

Moon Son, Ph.D.**Senior Researcher**

Center for Water Cycle Research

**Korea Institute of Science and Technology
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Research group: <https://sites.google.com/view/moonson>Google Scholar: <https://scholar.google.co.kr/citations?user=nPx7KdEAAAJ&hl=en>Phone: +82-10-6807-3733; moonson619@gmail.com; moonson@kist.re.kr**Assistant Professor**

Division of Energy and Environment

Technology, KIST-School

**University of Science and Technology
(UST)****Education**

2017 **Ph.D.** in Environmental Engineering, **Gwangju Inst. Sci. Tech. (GIST)**, South Korea.Dissertation: Thin-film nanocomposite (TFN) membrane for seawater desalination and energy harvesting: Effect of carbon nanotube (CNT) on membrane performance. (Advisor: Prof. **Heechul Choi**)2010 **B.S.** in Environmental Engineering, **Yonsei University**, South Korea.**Professional Experiences**

2022–Present **Assistant Professor**, UST (Division of Energy and Environment Technology, KIST-School)2021–Present **Senior Researcher**, KIST (Research area: environmental electrochemistry and artificial intelligence for water-energy nexus)2020–2021 **Assistant Research Professor**, Ulsan National Institute of Science and Technology (UNIST). (Advisor: Prof. **Kyung Hwa Cho**; Research area: seawater battery, electrochemical water treatment, and artificial intelligence)2020 **Postdoctoral Fellow**, University of Illinois, Chicago (Advisor: Prof. **Brian P. Chaplin**; Co-advisor: Prof. **Sangil Kim**; Research area: reactive electrochemical membranes).

- 2017–2019 **Postdoctoral Fellow, Pennsylvania State University** (Advisor: Prof. **Bruce E. Logan**; Co-advisor: Prof. **Christopher A. Gorski**; Research area: a new type of desalination and resource recovery system).
- 2017 **Postdoctoral Fellow, GIST** (Advisor: Prof. **Heechul Choi**; Research area: synthesis, characterization, and application of nano-enhanced membrane).
- 2016–2017 **Invited researcher, Korea Res. Inst. Chem. Technol.**
- 2010–2016 **Research assistant, GIST.**
- 2014 **Research assistant, GIST college** (Chemical engineering).

Publications (*corresponding author)

56. S. Lim, J. Seo, J. Lee, M. Seid, J. Lee, W. W. Ejerssa, D.-H. Lee, E. Jeong, S. Chae, Y. Lee, **M. Son***, Seok Won Hong* (2023) Clustering micropollutants and estimating rate constants of sorption and biodegradation using machine learning approaches, *npj Clean Water*, Accepted
55. S. Kim¹, J. Shim¹, **M. Son**, S. Park*, K. H. Cho* (2023), Influence of natural organic matters on seawater battery desalination performance, *Desalination*, Accepted
54. R. Kumar, S. Chakraborty, P. Chakraborty, J. Nayak, C. Liu, M. Khan, G. Ha, K. Kim, **M. Son**, H. Roh, S. Tripathy, B.-H. Jeon* (2023) Sustainable recovery of high-valued resources from spent lithium-ion batteries: A review of the membrane-integrated hybrid approach, *Chem. Eng. J.*, 470: 144169
53. N. Yanar, Y. Liang, E. Yang, M. Kim, H. Kim, **M. Son***, H. Choi* (2023) Robust and fouling-resistant ultrathin membranes for water purification tailored via semi-dissolved electrospun nanofibers, *J. Clean. Prod.*, 418: 138056
52. S. Park, N. Yoon, Z. Ullah, B. Tarus, B. Choi, H. Kim, **M. Son*** (2023) Energy storage capability of seawater batteries for intermittent power generation systems: Conceptualization and modeling, *J. Power Sources*, 580: 233322
51. N. Yoon, S. Lee, S. Park, **M. Son***, K. H. Cho* (2023) Explainable deep learning model for membrane capacitive deionization operated under fouling conditions, *Desalination*, 116676
50. Z. Ullah, N. Yoon, B. Tarus, S. Park*, **M. Son*** (2023) Comparison of tree-based model with deep learning model in predicting effluent pH and concentration by capacitive deionization, *Desalination*, 116614
49. S. Lim¹, **M. Son**¹, S. Ki, S. Suh, J. Chung* (2023) Opportunities and challenges of machine learning in bioprocesses: Categorization from different perspectives and future direction,

- Bioresour. Technol.**, 378: 128518 (¹author contributed equally).
48. **M. Son**, N. Yoon, S. Park, A. Abbas, K. H. Cho* (2023) An open-source deep learning model for predicting effluent concentration in capacitive deionization, **Sci. Total Environ.**, 856: 159158
 47. S. Park, **M. Son**, J. Shim, K. Jeong, K. H. Cho (2022). Physically-assisted removal of organic fouling by osmotic backwashing coupled with chemical cleaning. **J. Clean. Prod.**, 378: 134490.
 46. N. Yoon, S. Park, **M. Son***, K. H. Cho* (2022) Automation of membrane capacitive deionization process using reinforcement learning, **Water Res.**, 227: 119337
 45. S. Park, J. Shim, N. Yoon, S. Lee, D. Kwak, S. Lee, Y. Kim, **M. Son***, K. H. Cho* (2022) Deep reinforcement learning in an ultrafiltration system: optimizing operating pressure and chemical cleaning conditions, **Chemosphere**, 308: 136364
 44. S. Park, A. T. Angeles, **M. Son**, J. Shim, K. Chon, K. H. Cho (2022) Predicting the salt adsorption capacity of different capacitive deionization electrodes using random forest. **Desalination**, 537: 115826
 43. N. Yoon, S. Park, J. Shim, J. Lee, **M. Son***, K. H. Cho* (2022) Membrane capacitive deionization model including fouling indexes obtained via real-time fouling layer measurements, **Desalination**, 536; 115852
 42. **M. Son**, J. Shim, S. Park, N. Yoon, K. Jeong, K. H. Cho* (2022) Seawater battery desalination with sodium-intercalation cathode for hypersaline water treatment, **Desalination**, 531; 115713
 41. S. Park, N. Kim, Y. Kim, **M. Son***, K. H. Cho* (2022) Seawater battery desalination with a reverse osmosis membrane for simultaneous brine treatment and energy storage, **J. Clean. Prod.**, 130188
 40. K. Jeong, **M. Son**, N. Yoon, S. Park, J. Shim, J. Kim, J.-L. Lim, K. H. Cho (2021) Modeling and evaluating performance of full-scale reverse osmosis system in industrial water treatment plant. **Desalination**, 518: 115289
 39. **M. Son**, S. Park, N. Kim, A. T. Angeles, Y. Kim*, K. H. Cho* (2021) Simultaneous Energy Storage and Seawater Desalination using Rechargeable Seawater Battery: Feasibility and Future Directions, **Adv. Sci.**, 8: 2101289 (IF: 16)
 38. **M. Son**, N. Yoon, K. Jeong, A. Abbas, B. E. Logan, K. H. Cho* (2021) Deep learning for pH prediction in water desalination by membrane capacitive deionization. **Desalination**, 516: 115233
 37. K. Jeong, A. Abbas, J. Shin, **M. Son**, Y. M. Kim, K. H. Cho (2021) Prediction of biogas

- production in anaerobic co-digestion of organic wastes using deep learning models. *Water Res.*, 205: 117697
36. **M. Son**, N. Yoon, J. Shim, S. Park, K. Jeong, S. Baek, J. Park*, K. H. Cho* (2021) Pharmaceutical removal at low energy consumption using membrane capacitive deionization. *Chemosphere*, 276: 130133
35. S. Park, M. Ligaray, Y. Kim, K. Chon, **M. Son***, K. H. Cho* (2021) Investigating the influence of catholyte salinity on seawater battery desalination. *Desalination*, 506, 115018
34. N. Yanar, E. Yang, H. Park, **M. Son***, H. Choi* (2021) Efficacy of Electrically-Polarized Graphene-blended Spacers on the Flux Enhancement and Scaling Resistance of Water Filtration Membranes. *ACS Sustain. Chem. Eng.*, 9: 6623–6631
33. L. Shi, E. Newcomer, **M. Son**, V. Pothanamkandathil, C. A. Gorski, A. Galal, B. E. Logan (2021) Metal ion depletion impacts stability and performance of battery electrode deionization over multiple cycles. *Environ. Sci. Technol.*, 55: 5412–5421
32. N. Yanar, Y. Liang, E. Yang, H. Park*, **M. Son***, H. Choi* (2021). Electrically Polarized Graphene-Blended Spacers for Organic Fouling Reduction in Forward Osmosis. *Membranes*, 11: 36
31. N. Yanar, E. Yang, H. Park, **M. Son***, H. Choi* (2021). Boron Nitride Nanotube (BNNT) Membranes for Energy and Environmental Applications. *Membranes*, 10: 430
30. A. B. Alayande, K. Goh, **M. Son**, C.-M. Kim, K.-J. Chae, Y. Kang, J. Jang, I. S Kim, E. Yang (2021). Recent Progress in One-and Two-Dimensional Nanomaterial-Based Electro-Responsive Membranes: Versatile and Smart Applications from Fouling Mitigation to Tuning Mass Transport. *Membranes*, 11: 1
29. J. Shim, N. Yoon, S. Park, J. Park, **M. Son**, K. Jeong, K. H. Cho (2021). Influence of Natural Organic Matter on Membrane Capacitive Deionization Performance. *Chemosphere*, 264(2): 128519
28. **M. Son**, V. Pothanamkandathil, W. Yang, J. S. Vrouwenvelder, C. A. Gorski, B. E. Logan (2020). Improving the thermodynamic energy efficiency of battery electrode deionization using flow-through electrodes. *Environ. Sci. Technol.*, 54: 3628–3635
27. L. Shi, R. Rossi, **M. Son**, D. M. Hall, M. A. Hickner, C. A. Gorski, B. E. Logan (2020). Using reverse osmosis membranes to control ion transport during water electrolysis. *Energy Environ. Sci.*, 13(9): 3138–3148
26. **M. Son**, B. L. Aronson, W. Yang, C. A. Gorski, B. E. Logan (2020). Recovery of Ammonium

- and Phosphate using Battery Deionization in a Background Electrolyte. *Environ. Sci.: Water Res. Technol.*, 6: 1688–1696
25. **M. Son**, E. Kolvek, T. Kim, W. Yang, J. S. Vrouwenvelder, C. A. Gorski, B. E. Logan (2020). Stepwise ammonium enrichment using selective battery electrodes. *Environ. Sci.: Water Res. Technol.*, 6: 1649–1657
24. K. Jeong, N. Yoon, S. Park, **M. Son**, J. Lee, J. Park, K. H. Cho (2020). Optimization of a nanofiltration and membrane capacitive deionization (NF-MCDI) hybrid system: Experimental and modeling studies. *Desalination*, 493(1): 114658
23. **M. Son**, K. H. Cho, K. Jeong, J. Park (2020). Membrane and Electrochemical Processes for Water Desalination: A Short Perspective and the Role of Nanotechnology. *Membranes*, 10: 280
22. M. N.-Ocampo, A. S. F. Farinha, **M. Son**, B. E. Logan, J. S. Vrouwenvelder, S. Bucs (2020). Sacrificial coating development for biofouling control in membrane systems. *Desalination*, 496(15): 114650
21. N. Yanar, P. Kallem, **M. Son**, H. Park, H. Choi (2020). A new era for water treatment technologies: 3D printed membranes. *J. Ind. Eng. Chem.*, 91(25): 1–14
20. W. Yang, X. Wang, **M. Son**, B. E. Logan (2020). Simultaneously enhancing power density and coulombic efficiency with a hydrophobic Fe–N4/activated carbon air cathode for microbial fuel cells. *J. Power Sources.*, 465, 228264
19. N. Yanar, **M. Son**, H. Park, H. Choi (2020). Towards greener membranes with 3D printing. *Environ. Eng. Res.*, 26(2): 200027
18. W. Yang, **M. Son**, R. Rossi, J. S. Vrouwenvelder, B. E. Logan (2020). Adapting aluminum doped zinc oxide for electrically conductive membranes fabricated by atomic layer deposition. *ACS Appl. Mater. Interfaces.*, 12: 963–969
17. N. Yanar, **M. Son**, H. Park, H. Choi (2020). Bio-mimetically inspired 3D-printed honeycombed support (spacer) for the reduction of reverse solute flux and fouling of osmotic energy driven membranes. *J. Ind. Eng. Chem.*, 83: 343–350
16. **M. Son**, T. Kim, W. Yang, C. A. Gorski, B. E. Logan (2019). Electro-forward osmosis. *Environ. Sci. Technol.*, 53: 8352–8361
15. W. Yang, **M. Son**, B. Xiong, M. Kumar, S. Bucs, J. S. Vrouwenvelder, B. E. Logan (2019). Effective Biofouling Control Using Periodic H₂O₂ Cleaning with CuO Modified and Polypropylene Spacers. *ACS Sustain. Chem. Eng.*, 7: 9582–9587
14. **M. Son**, W. Yang, S. Bucs, M. Nava-Ocampo, J. S. Vrouwenvelder, B. E. Logan (2018).

Polyelectrolyte-based sacrificial protective layer for fouling control in RO desalination.

Environ. Sci. Technol. Lett., 5: 584–590.

13. **M. Son**¹, J. Bae¹, H. Park, H. Choi (2018). Continuous thermal-rolling of electrospun nanofiber for polyamide layer deposition and its detection by engineered osmosis. *Polymer*, 145: 281–285.
12. N. Yanar, **M. Son**, E. Yang, Y. Kim, H. Park, S.-E. Nam, H. Choi (2018). Investigation of the performance behavior of a forward osmosis membrane system using various feed spacer materials fabricated by 3D printing technique. *Chemosphere*, 202: 708–715.
11. **H.G. Choi**¹, **M. Son**¹, H. Choi (2017). Integrating seawater desalination and wastewater reclamation forward osmosis process using thin-film composite mixed matrix membrane with functionalized carbon nanotube blended polyethersulfone support layer. *Chemosphere*, 185: 1181–1188 (¹author contributed equally).
10. **M. Son**, H. Kim, J. Jung, S. Jo, H. Choi (2017). Influence of extreme concentrations of hydrophilic pore-former on reinforced polyethersulfone ultrafiltration membranes for reduction of humic acid fouling. *Chemosphere*, 179: 194–201.
9. **M. Son**, H. Park, L. Liu, H-G. Choi, J. Kim, H. Choi (2016). Thin-film nanocomposite membrane with CNT positioning in support layer for energy harvesting from saline water. *Chem. Eng. J.*, 284: 68–77 (Selected as “Key Scientific Article” by Advances in Engineering).
8. **M. Son**, V. Novotny, H. Choi (2016). Thin-film nanocomposite membrane with vertically-embedded carbon nanotube for forward osmosis. *Desalin. Water Treat.*, 57: 26670–26679.
7. **M. Son**, H-G. Choi, L. Liu, E. Celik, H. Park, H. Choi (2015). Efficacy of carbon nanotube positioning in the polyethersulfone support layer on the performance of thin-film composite membrane for desalination. *Chem. Eng. J.*, 266: 376–384.
6. H-G. Choi, **M. Son**, S. Yoon, E. Celik, S. Kang, H. Park, C. Park, H. Choi (2015). Alginate fouling reduction of functionalized carbon nanotube blended cellulose acetate membrane in forward osmosis. *Chemosphere*, 136: 204–210.
5. L. Liu, D-Y. W. Di, H. Park, **M. Son**, H-G. Hur, H. Choi (2015). Improved antifouling performance of polyethersulfone (PES) membrane via surface modification by CNTs bound polyelectrolyte multilayers. *RSC adv.*, 5: 7340–7348.
4. H-G. Choi, S. Yoon, **M. Son**, H. Park, H. Choi (2015). Efficacy of synthesis conditions on functionalized carbon nanotube blended cellulose acetate membrane for desalination. *Desalin. Water Treat.*, 57: 7545–7554.

3. **M. Son**, H-G. Choi, L. Liu, H. Park, H. Choi (2014). Optimized synthesis conditions of polyethersulfone support layer for enhanced water flux for thin film composite membrane. *Environ. Eng. Res.*, 19: 339–344.
2. L. Liu, **M. Son**, H. Park, E. Celik, C. Bhattacharjee, H. Choi (2014). Efficacy of CNTs bound polyelectrolyte membrane by spray-assisted layer-by-layer (LbL) technique on water purification. *RSC adv.*, 4: 32858–32865.
1. L. Liu, **M. Son**, S. Chakraborty, C. Bhattacharjee, H. Choi (2013). Fabrication of ultra-thin polyelectrolyte/carbon nanotube membrane by spray-assisted layer-by-layer technique: characterization and its anti-fouling properties for water treatment. *Desalin. Water Treat.*, 51: 6194–6200.

Patents

12. **M. Son** (2023). Apparatus and method for summarizing information using generative artificial intelligence model. 10-2023-0052082, Korea, Pending
11. **M. Son** and Z. Ullah (2023). Apparatus and method for predicting and controlling process performance based on artificial intelligence. 10-2023-0059581, Korea, Pending
10. **M. Son**, J. Jang, S. Park (2023). Self-rechargeable seawater battery system. 10-2023-0010175, Korea, Pending
9. K. H. Cho, **M. Son**, N. Yoon (2021). System for controlling electrochemical water treatment process based on deep learning and method thereof. 10-2021-0037863, Korea, Registration
8. J. Kim, K. H. Cho, **M. Son**, S. Park, N. Yoon, J. Shim (2020). Capacitive deionization system for process automation by monitoring electrode surface using optical coherence tomography. 10-2020-0173996, Korea, Registration
7. **M. Son**, B. E. Logan, W. Yang, J. S. Vrouwenvelder, S. Bucs (2018). A polyelectrolyte-based sacrificial protective layer for fouling control in desalination and water filtration. US patent Invention Disclosure.
6. H. Choi, **M. Son**, L. Liu, H. Park, H. Choi (2016). Nanocomposite ultra-thin separation film and method for manufacturing same. US 2016/0051939 A1, Application.
5. H. Choi, **M. Son**, L. Liu, H. Park, H. Choi (2013). Nanocomposite ultra-thin separation film and method for manufacturing same. PCT/KR2013/003906, Application.

4. H. Choi, L. Liu, **M. Son** (2014). Multilayer membrane containing carbon nanotube manufactured by layer-by-layer assembly method. US 2014/0202953, Application.
3. H. Choi, **M. Son**, S. Nam (2017). Thin film nanocomposite membranes with vertically-embedded CNT for desalination and method for preparing the same. 10-1735552, Korea, Registration.
2. H. Choi, **M. Son**, L. Liu, H. Park, H. Choi (2014). Thin film nanocomposite membranes for desalination and method for preparing the same. 10-1381890, Korea, Registration.
1. H. Choi, L. Liu, **M. Son** (2014). A process of preparing multi-layered membrane comprising carbon nanotube by layer-by-layer method, and the same prepared thereby. 10-1381889, Korea, Registration.

Book Chapters

4. Inorganic-Organic Composites: Carbon Nanotubes (CNTs), *UNESCO*, *Submitted*
3. Water-Energy-Food Nexus for Sustainable Development and Megacity Design, *IGLUS Quarterly*, (2019) 5: 7-11
2. Nanotechnology in engineered membranes: Innovative membrane materials for water-energy nexus (Materials Science and Engineering: Concepts, Methodologies, Tools, and Applications), *IGI global*, (2017) 802-824, DOI:10.4018/978-1-5225-1798-6.ch031
1. Nanotechnology in engineered membranes: Innovative membrane material (Applying Nanotechnology for Environmental Sustainability), *IGI global*, (2016) 50-71, DOI:10.4018/978-1-5225-0585-3.ch003

Conference Proceedings (Selected International)

14. **M. Son** (2023). Artificial intelligence technologies for electrochemical water-energy production processes of saline water, *American Chemical Society (ACS)*, Harnessing the power of data, San Francisco, USA, August 13-17, **Oral presentation**.
13. **M. Son**, W. Yang, S. Bucs, M. Nava-Ocampo, J. S. Vrouwenvelder, B. E. Logan (2019). Sacrificial protective layer for fouling control in reverse osmosis desalination. *North American Membrane Society (NAMS)*, Membrane separations for emerging water, energy, & health applications, Pittsburgh, USA, May 11-15, **Oral presentation**.

12. B. E. Logan, **M. Son**, E. Kolvek, C. A. Gorski (2019). Improving the performance of battery electrode deionization for desalination and ammonium removal. *International Conference on Capacitive Deionization & Electrosorption*, Beijing, China, May 20–23, **Oral presentation**.
11. B. E. Logan, **M. Son**, E. Kolvek, C. A. Gorski (2019). Capturing nitrogen in wastewater by using ammonium-selective electrodes in the battery electrode deionization (BDI) process. *Association of Environmental Engineering & Science Professors*, Environmental Engineers & Scientists see Cities in 4-D, Arizona, USA, May 14–16, **Oral presentation**.
10. M. Geitner, **M. Son**, B. Xiong, W. Yang, D. Velegol, B. E. Logan, M. Kumar (2018). Reactive membranes for the degradation of emerging wastewater contaminants. *AIChE*, Advanced treatment for water reuse and recycling, Pittsburgh, USA, Oct. 28–Nov. 2, **Oral presentation**.
9. **M. Son**, J. Bae, H. Choi (2016). Thin-film nanocomposite and vertically embedded carbon nanotube composite membrane for forward osmosis. *International Forward Osmosis Summit (IFOS)*, Sydney, Australia, Dec. 2–4, **Oral presentation**.
8. **M. Son**, J. Bae, H. Choi (2016). Novel thin-film nanofiber composite (TNC) membrane for osmotic energy harvesting, *IWA Leading Edge Conference*, Advanced materials–nanotechnology and new membranes, Jerez de la Frontera, Spain, June 13–16, **Oral presentation**.
7. **M. Son**, H. Choi (2016). Carbon nanotube incorporated thin-film nanocomposite membrane for energy harvesting from saline water. *US-Korea Conference (UKC)*, Texas, USA, Aug. 10–13, Poster.
6. **M. Son**, HG. Choi, L. Liu, H. Choi (2015). Alginate fouling reduction with CNT modified thin-film nanocomposite (TFN) membrane for desalination. *North American Membrane Society (NAMS)*, Membrane for water treatment and desalination, Boston, USA, May 30–June 3, **Oral presentation**.
5. **M. Son**, HG. Choi, I-C. Baek, H. Choi (2015). The novel thin-film nanocomposite (TFN) membrane with CNT for energy harvesting from saline water. *International Desalination Workshop (IDW)*, Jeju, South Korea, Nov. 18–21, Poster.
4. **M. Son**, HG. Choi, L. Liu, H. Park, H. Choi (2014). The nano-enhanced thin-film composite membrane for seawater desalination and energy harvesting. *Desalination for the environment clean water and energy (by EDS)*, Limassol, Cyprus, May 11–15, **Oral presentation**.
3. **M. Son**, H. Park, HG. Choi, L. Liu, H. Choi (2013). CNT blended TFC membrane for flux enhancement and energy harvesting. *IWA Leading Edge Technology*, Innovative design,

operation, and robustness of membrane systems for water and wastewater processes, Bordeaux, France, June 2–6, **Oral presentation.**

2. **M. Son**, H. Park, HG. Choi, L. Liu, H. Choi (2013). CNT blended TFC membrane for flux enhancement and energy generation. *IEEC*, Drinking water, Seoul, South Korea, June 11–13, Poster.
1. **M. Son**, HG Choi, L. Liu, S. Yoon, B. An, H. Choi (2012). Dependency of synthesis conditions on properties of functionalized carbon nanotube blended polyethersulfone membrane. *IWA World Water Congress*, Membrane technologies–process applications, Busan, South Korea, Sep. 16–21, **Oral presentation.**

※ More than 10 proceedings for the international and domestic conference

Awards and Honors

2021	<u>Sejong Science Fellowship Recipient (as PI), 650,000 USD</u> for 5 yr (2021–2026)
2020	Guest Editor, <i>Membranes</i> , Special Issue "Nanotechnology in Engineered Membranes"
2016	Selected as “Key Scientific Article” by <i>Advances in Engineering</i> (Article title: Thin-film nanocomposite membrane with CNT positioning in support layer for energy harvesting from saline water)
2010–2016	Government scholarship recipient
2010–2016	Brain Korea 21 Project research assistance scholarship recipient
2016	Poster pitch, IWA Leading Edge Conference, Spain
2015	International Desalination Workshop “Desal-Pro” certificate
2009	Highest honors student (1 st Semester)
2008	Honors student (1 st Semester)

Teaching Activities

Course taught at UST (since 2022)

21090 Membrane-based Technologies for Water Treatment

21092 Introduction to Water Treatment Materials

19003 Field Research

Advising activities at Penn State | KIST | UNIST | GIST | (2010-2019)

Graduate Student Advising (2021–Present) Water-Energy Nexus

Graduate Student Advising (2021–Present) Environmental Artificial Intelligence

Graduate Student Advising (2017–2019) Battery Electrode Deionization

Graduate Student Advising (2010–2017) Nano-enhanced Membranes

Undergraduate Student Advising (2013–Present) Salinity-Gradient Energy

High School Student Advising (2015–2017) Membrane Fouling Control

International Intern Student Advising (2012–2017) Carbon Nanotube Membranes

Guest Lecturer (2014) Environmental Nanotechnology

Guest Lecturer (2013) Advanced Chemistry Experiment

Grant (as Principal Investigator)

2021–2026	Optimization of Electrochemical Cells using Deep Learning for Water Treatment and Renewable Energy Production, <u>Sejong Science Fellowship</u> , South Korea (650,000 USD, Funded by NRF, <u>PI: Moon Son</u>)
2021-2023	Desalination Battery for Climate Change Adaptation (100,000 USD, Funded by KIST, <u>PI: Moon Son</u>)

Grants and Projects (Participated)

2023–2024	New Biofuel Refinery System for Electricity/Hydrogen Generation, South Korea (200,000 USD, Funded by KIST, PI: Jisoo Jang)
2020–2021	Seawater battery for water desalination, South Korea (1,500,000 USD, Funded by NRF, PI: Kyung Hwa Cho)
2020–2021	Model development for predicting contaminants of emerging concerns (CECs), South Korea (1,000,000 USD, Funded by KEITI, PI: Kyung Hwa Cho)
2020	Reactive electrochemical nanofiltration membrane for desalination, USA (150,000 USD, Funded by Bureau of Reclamation, PI: Brian P. Chaplin)
2017–2019	Fouling control in desalination by disruption of concentration polarization, USA (500,000 USD, Funded by KAUST, PI: Bruce E. Logan)
2012–2017	Development of hybrid nonporous polymeric thin-film for desalination, MSIP, South Korea (600, 000 USD, PI: Heechul Choi)
2016–2017	Development of core materials for membrane-based seawater desalination, KRICT, South Korea (3,200,000 USD, PI: Heechul Choi)
2014–2016	Development of nano-enhanced thin-film composite membrane for seawater desalination, MSIP, South Korea (340,000 USD, PI: Heechul Choi)
2009–2014	Development of granule-type nanoporous material with targeted selectivity for treatment of specific contaminants, ME, South Korea (2,200,000 USD, PI: Heechul Choi)
2011–2014	Nanomaterial-based membrane in water purification, MSIP, South Korea (120,000 USD, PI: Heechul Choi)
2011	Water grid intelligent technology planning, MOLIT, South Korea (200,000 USD,

PI: Heechul Choi)

2013 National water research institute support project, Gwangju city, South Korea
(50,000 USD, PI: Heechul Choi)

2010–2016 Basic research projects in high-tech industrial technology, GIST, South Korea
(100,000 USD, PI: Heechul Choi)