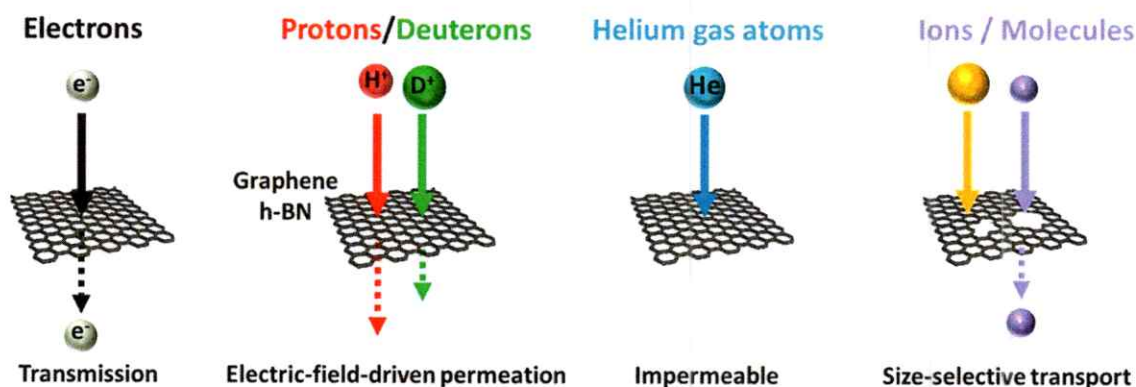


# Nanoscale Mass Transport in 2D and 1D Nanomaterials for Energy, Environment and Healthcare

2D and 1D nanomaterials offer fundamentally new opportunities to study, understand and control mass transport at the sub-nanometer-scale. Specifically, they allow for quantum tunneling and size-selective ionic/molecular transport/sieving. I will discuss our recent work in 2D material synthesis and processing to enable *i)* large-area atomically thin Helium barriers, *ii)* fully functional nanoporous atomically thin membranes for desalination, dialysis, and molecular separations, *iii)* bottom-up formation of nanopores in 2D lattices, *iv)* new approaches to probe sub-nanometer scale defects in centimeter scale 2D-single-crystals, *v)* size-selective defect sealing for functional large-area 2D membranes, *vi)* roll-to-roll manufacturing of atomically thin membranes, and *vii)* proton transport through atomically thin membranes for advancing energy conversion/storage and security. Finally, I will discuss transport in 1D nanomaterials (carbon nanotubes) for hemodialysis as well as some of our efforts to move these technologies to the commercial arena.



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