

Yue Yu

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EDUCATION

Yale University | Mentor: Prof. Victor Batista New Haven, CT
Major: Mechanical Engineering & Material Sciences August 2022-present

Duke Kunshan University (DKU)/Duke University GPA 3.972/4 August 2018-May 2022
Bachelor of Science in Molecular Bioscience (by Duke Kunshan) Kunshan, China
Bachelor of Science in Molecular Bioscience with track in Biophysics (By Duke) Durham, U.S.

- Thesis:
 - Size-Sieving Separation of Hard-Sphere Mixtures through Cylindrical Pores
 - Advisor: Prof. Kai Zhang, Ph.D.

RESEARCH EXPERIENCE

Research group of Prof. Myung-Joong Hwang, Ph.D May 2021-Aug 2021
Summer Research Scholar (SRS) Suzhou, China

- Research focused on the quantum entanglement strength of system of two coupled identical Rabi models, particularly at normal to superradiant phase transition
- Discovered the existence of a superradiance region with absolute zero entanglement, corresponding to a quantum (anti-)Jaynes-Cumming model, drew comparison with quantum Dicke model

Research group of Prof. Kai Zhang, Ph.D. Feb 2019-Apr 2021
Research Assistant Suzhou, China

The collision dynamics of hard spheres and cylindrical pores are solved exactly. Nonequilibrium event-driven molecular dynamics simulations are used to show that the permeability P of hard spheres of size σ through cylindrical pores of size d follow the hindered diffusion mechanism due to size exclusion as $P \propto \left(1 - \frac{\sigma}{d}\right)^2$. Under this law, the separation of binary mixtures of large and small particles exhibits a linear relationship between $\alpha^{-1/2}$ and $P^{-1/2}$, where α and P is the selectivity and permeability of the smaller particle, respectively.

- Set up C++ simulation program for diffusion across porous membranes of two types of hard-sphere particles differing in diameter, as well as processed and interpreted collected data
- Process involved C++ programming in Linux environment and data processing in Jupyter Notebook. Results show power law between permeation and particle size, along with linear relationship between $-1/2$ powers of permeation and separation factors. Have great implications for future designers of filtration membranes across disciplines
- Shared simulation code on GitHub

CONFERENCE PRESENTATION

Molecular Simulation of Gas Transport Through Cylindrical Pores Mar 2021
American Physics Society (APS) March Meeting 2021 Online

- Presented research under Prof. Zhang during the APS March Meeting 2021 in session J21, titled “Molecular Simulation of Gas Transport Through Cylindrical Pores”
- Gave 12-minute speech focusing on the Dual-Control Monte-Carlo simulation and Molecular Dynamical method applied in simulation, touching on preliminary results concluded from data
- Offered tutoring session for STATS 101, Introduction to Applied Statistical Methods to fellow undergraduates

PUBLICATIONS

- Yu, Y., & Zhang, K. (2021). Size-Sieving Separation of Hard-Sphere Mixtures through Cylindrical Pores. *ArXiv:2104.10881 [Cond-Mat]*. <http://arxiv.org/abs/2104.10881>