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Aiiso Yufeng Li Family Department of  
Chemical and Nano Engineering

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## DEPARTMENT SEMINAR

Wednesday, October 9th, 2024

11:00 AM - 12:00 PM

SME 248



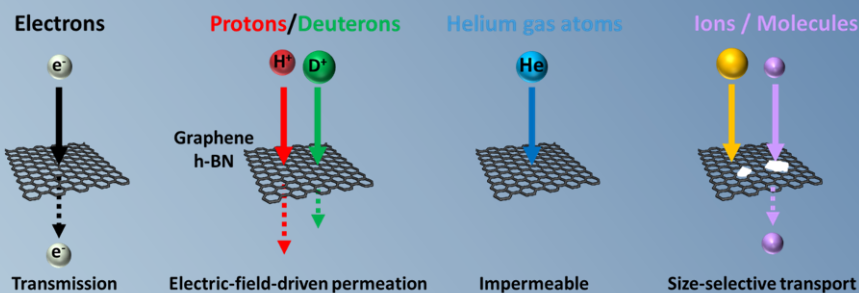
Dr. Piran Kidambi, PhD

*“Nanoscale Mass Transport in 2D and 1D Nanomaterials for Energy, Environment and Healthcare”*

Harrington Faculty Fellow, University of Texas at Austin

Assistant Professor, Chemical and Biomolecular Engineering, mechanical Engineering, Vanderbilt

**Abstract:** 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



**References:** [1] Moehring et al. *Nanoscale*, 2024 [2] Cheng P. et al. *Adv. Func. Mat.*, 2023 [3] Chaturvedi et. al. *Mat. Adv.* 2023 [4] Moehring et al. *ACS Nano*, 2022, [5] Cheng P. et al. *Nat. Comms.* 2022 [6] Naclerio A. *Adv. Mat.* 2022 [7] Chaturvedi P. et al. *J. Mat. Chem. A.* 2022 [8] Kidambi P.R. et al. *Science* 2021 [9] Cheng P. et al. *Nanoscale* 2021 [10] Cheng P. et al. *Nano Lett.* 2020 [11] Prozorovska L. and Kidambi P.R. *Adv. Mat.* 2018 [12] Kidambi P.R. et al. *ACS App. Mat. & Int.* 2018 [13] Kidambi P.R. et al. *Adv. Mat.* 2018 [14] Kidambi P.R. et al. *Adv. Mat.* 2017 [15] Kidambi P.R. et al. *Adv. Mat.* 2017

**Bio:** Piran R. Kidambi is a Harrington Faculty Fellow at the University of Texas at Austin and Assistant Professor at the Departments of Chemical and Biomolecular Engineering and Mechanical Engineering, Vanderbilt University (on-leave). After receiving his PhD from the University of Cambridge, he pursued postdoctoral research at MIT through a Lindemann Trust Fellowship. Kidambi's research leverages the intersection between (i) nanomaterial synthesis, (ii) process engineering, and (iii) in situ metrology, to enable bottom-up materials design and synthesis for energy, separations, and healthcare applications. His research has been recognized via several awards and honors including ASME Rising Star (2024), AIChE NSEF Young Investigator (2023), DOE Early Career Award (2022), ACS PMSE Young Investigator (2022), NSF CAREER (2020), ECS Toyota Young Investigator (2020), and Ralph E. Powe Junior Faculty Award (2018), among others.

Seminar Host: Zeinab Jahed