Cheng-Hsun Hsu

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EDUCATION

University of Texas at Austin (UT Austin), Austin, Texas *Aug 2024 – present*

PhD Student in Chemical Engineering

National Taiwan University (NTU), Taipei, Taiwan *Graduated in 2024*

MS in Chemical Engineering; Thesis title: Transport Phenomena of Small Molecules in MOF Membranes

National Taiwan University, Taipei, Taiwan *Graduated in 2022*

BS in Chemical Engineering; Overall GPA: 4.00/4.30 (3.92/4.00)

RESEARCH AND WORK EXPERIENCE

Milliron Group | UT Austin, Austin, Texas *Oct 2024 – present*

Graduate Research Assistant

- Synthesize **bimetallic nanomaterials for electrochemical applications**, such as electrochromic devices and electrocatalysis in fuel cells
- Investigate the relationships between crystal structures and their corresponding physical properties to enhance material performance

Dun-Yen Group | NTU, Taipei, Taiwan *Sep 2021 – Aug 2024*

Graduate Research Assistant

- Developed novel methods, like reactive interfacial reaction, and refine existing techniques, such as seeded growth, to **produce pure and continuous metal-organic framework (MOF) membranes** for CO_2/N_2, CO_2/CH_4, and H_2O/EtOH separations (e.g., CAU-10-H, MOF-303, and UTSA-280 membranes)
- Integrated polymeric materials and MOFs in various forms, including polymer-in-MOF, MOF-in-polymer, and MOF-on-polymer structures (e.g., PEG in $[Zn_2(bdc)_2ted]_n$ and CAU-10-H in 6FDA-mPDA/DABA)
- Investigated the molecular-level **mass transfer in MOFs** via advanced experimental and computational approaches, including solid-state NMR, first-principles calculation, Monte Carlo simulations, etc.
- Explored the diverse potential applications of MOFs, including their use in thermoelectric generators, solar steam generators, and sensors (e.g., MIL-53, MIL-68, CAU-10-H, MOF-235, ZIF-8, and UiO-66)

Department of Chemical Engineering | NTU, Taipei, Taiwan *May 2023 – Jan 2024*

Teaching Assistant for X-Ray Diffraction (XRD)

- Conducted training sessions on **1D XRD, 2D XRD, GIXRD, reciprocal space mapping, and pole-figure measurement** for users, covering both **powder and thin film** samples
- Maintained the operation of the diffractometer and upgrade the instrument to meet the demands of the users
- Assisted the user in analyzing XRD patterns using software such as Materials Studio, GSAS-II, etc.

Department of Chemical Engineering | NTU, Taipei, Taiwan *Fall 2023*

Teaching Assistant for Physical Chemistry

- Assisted the course on quantum mechanics and statistical mechanics

Cheng-Che Group | NTU, Taipei, Taiwan *Jul 2020 – Aug 2021*

Undergraduate Research Assistant

- Integrated a low-cost optical fiber and **a solution plasma generator** into a portable probe for detecting multiple heavy metals simultaneously
- Developed a pre-electrolysis method based on the Pourbaix diagram to improve the detection limit of heavy metals by locally increasing the metal concentration or depositing metal oxides on the electrode

PUBLICATIONS

1. **C-H Hsu**[1], C-Y Lin[1], H-Y Wang[1], et al. "Single-file diffusion and its influence on membrane gas separation: A case study on UTSA-280," ***Journal of Membrane Science***, 706 (2024), 122920.
2. M-H Lin[1], **C-H Hsu**[1], et al. "Correlating Framework Structures and Thermoelectric Performance of Metal-Organic Framework/Carbon Nanotube Thermoelectric Hybrids with N-P Type Inversion," ***Chemical Engineering Journal***, 485 (2024), 149732.
3. **C-H Hsu**, et al. "Fast Water Transport in UTSA-280 via a Knock-off Mechanism," ***Angewandte Chemie International Edition***, 62 (2023), 39, e202309874.
4. H-L Hung, T Iizuka, X Deng, Q Lyu, **C-H Hsu**, et al. "Engineering Gas Separation Property of Metal–Organic Framework Membranes via Polymer Insertion," ***Separation and Purification Technology***, 310 (2023), 123115.
5. H Yu[1], D-S Chiou[1], **C-H Hsu**[1], et al. "Engineering CAU-10-H for preparation of mixed matrix membrane for gas separations," ***Journal of Membrane Science***, 663 (2022), 121024.
6. T-N Hu, **C-H Hsu**, et al. "CAU-10-H as Efficient Water Sorbent for Solar Steam Generation," ***Journal of the Taiwan Institute of Chemical Engineers***, 141 (2022), 104593.
7. D-S Chiou, Y-C Chuang, C-K Chang, **C-H Hsu**, et al. "X-ray diffraction for probing free energy profiles and self-diffusivity of gases in metal-organic frameworks," ***CrystEngComm***, 24 (2022), 6302–6308.

CONFERENCE PRESENTATIONS

1. "Knock-Off Mechanism for Water Transport in UTSA-280 Membrane," *ZMPC 2024*, Osaka, Japan, 7/2024.
2. "Highly H_2 Selective Metal-Organic Framework Membrane with Restrained Transport of CO_2," *ICOM 2023*, Chiba, Japan, 7/2023.
3. "Growth of UTSA-280 Membranes for Gas and Liquid Separations," *2022 TwIChE Annual Meeting*, Kaohsiung, Taiwan, 1/2022.
4. "Development of a Home-Made and Low-Cost Probe for Heavy Metal Detection Using Plasmas in Solution with Plasma Spectroscopy," *APSPT-12*, Taipei, Taiwan, 12/2021.

LEADERSHIP & COMMUNITY INVOLVEMENT

International Student Volunteer | Office of International Affairs, NTU — *Sep 2022 – Jan 2023*

Student Representative | Department of Chemical Engineering, NTU — *Sep 2018 – Jun 2022*

Chief Director of Activities | A Cappella Club, NTU — *Feb 2019 – Jun 2020*

SKILLS

Instrumental analysis: SEM, STEM, EDS, XRD, TGA, DSC, GC, MS, FTIR, NMR, SAXS, and **HR PXRD**

Crystal and molecule analysis: **Rietveld refinement** and **molecular simulation (RASPA)**

Research software: **Material Studio**, Mercury, Zeo++, VESTA, GSAS-II, Diamond, VMD, IAST++, dmfit, Origin, Adobe Illustrator, Blender, EndNote, Zotero, Aspen+

Program language: Python, C++, and MATLAB

Language: Chinese (Native), English (TOEFL iBT score: 105), Japanese (JLPT N2)