

Curriculum Vitae
NICK CHEW, Ph.D.
March 2022

Department of Environmental Sciences and Engineering
Gillings School of Global Public Health
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EDUCATION

Ph.D., Chemical & Environmental Engineering, Nanyang Technological University 2019

Advisors: Rong Wang & Chandresh Malde

Dissertation: Performance Enhancement of the Membrane Distillation Process via Membrane Surface Modification for Surfactant-Containing Feed Water

B.Eng. Honors, Environmental Engineering, Nanyang Technological University 2014

Advisor: Xiaoli Yan

Thesis: Graphene-Based Catalyst for Water Treatment

Diploma, Chemical Engineering, Singapore Polytechnic 2009

Advisor: Won Jae Choi

Final Year Project: Bioethanol Production from Cassava Roots

PROFESSIONAL EXPERIENCE

Superfund Research Program Trainee 2020–Present
Gillings School of Global Public Health
National Institute of Environmental Health Sciences

Postdoctoral Research Associate 2019–Present
Department of Environmental Sciences and Engineering
University of North Carolina, Chapel Hill

Postdoctoral Research Fellow 2018–2019
Singapore Membrane Technology Center
Nanyang Environment and Water Research Institute

Graduate Research Assistant 2014–2018
Interdisciplinary Graduate School
Nanyang Technological University

Research Assistant 2013–2014
School of Civil and Environmental Engineering
Nanyang Technological University

Engineering Intern 2013–2013
Technology Department
Public Utilities Board (PUB), Singapore's National Water Agency

Intelligence Specialist & Armored Vehicle Commander 2009–2011
40th Battalion, Singapore Armored Regiment
Singapore Armed Forces

Research Intern 2008–2009
Institute of Chemical and Engineering Sciences
Agency for Science, Technology, and Research

Engineering Intern
Chemical Process Technology Center
Singapore Economic Development Board

2008–2008

RESEARCH EXPERIENCE

Postdoctoral Research Associate, Michael Hooker Research Center
Advisor: Orlando Coronell

2019–Present

- Optimized the removal of both legacy and emerging per- and polyfluoroalkyl substances (PFAS) from contaminated surface water and groundwater sources in North Carolina (NC) using a wide range of commercially available and residential high-pressure membranes under various water quality and operating conditions.
- Characterized relevant material physico-chemical properties to elucidate the property-performance relationships that relate PFAS removal efficiency to material properties.
- Cross-correlated charge densities of different polyamide-based thin-film composite membranes measured via established characterization techniques to infer whether or not these measurements were in good agreement.
- Designed and built rapid small-scale column testing (RSSCT) experimental rig for PFAS removal from drinking-water sources using ionic fluorogels.
- Operated dead-end filtration cells to evaluate the performance of novel liquid-crystalline, rigid-rod polyamide membranes.

Graduate Research Assistant, Singapore Membrane Technology Center
Advisors: Rong Wang & Chandresh Malde

2014–2019

- Developed a fundamental understanding of the relationship between surfactant-stabilized oil-in-water emulsions and the hydrophobic poly(vinylidene fluoride) (PVDF) membrane surface in long-term direct-contact membrane distillation (DCMD) operations.
- Defined the roles of different types of surfactants and oils in the treatment of synthetic produced water via DCMD, and elucidated possible membrane fouling and pore wetting mechanisms.
- Fabricated composite PVDF membranes with fouling- and wetting-resistant properties via single-step co-deposition of polydopamine/polyethylenimine onto a hydrophobic PVDF substrate.
- Engineered composite PVDF membranes with enhanced flux through oxidant-induced dopamine polymerization on the outer and inner surfaces of a hydrophobic PVDF substrate.
- Tailored hierarchically structured Janus membrane surfaces via oxidant-induced dopamine polymerization followed by in-situ immobilization of silver nanoparticles for enhanced DCMD performance.
- Advanced DCMD as an energy-efficient and effective technology for long-term water recovery from low-surface-tension feed streams.

Research Assistant, Environmental Chemistry & Materials Center
Advisor: Xiaoli Yan

2013–2014

- Synthesized a two-dimensional graphene-based catalyst, termed copper sulfide–graphene oxide (GO-COOH-CuS) composite, for water treatment; the self-assembled GO-COOH-CuS nanocomposite could be dispersed in water due to its enhanced hydrophilicity.
- Assessed the environmental impact of the novel nanomaterial by using typical recalcitrant organics such as Rhodamine B (RhB) dye as target pollutants.
- Confirmed the photocatalytic activity of GO-COOH-CuS by the degradation of RhB under UV light irradiation.

Engineering Intern, PUB WaterHub
Advisor: Yongjie Xing

2013–2013

- Conducted a demonstration study on a novel reverse osmosis (RO) membrane-cleaning technique named direct osmosis-high salinity (DO-HS).
- Optimized operating parameters to improve on RO system operation and reduce energy consumption at Kranji NEWater Plant.
- Analyzed and interpreted experimental data to determine the feasibility of extending the DO-HS cleaning technique to all NEWater Plants.

- Gained knowledge on the working principles of DO-HS, its R&D status, and practical applications in the water industry.

Research Intern, Institute of Chemical and Engineering Sciences

2008–2009

Advisor: Won Jae Choi

- Produced optimum ethanol yield using Cassava roots through three processes, namely pre-treatment, enzymatic hydrolysis, and fermentation, which included the dissolved oxygen (DO)-Stat.
- Optimized the amount of immobilized enzyme and DO using different amounts of glucose per liter of fermentation solution.
- Identified the non-negligible amount of glycerol that was a byproduct of ethanol.

GRANT WRITING EXPERIENCE

Precision Separation and Autonomous Water

2021

Funding Agency: National Alliance for Water Innovation

Title: Ionic Fluorogels for PFAS Removal from Water

Principal Investigators: Orlando Coronell & Frank Leibfarth

Institution: University of North Carolina, Chapel Hill

Amount: TBA

Status: Full proposal submitted

Role: Co-author. My work on RSSCT was the basis of this proposal. I conducted the literature review, generated the list of references, wrote the proposal narrative, and made revisions to subsequent versions of the proposal.

Emerging Frontiers in Research and Innovation

2021

Funding Agency: National Science Foundation

Title: Distributed Production of Carboxylates from Food Waste

Principal Investigators: Douglas Call, Orlando Coronell, Jeffrey Dick, James Levis, & Louie Rivers

Institution: North Carolina State University & University of North Carolina, Chapel Hill,

Amount: \$1,999,650

Status: Full proposal submitted

Role: Co-author. My work on air-gap membrane distillation was the basis of this proposal. I conducted the literature review, wrote the proposal narrative, and made revisions to subsequent versions of the proposal.

U.S. Geological Survey 104(b) Competitive Grants Program

2020

Funding Agency: North Carolina Water Resources Research Institute

Title: Performance Evaluation of Novel Resins in Flow-Through Columns for PFAS Removal from Drinking Water and Treated Wastewater

Principal Investigators: Orlando Coronell & Frank Leibfarth

Institution: University of North Carolina, Chapel Hill

Amount: \$120,000

Status: Awarded

Role: Co-author. My work on RSSCT was the basis of this award. I conducted the literature review, generated the list of references, wrote the proposal narrative, made revisions to subsequent versions of the proposal, prepared letters of support/collaboration, devised the data management plan, and put together the budget list.

TEACHING EXPERIENCE

Guest Lecturer, University of North Carolina, Chapel Hill

Spring 2020

Course: Science and Technology of Membranes for Water Purification

- Developed course content, prepared lecture slides and homework questions, and delivered five hours of lectures on membrane distillation (MD) to graduate students.
- Covered mass- and heat-transfer phenomena controlling vapor permeation, membrane fouling and pore wetting phenomena, characterization of membrane materials, characterization of membrane performance, modification of membrane surface chemistry for enhanced performance, and to a lesser extent modeling approaches in MD.

PUBLICATIONS

Peer-Reviewed Articles

1. **Chew, N. G. P.**, Zhao, S., & Wang, R. (2019). Recent Advances in Membrane Development for Treating Surfactant- and Oil-Containing Feed Streams via Membrane Distillation. *Advances in Colloid and Interface Science*, 273, 102022. <https://doi.org/10.1016/j.cis.2019.102022>. (Impact Factor: 12.984; 40 citations).
2. **Chew, N. G. P.***, Zhang, Y.*, Goh, K., Ho, J. S., Xu, R., & Wang, R. (2019). Hierarchically Structured Janus Membrane Surfaces for Enhanced Membrane Distillation Performance. *ACS Applied Materials and Interfaces*, 11(28), 25524–25534. <https://doi.org/10.1021/acsami.9b05967>. (*contributed equally to this work). (Impact Factor: 9.229; 56 citations).
3. Xu, Y., Lin, Y., **Chew, N. G. P.**, Malde, C., & Wang, R. (2019). Biocatalytic PVDF Composite Hollow Fiber Membranes for CO₂ Removal in Gas-Liquid Membrane Contactor. *Journal of Membrane Science*, 572, 532–544. <https://doi.org/10.1016/j.memsci.2018.11.043>. (Impact Factor: 8.742; 33 citations).
4. Tan, Y. Z., Han, L., **Chew, N. G. P.**, Chow, W. H., Wang, R., & Chew, J. W. (2018). Membrane Distillation Hybridized with a Thermoelectric Heat Pump for Energy-Efficient Water Treatment and Space Cooling. *Applied Energy*, 231, 1079–1088. <https://doi.org/10.1016/j.apenergy.2018.09.196>. (Impact Factor: 9.746; 24 citations).
5. **Chew, N. G. P.**, Zhao, S., Malde, C., & Wang, R. (2018). Polyvinylidene Fluoride Membrane Modification via Oxidant-Induced Dopamine Polymerization for Sustainable Direct-Contact Membrane Distillation. *Journal of Membrane Science*, 563, 31–42. <https://doi.org/10.1016/j.memsci.2018.05.035>. (Impact Factor: 8.742; 68 citations).
6. **Chew, N. G. P.***, Zhao, S.*, Malde, C., & Wang, R. (2017). Superoleophobic Surface Modification for Robust Membrane Distillation Performance. *Journal of Membrane Science*, 541, 162–173. <https://doi.org/10.1016/j.memsci.2017.06.089>. (*contributed equally to this work). (Impact Factor: 8.742; 86 citations).
7. **Chew, N. G. P.**, Zhao, S., Loh, C. H., Permogorov, N., & Wang, R. (2017). Surfactant Effects on Water Recovery from Produced Water via Direct-Contact Membrane Distillation. *Journal of Membrane Science*, 528, 126–134. <https://doi.org/10.1016/j.memsci.2017.01.024>. (Impact Factor: 8.742; 108 citations).

Manuscripts Under Review

1. Fraser, A. C., **Chew, N. G. P.**, Hegde, M., Liu, F., Liu, C. W., Coronell, O., & Dingemans, T. J. The Role of Polyamide Geometry on Salt Exclusion in Thin-Film Composite Membranes.
2. Manning, I. M., **Chew, N. G. P.**, Macdonald, H. P., Miller, K., Strynar, M., Coronell, O., & Leibfarth, F. A. Hydrolytically Stable Ionic Fluorogels for High-Performance PFAS Remediation from Natural Water.

Manuscripts in Preparation

1. Armstrong, M.D., **Chew, N. G. P.**, & Coronell, O. Modifying Commercial Reverse Osmosis Membranes with Solvent Exposure and Additional Polymerization Can Enhance Water Permeability and Solute Rejection.
2. Perry, L. A.*, **Chew, N. G. P.***, Cay-Durgun, P., Lind, M. L., & Coronell, O. Correlating the Role of Nano-Fillers with Active Layer Properties and Performance of Thin-Film Nanocomposites. (*contributed equally to this work).
3. **Chew, N. G. P.***, Macdonald, H. P.*, Zhang, W.*, & Coronell, O. Membrane Surface Modification for Oil-Water Separations: How Have We Progressed? (*contributed equally to this work).
4. **Chew, N. G. P.** & Coronell, O. Cross-Correlation of Charge Density Measurement Techniques for Polyamide Membranes.
5. Grzebyk, K., **Chew, N. G. P.**, Hopkins, Z. R., Knappe, D. R. U., & Coronell, O. Efficacy of High-Pressure Membranes in the Removal of Legacy and Emerging Per- and Polyfluoroalkyl Substances.

Theses/Dissertations

1. **Chew, N. G. P.** (2018). Performance Enhancement of the Membrane Distillation Process via Membrane Surface Modification for Surfactant-Containing Feed Water. Ph.D. Dissertation, Nanyang Technological University. <https://doi.org/10.32657/10220/46783>.
2. **Chew, N. G. P.** (2014). Graphene-Based Catalyst for Water Treatment. Honors Thesis, Nanyang Technological University. <https://hdl.handle.net/10356/60738>.

CONFERENCE PRESENTATIONS/INVITED TALKS

^ = Presenter

1. **Chew, N. G. P.** ^ “Water-Downed” Justice: Developing Advanced Functional Materials to Address Environmental Health Disparities. *University of California, Irvine Black Thriving Initiative Seminar Series*, February 7, 2022, Virtual. Oral Presentation.
2. **Chew, N. G. P.** ^ & Wang, R. Bioinspired Janus Membranes for Produced-Water Treatment via Membrane Distillation. *Xi’an University of Architecture and Technology Disciplinary Frontiers Youth Seminar*, December 13, 2021, Virtual. Oral Presentation.
3. **Chew, N. G. P.** ^ & Wang, R. Bioinspired Janus Membranes for Produced-Water Treatment via Membrane Distillation. *2021 Tsinghua SIGS International Interdisciplinary Innovation Forum*, October 9, 2021, Virtual. Oral Presentation.
4. **Chew, N. G. P.** ^, Zhang, Y., Goh, K., Ho, J. S., Xu, R., & Wang, R. Hierarchically Structured Janus Membrane Surfaces for Enhanced Membrane Distillation Performance. *Surface Science Deutschen Physikalischen Gesellschaft Conference*, March 1–4, 2021, Virtual. Poster Presentation.
5. Grzebyk, K. ^, **Chew, N. G. P.**, Hopkins, Z. R., Knappe, D. R. U., & Coronell, O. Removal of PFAS from Drinking Water Sources. *PFAST Network Science Symposium*, August 9, 2019, Chapel Hill, NC. Oral Presentation.
6. **Chew, N. G. P.**, Zhang, Y. ^, Goh, K., Ho, J. S., Xu, R., & Wang, R. Hierarchically Structured Janus Membrane Surfaces for Enhanced Membrane Distillation Performance. *14th International Conference on Membrane Science and Technology*, June 13–14, 2019, Singapore. Oral Presentation.
7. **Chew, N. G. P.** ^, Zhao, S., Malde, C., & Wang, R. Novel Modification Method for Membranes Used in Membrane Distillation. *11th International Desalination Workshop*, July 12–13, 2018, Singapore. Oral Presentation.
8. **Chew, N. G. P.** ^, Zhao, S., Malde, C., & Wang, R. PVDF Modification for Membrane Distillation via Oxidant-Induced Dopamine Polymerization. *Johnson Matthey Academic Conference*, April 10–11, 2018, Reading, UK. Oral Presentation.
9. **Chew, N. G. P.** ^, Zhao, S., Malde, C., & Wang, R. Superoleophobic Surface Modification for Robust Membrane Distillation Performance. *11th International Congress on Membranes and Membrane Processes*, July 29–August 4, 2017, San Francisco, CA. Oral Presentation.
10. **Chew, N. G. P.** ^, Zhao, S., Malde, C., & Wang, R. Mussel-Inspired Superoleophobic Surface Modification for Robust Membrane Distillation Performance. *Engineering with Membranes Conference*, April 26–28, 2017, Singapore. Poster Presentation.
11. **Chew, N. G. P.** ^, Zhao, S., Loh, C. H., Permogorov, N., & Wang, R. Surfactant Effects on Water Recovery from Produced Water via Direct-Contact Membrane Distillation. *Johnson Matthey Academic Conference*, April 12–13, 2016, Reading, UK. Poster Presentation.

HONORS AND AWARDS

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| Water Quality Center Scholarship , Marquette University | 2021 |
| Academic Achievement Award First Place , American Water Works Association | 2020 |

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| Postdoctoral Research Scholarship , University of North Carolina, Chapel Hill | 2019–2022 |
| National Service Excellence Award , Singapore Armed Forces | 2017, 2018, 2019 |
| Good Service Medal , Singapore Armed Forces | 2018 |
| Travel Award , Johnson Matthey PLC | 2016, 2018 |
| Conference Funding , Interdisciplinary Graduate School | 2017 |
| Best Poster Presentation Award , Engineering with Membranes Conference | 2017 |
| Regimental Sergeant Major Medallion , Singapore Armed Forces | 2017 |
| Johnson Matthey Studentship , Johnson Matthey PLC | 2014–2018 |
| Doctoral Research Scholarship , Nanyang Technological University | 2014–2018 |
| Bursary Award , Singapore Technologies Land System Ltd | 2012, 2013 |
| Bursary Award , Community Development Council | 2012, 2013 |

PEER REVIEW EXPERIENCE

Editorial Board Member

American Journal of Water Science and Engineering

Reviewer Board & Topical Advisory Panel Member

Membranes (Impact Factor: 4.106)

Topic Editorial Board Member

Coatings (Impact Factor: 2.881)

Ad-Hoc Reviewer

ACS ES&T Water; Agronomy (Impact Factor: 3.417); Applied Sciences (Impact Factor: 2.679); Applied Surface Science (Impact Factor: 6.707); Biomolecules (Impact Factor: 4.879); Biosciences Biotechnology Research Asia; Catalysts (Impact Factor: 4.146); Energies (Impact Factor: 3.004); Journal of Membrane Science (Impact Factor: 8.742); Journal of Water Process Engineering (Impact Factor: 5.485); Materials (Impact Factor: 3.623); Processes (Impact Factor: 2.847); Sustainability (Impact Factor: 3.251); Symmetry (Impact Factor: 2.713); Water (Impact Factor: 3.103)

MENTORING EXPERIENCE

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| Mary Noelia Cruz Chua , Clean Water Science Network Mentorship Program | Spring 2022–Present |
| Raúl Santiago Ramos , Clean Water Science Network Mentorship Program | Spring 2022–Present |
| Haley Patricia Macdonald , University of North Carolina, Chapel Hill, Ph.D. Student | Fall 2020–Present |
| Yujun Zhang , Nanyang Technological University, Ph.D. Student | Fall 2018–Spring 2019 |
| Kuan Yee Ling , Republic Polytechnic, Intern | Fall 2017–Spring 2018 |
| Nurulhuda Amiera , Republic Polytechnic, Intern | Fall 2017–Spring 2018 |

SERVICE AND OUTREACH

Judge, *North Carolina Student Academy of Science District 3 Regional Competition*, February 19, 2022
Judge, *North Carolina Science and Engineering Fair Region 5*, February 17, 2022
Judge, *North Carolina Science and Engineering Fair Region 3B*, February 14, 2022
Mentor, *Clean Water Science Network Mentorship Program*, October 2021–July 2022
Safe Zone Ally, *University of North Carolina, Chapel Hill*
HAVEN Ally, *University of North Carolina, Chapel Hill*
Judge, *North Carolina Science and Engineering Virtual Fair*, April 24, 2021
Judge, *North Carolina Student Academy of Science State Competition*, March 19, 2021
Judge, *North Carolina Science and Engineering Fair Region 5*, February 25–26, 2021
Judge, *North Carolina Student Academy of Science District 3 Regional Competition*, February 6, 2021

PROFESSIONAL MEMBERSHIPS

American Water Works Association
Association of Environmental Engineering & Science Professors
European Membrane Society
Membrane Society in Singapore
North American Membrane Society