Ping-Han(Bing) Wu

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Specialization: Separation Process, Electrochemistry, Polymer Science, Instrumental Analysis

Education

- **Stony Brook University** — Stony Brook, New York
  Ph.D. in Matetrial Science and Chemical Engineering — *Sept. 2023 - Dec. 2027(Anticipated)*
- **Chung Yuan Christian University** — Taoyuan City, Taiwan
  B.S. in Chemical Engineering — *Sept. 2018 - June 2022*

Experience

- **Electrochemical Decarbonization Engineering Lab** — Stony Brook, New York
  Graduate Researcher, Advisor: Prof. Hyowon Seo — *Jan. 2024 - Present*
  - **Electrochemical Carbon Capture**: Reduced cell voltage by **30.8%** in an electrochemical carbon capture system through current optimization, improving stability and energy efficiency.
- **R&D Center for Membrane Technology** — Taoyaun City, Taiwan
  Undergraduate Researcher — *Aug. 2020 - June 2022*
  - **Membrane Filtration Technology**: Fabricated thin-film composite membranes exhibiting **2–10x** higher water flux than conventional nanofiltration membranes while maintaining **99%** dye/salt selectivity.

Projects

- **Electrolyte Design for Stable Electrochemical Carbon Capture** — *Oct. 2025 - Present*
  - **Tuning Supporting Electrolyte and Additives**: Optimizing supporting electrolytes and additives to improve solubility and control molecular interactions, minimizing side reactions. Expecting to extend to the life span **twice**.
  - **Multiple Mediators System**: Exploring multi-mediator formulations to introduce controlled competing pathways and suppress undesired side reactions.
- **Joint Research with Hyundai/KIA on Pulsed Electrolysis** — *May 2025 - Dec. 2025*
  - **Current Strategy for redox mediator**: Applied pulsed and pulse–reverse current strategies to adjust electrode-electrolyte interface lowering cell voltage and energy consumption in Neutral Red–mediated electrochemical CO_2 capture.
  - **Dual Diffusion-Layer Modeling**: Developed a coupled diffusion–kinetic model to describe voltage stabilization and mass transport behavior under pulsed operation.
- **Membrane Engineering for Water Treatment Applications** — *Aug. 2020 – June 2022*
  - **Engineering Supports and Monomers for Polyamide TFC Membranes**: Fabricated nanofiltration membranes via interfacial polymerization and characterized structure–performance relationships using FTIR, SEM, AFM, UV–vis, and contact angle analysis to improve purification efficiency and durability.
  - **Chlorine-Tolerant Nanofiltration Membranes for Dye Desalination**: Conducted dye and salt separation tests to evaluate the enhanced stability and selectivity of modified thin-film composite membranes.

Publications

- **Impact of Substrate and Monomer Structure on TFC Nanofiltration Membranes**:
  P.H. Wu, M. R. Gallardo, M. B. M. Y. Ang, J. C. Millare, S.H. Huang, H.A. Tsai, and K.R. Lee,
  J. Polym. Res., **29**, 270 (2022).
- **Chlorine-Tolerant Nanofiltration Membranes via Cycloalkane-Based Interfacial Polymerization**:
  M. B. M. Y. Ang, Y.L. Wu, M.Y. Chu, **P.H. Wu**, Y.H. Chiao, J. C. Millare, S.H. Huang, H.A. Tsai, and K.R. Lee,
  Membranes, **12**(3), 333 (2022).
- **Current Strategies for Energy-Efficient Electrochemical CO_2 Capture**:
  P.H. Wu, T. A. Hatton, and H. Seo, *Unpublished manuscript.*

Presentations

- **Improving Electrochemical Carbon Capture with Pulsed Methods** — Montreal, Canada
  The Electrochemical Society (ECS) — *April 2025*
- **Substrate and Monomer Effects on TFC Membrane Performance** — Taichung City, Taiwan
  Polymer Society of Taiwan — *Jan. 2022*

Skills Summary

- **Programming & Data Analysis**: Python (NumPy, Pandas, SciPy, Matplotlib), Matlab
- **Experimental Techniques**: Chronopotentiometry, Cyclic Voltammetry, Echem cell desgin, UV–Vis, FTIR, XPS, SEM, AFM, GC, HPLC
- **Software & Tools**: Origin, Chemdraw, AutoCAD, LaTeX, Overleaf
- **Research Focus**: Electrochemical carbon capture, redox mediator, Flow battery, Membrane separation, Membrane modification