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RESEARCH INTERESTS

I am interested in advancing high-precision separation technologies that distinguishes single solutes for sustainable water treatment, energy storage, and resource recovery. My past and ongoing research focuses are i) designing novel separation materials for lithium-ion battery recycling, ii) life-cycle environmental impacts of different separation technologies, iii) treatment and management of high-salinity wastewater, iv) transport theory for polymeric membranes in water purification, and v) energy conversion of low-temperature heat resources.

EDUCATION and TRAINING

Stanford University , Stanford, CA	2020–2023
Postdoctoral Researcher, Chemical Engineering	
Advisor: William A. Tarpeh	
Columbia University , New York, NY	2015–2020
Ph. D., Environmental Engineering	
Advisor: Ngai Yin Yip	
University of Illinois at Urbana-Champaign , Champaign, IL	2013–2015
M. S., Environmental Engineering	
Advisors: Timothy J. Strathmann & Jinyong Liu	
Nankai University , Tianjin, China	2009–2013
B. S., Environmental Science	

AWARDS and HONORS

Early-Career Editorial Board, <i>Desalination</i>	2022
Inaugural Early-Career Editorial Board, <i>Environmental Science & Ecotechnology</i>	2021
1 st Place Award of Young Researcher Best Oral Presentation, 5 th International Conference on Desalination using Membrane Technology	2021
Class Day Marshal, School of Engineering and Applied Science, Columbia University	2020
Elias Klein Founders' Travel Supplement, North American Membrane Society	2019
EGSC Professional Development Scholarship, Columbia University	2018 & 2017
Zhou Enlai Scholarship, Nankai University & Tianjin Haihe Education Foundation	2012
Highest honor for a Nankai undergraduate, awarded to 10/13000 students annually	
National Encouragement Scholarship, Ministry of Education of China	2010

PUBLICATIONS

h-index = 13 | [ORCID: 0000-0001-6404-3614](https://orcid.org/0000-0001-6404-3614) | [ResearcherID: AAP-5017-2021](https://pubs.rsc.org/authors/AAP-5017-2021)

First-Author (“_” denotes authorship, “#” denotes equal contribution, “*” denotes corresponding author)

1. Machala, M. L.[#]; **Chen, X.**^{**}; Bunke, S. P.[#]; Forbes, G.; Yegizbay, A.; de Chalendar, J.A.; Azevedo, I.; Benson, S.; Tarpeh, W. A.* Life cycle comparison of industrial-scale lithium-ion battery recycling and mining supply chains. *Accepted. Nature Communications*.
2. **Chen, X.**; Verbeke, R.; Boo, C.; Dickmann, M.; Egger, W.; Ndamage, K.; Vankelecom, I. F. J.; Yip, N. Y. Elucidating the roles of polyamide layer structural properties in the permeability–selectivity tradeoff governing aqueous separations. *ACS ES&T Engineering*. 2022. doi.org/10.1021/acsestengg.2c00103
3. **Chen, X.**; Boo, C.; Yip, N. Y. Influence of solute molecular diameter on permeability–selectivity tradeoff of thin-film composite polyamide membranes in aqueous separations. *Water Research*. 2021, 117311. doi.org/10.1016/j.watres.2021.117311
4. **Chen, X.**; Boo, C.; Yip, N. Y. Transport and structural properties of osmotic membranes in high-salinity desalination using cascading osmotically mediated reverse osmosis. *Desalination*. 2020, 479, 114335. doi.org/10.1016/j.desal.2020.114335
5. **Chen, X.**; Boo, C.; Yip, N. Y. Low-temperature heat utilization with vapor pressure-driven osmosis: Impact of membrane properties on mass and heat transfer. *Journal of Membrane Science*. 2019, 588, 117-181. doi.org/10.1016/j.memsci.2019.117181
6. **Chen, X.**; Yip, N. Y. Unlocking high-salinity desalination with cascading osmotically mediated reverse osmosis: Energy and operating pressure analysis. *Environmental Science & Technology*. 2018, 52 (4), 2242-2250. doi.org/10.1021/acs.est.7b05774
7. **Chen, X.**[#]; Huo, X.[#]; Liu, J.; Wang, Y.; Werth, C. J.; Strathmann, T. J. Exploring beyond palladium: Catalytic reduction of aqueous oxyanion pollutants with alternative platinum group metals and new mechanistic implications. *Chemical Engineering Journal*. 2017, 313, 745-752. doi.org/10.1016/j.cej.2016.12.058

Supporting-Author

8. Kristen, A.; Botelho, A. B.; **Chen, X.**; Tarpeh, W. A. Ligand content and driving force effects on ion-ion permselectivity in ligand-functionalized membranes. *Under Revision*. [10.26434/chemrxiv-2024-z6t01](https://doi.org/10.26434/chemrxiv-2024-z6t01)
9. Kogler, A.; Sharma, N.; Tiburcio, D.; Gong, M.; Miller, D.; Williams, K.; **Chen, X.**; Tarpeh, W.A. Long-term robustness and failure mechanisms of electrochemical stripping for wastewater nitrogen recovery. *ACS Environment Au*. 2024, 4, 2, 89–105. <http://doi.org/10.1021/acsenvironau.3c00058>
10. Shah, K. M.; Billinge, I. H.; **Chen, X.**; Fan, H.; Huang, Y.; Winton, R. K.; Yip, N. Y. Drivers, Challenges, and Emerging Technologies for Desalination of High-Salinity Brines: A Critical Review. *Desalination*. 2022, 538, 115827. doi.org/10.1016/j.desal.2022.115827
11. Le, T.; **Chen, X.**; Dong, H.; Tarpeh, W. A.; Perea-Cachero, A.; Coronas, J.; Martin, S. M.; Mohammad, M.; Razmjou, A.; Esfahani, A. R.; Koutahzadeh, N.; Cheng, P.; Kidambi, P. R.; Esfahani, M. R. An evolving insight into metal organic framework-functionalized membranes for water and wastewater treatment and resource recovery. *Industrial & Engineering Chemical Research*. 2021. doi.org/10.1021/acs.iecr.1c00543
12. Tarpeh, W. A.; **Chen, X.** Making wastewater obsolete: Selective separations to enable circular water treatment. *Environmental Science & Ecotechnology*. 2021, 5, 100078. **Editor’s Choice Award**. doi.org/10.1016/j.ese.2021.100078
13. Boo, C.; Billinge, I.; **Chen, X.**; Shah, K.; Yip, N. Y. Zero liquid discharge of ultrahigh salinity brines by

- temperature swing solvent extraction. *Environmental Science & Technology*. 2020, 54 (14), 9124-9131. doi.org/10.1021/acs.est.0c02555
14. McCartney, S.; Williams, N.; Boo, C.; **Chen, X.**; Yip, N. Y. Novel isothermal membrane distillation with acidic collector for selective and energy-efficient recovery of ammonia from urine. *ACS Sustainable Chemistry & Engineering*. 2020, 8 (19), 7324-7334. doi.org/10.1021/acssuschemeng.0c00643
 15. Liu, J.; Han, M.; Wu, D.; **Chen, X.**; Choe, J. K.; Werth, C. J.; Strathmann, T. J. A new bioinspired perchlorate reduction catalyst with significantly enhanced stability via rational tuning of rhenium coordination chemistry and heterogeneous reaction pathway. *Environmental Science Technology*. 2016, 50(11), 5874-5881. doi.org/10.1021/acs.est.6b00886
 16. Liu, J.; **Chen, X.**; Wang, Y.; Strathmann, T. J.; Werth, C. J. Mechanism and mitigation of the decomposition of an oxorhenium complex-based heterogeneous catalyst for perchlorate reduction in water. *Environmental Science & Technology*. 2015, 49(21), 12932-12940. doi.org/10.1021/acs.est.5b03393
 17. Lian, F.; Sun, B.; **Chen, X.**; Zhu, L.; Liu, Z.; Xing, B. Effect of humic acid (HA) on sulfonamide sorption by biochars. *Environmental Pollution*. 2015, 204, 306-312. doi.org/10.1016/j.envpol.2015.05.030
 18. Wan, W.; **Chen, X.**; Ju, X.; Mu, Q.; Wang, C.; Mao, D.; Luo, Y. Simultaneous determination of residual antibiotics in livestock manure by solid phase extraction-ultra-high performance liquid chromatography tandem mass spectrometry. *Chinese Journal of Analytical Chemistry*. 2013, 41, 993-999. doi.org/10.3724/SP.J.1096.2013.21199

SEMINARS and CONFERENCE PRESENTATIONS (selected)

Invited Seminars

1. “Advancing separation technologies for a circular battery manufacturing”, Memorial Speech Series for Celebration of the 40th Anniversary of College of Environment. Tsinghua University. Beijing, China. Apr. 2024.
2. “A framework for better understanding the permeability-selectivity tradeoff relationship in thin-film composite polyamide membranes”, Stanford Polymer Collective Lunch and Learns. Stanford University, Stanford, U.S. Nov. 2021.
3. “Elucidating the roles of polyamide layer structural properties in permeability-selectivity tradeoff”, International Conference on Sustainable Technology and Development. Online, Oct. 2021.
4. “A framework for better understanding the permeability-selectivity tradeoff relationship in thin-film composite polyamide membranes”, Stanford-SLAC Water Group. Stanford University, Stanford, U.S. Oct. 2020.
5. “Unlocking high-salinity desalination using cascading osmotically mediated reverse osmosis”, College of Environmental Science and Engineering, Nankai University. Tianjin, China. Oct 2019.

Conference Presentations (selected)

1. “Comparing the productivity–selectivity performance across aqueous separation processes: Membrane, adsorption, and solvent extraction”. **Poster**, Gordon Research Conference, Membranes: Materials and Processes, New London, U.S. July 2024.
2. “Comparing the productivity–selectivity performance across aqueous separation processes: Membrane, adsorption, and solvent extraction”. **Oral**, Association of Environmental Engineering and Science Professors Research and Education Conference, Boston, U.S. June 2023.
3. “Elucidating the roles of polyamide layer structural properties in permeability-selectivity tradeoff”. **Poster**, Gordon Research Conference: Membranes, New London, U.S. Aug. 2022.

4. “Selective separation of lithium using chemically modified nanoporous polyamide membrane with electrodialysis”. *Oral*, North America Membrane Society Annual Meeting, Tempe, U.S. May 2022.
5. “Elucidating the roles of polyamide layer structural properties in permeability-selectivity tradeoff”. *Oral*, North America Membrane Society Annual Meeting, Tempe, U.S. May 2022.
6. “Selective separation of lithium using chemically modified nanoporous polyamide membrane with electrodialysis”. *Oral*, ACS National Meeting & Exposition, San Diego, U.S. Mar. 2022.
7. “Elucidating the roles of polyamide layer structural properties in permeability-selectivity tradeoff”. *Oral*, 5th International Conference on Desalination using Membrane Technology, online, Nov. 2021.
8. “New insights into solute-selectivity relationship of thin-film composite polyamide membranes”. *Oral*, North America Membrane Society Annual Meeting, online, May 2020.
9. “Transport and structural properties of osmotic membranes in high-salinity desalination using cascading osmotically mediated reverse osmosis.” *Oral*, North America Membrane Society Annual Meeting, Pittsburgh, U.S. May 2019.
10. “Unlocking high-salinity desalination with cascading osmotically mediated reverse osmosis: Analysis of energy, pressure, and membrane transport properties.” *Oral*, Gordon Research Seminars: Membranes, New London, U.S. Aug. 2018.
11. “Unlocking high-salinity desalination with cascading osmotically mediated reverse osmosis: Analysis of energy, pressure, and membrane transport properties”. *Oral*, North America Membrane Society Annual Meeting, Lexington, U.S. May 2018.

TEACHING and ADVISING

Course Teaching at City University of Hong Kong

SEE1005: Global Sustainable Technologies and Finance (co-instructor)	Semester A, 2024/2025
SEE4122: Chemical Separations for Energy and Environmental Applications	Semester B, 2023/2024

Doctoral Student Advising at City University of Hong Kong

Changlin Li	2024–2028 (expected)
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Research Mentor Prior to City University of Hong Kong (* denotes historically under-represented groups)

*Joyce An, doctoral researcher in Chemical Engineering, Stanford University	2023
*Diego Bustamante, Engineering undergraduate summer research, Stanford University Provided recommendation letter for the mentee for his internship application	2022
*Kristen Abel, doctoral researcher in Chemical Engineering, Stanford University	2021–present
*Sam Bunke, doctoral researcher in Chemical Engineering, Stanford University	2020–2021
*Gloria Chyr, doctoral researcher in Material Science, Stanford University	2021
David Kim, Environmental Engineering undergraduate, Columbia University Resulted in the B. S dissertation of the mentee, currently Ph.D. student, Yale University	2016 – 2018
*Kalisa Ndamage, Environmental Engineering undergraduate, Columbia University Resulted in coauthored paper with mentee (Publication No. 1)	2018 – 2020

US PROPOSAL WRITING and CONTRIBUTIONS (selected funded)

Leading-Writer of the 1st Draft

1. “Developing polymeric membrane materials for precision lithium separations to circularize battery manufacturing”. StorageX Initiative, Stanford University, **2022**, PIs: William A. Tarpeh and Yan Xia. *Awarded. \$100,000 for 1 year.*
2. “ECS Toyota Young Investigator Fellowship: Enabling and implementing a sustainable circular economy using selective membranes”. Toyota, **2022**, PI: William A. Tarpeh. *Awarded \$50,000 for 1 year.*

Contributor

3. “C2E2: Designing and evaluating battery recycling unit processes”. Precourt Institute for Energy, Stanford University, **2021**, PI: William A. Tarpeh. *Awarded \$160,000 for 2 years.*
4. “EFRI DChEM: Re-engineering the nitrogen cycle: Distributed electrochemical nitrogen refineries for ammonia synthesis and water purification”. National Science Foundation, **2021**, 2132007, PI: William A. Tarpeh. *Awarded \$2,000,000 for 4 years.*
5. “INFEWS: U.S.-China: Sustainable decentralized wastewater management: Simultaneous nutrient recovery and pharmaceutical degradation of source-separated urine”. National Science Foundation-Division of Chemical, Bioengineering, Environmental, and Transport Systems, **2019**, 1903705, PI: Ngai Yin Yip. *Awarded \$323,051 for 4 years.*

PROFESSIONAL SERVICE and ACTIVITIES OF DIVERSITY-EQUITY-INCLUSION

Reviewer for Scholarly Journals

Colloids and Surfaces A, Desalination, Engineering, Environmental Science & Technology, Environmental Science & Technology Letters, ACS ES&T Engineering, Environmental Science and Ecotechnology, Environmental Science: Water Research & Technology, Journal of Membrane Science, Nature Water, Journal of Water Process Engineering, npj Clean Water, Separation and Purification Technology

Professional Memberships

American Chemical Society (ACS), Association of Environmental Engineering & Science Professors (AEESP), American Membrane Technology Associations (AMTA), North American Membrane Society (NAMS)

Poster Judge for Student Research Symposia

North American Membrane Society (NAMS) 2022
Stanford Research Conference (SRC) undergraduate symposium 2022 & 2021

Chemical Engineering Postdoctoral Researcher Action Committee (PRAC), Stanford University 2022–*present*

Cofounder, treasurer

Organized professional development activities for postdoctoral fellows in the Department of Chemical Engineering at Stanford University