions (Wang *et al*, *Chem Eng J*, **2025**, 508, 160721).
6. In graphene membranes, perfection in structure becomes imperfection in ion transport.
7. If vibrational or electronic methods allow *in situ* monitoring of the ion transport process, imaging techniques may no longer be important in characterizing membranes.
8. Theoretical studies are important to support an experimental hypothesis when the underlying mechanisms cannot be fully understood through experiments alone.
9. Hard work doesn't always pay off, but not working hard almost never does.
10. The hardest part of a PhD is staying motivated during long periods of self-doubt.

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