

Wonjun Noh, Ph.D.

Chemical and Biological Engineering, Princeton University

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Professional Experience

2025.09 – present Postdoctoral Research Fellow in Chemical and Biological Engineering, Princeton University, NJ, US [Advisor: **Prof. Christos Maravelias**]

EDUCATION

2020.03 – 2025.08 Ph.D. in School of Chemical Engineering, Pusan National University, Busan, Korea [Advisor: **Prof. Inkyu Lee**]

2014.03 – 2020.02 B.S. in School of Chemical and Biomolecular Engineering (graduated first class honor - 1/40), Pusan National University, Busan, Korea

RESEARCH INTEREST

1. Sustainable Process Design

- Sustainable Process Design Using Various Process Systems Engineering (PSE) Techniques
- Techno-economic Analysis (TEA) and Life-cycle Assessment (LCA)
- Process Optimization for Enhancing Process Performance from Various Perspectives

2. Carbon-neutral Engineering

- Process-level Carbon Contribution Analysis (PCCA) for Chemical Processes
- Development of a Novel Environmental Analysis and Reduction Method Addressing the Limitations of LCA

3. Realistic Transition Strategies from Traditional Industries to Emerging Clean Technologies

- Integrated Assessment Models (IAMs) Development for Evaluating Plastic and Biomass-based Technology
- Estimation of Equipment Cost and Capital Expenditure (CAPEX) and Precise GHG Emissions of Emerging Clean Technologies

4. Artificial Intelligence in Chemical and Environmental Engineering

- Artificial Intelligence in Chemical Industries and Energy Systems
- Hybrid Framework of First-principles and Machine Learning Model

PUBLICATIONS

§ Equal contribution; * Corresponding author

PUBLICATIONS (First Author)

1. **Wonjun Noh**[§], Sihwan Park[§], Sojung Kim, and Inkyu Lee*. "A hybrid framework of first-principles model and machine learning for optimizing control parameters in chemical processes." *Journal of Industrial and Engineering Chemistry* 141 (2025): 582-596.
2. **Wonjun Noh** and Inkyu Lee*. "Synergizing Autothermal Reforming Hydrogen Production and Carbon Dioxide Electrolysis: Enhancing the Competitiveness of Blue Hydrogen in Sustainable Energy Systems." *Chemical Engineering Journal* 499 (2024): 156688.
3. **Wonjun Noh**[§], Seoyeon Cho[§], and Inkyu Lee*. "Carbon utilization in natural gas-based hydrogen production via carbon dioxide electrolysis: Towards cost-competitive clean hydrogen." *Energy Conversion and Management* 314 (2024): 118719.
4. **Wonjun Noh**, Sihwan Park, Yurim Kim, Jaewon Lee, Junghwan Kim, Inkyu Lee*. "Systems design and techno-economic analysis of a novel cryogenic carbon capture process integrated with an air separation unit for autothermal reforming blue hydrogen production system." *Journal of Cleaner Production* 457 (2024): 142341.
5. Cho, Seoyeon[§], **Wonjun Noh**[§], and Inkyu Lee*. "Hybrid systems design for blue and green hydrogen co-production: Integration of autothermal reforming with solid oxide electrolysis." *Energy Conversion and Management* 300 (2024): 117969.
6. **Wonjun Noh**[§], Juyeoung Seo[§], Junghwan Kim*, and Inkyu Lee*. "A novel process-level carbon contribution analysis (PCCA) method for carbon minimization of chemical processes: Exergy mapping to carbon emissions." *Chemical Engineering Journal* 471 (2023): 144502.
7. **Wonjun Noh**, Sihwan Park, Junghwan Kim*, and Inkyu Lee*. "Comparative design, thermodynamic and techno-economic analysis of utilizing liquefied natural gas cold energy for hydrogen liquefaction processes." *International Journal of Energy Research* 46.9 (2022): 12926-12947.

PUBLICATIONS (Co-Author)

8. Doyeong An, **Wonjun Noh**, Jinwoo Park*, and Inkyu Lee*. "Cryogenic carbon capture as the bridge for integrating hydrogen production and Liquefaction: Enhancing the sustainability of blue hydrogen Production-to-Storage systems." *Chemical Engineering Journal* (2024): 158811.
9. Sihwan Park, **Wonjun Noh**, Jaedeuk Park, Jinwoo Park, and Inkyu Lee*. "Efficient heat exchange configuration for sub-cooling cycle of hydrogen liquefaction process." *Energies* 15.13 (2022): 4560.
10. Seungsik Cho, Jinwoo Park, **Wonjun Noh**, Inkyu Lee*, and Il Moon*. "Developed hydrogen liquefaction process using liquefied natural gas cold energy: design, energy optimization, and techno-economic feasibility." *International Journal of Energy Research* 45.10 (2021): 14745-14760.

11. Jinwoo Park[§], Seungsik Cho[§], Meng Qi, **Wonjun Noh**, Inkyu Lee*, and Il Moon*. "Liquid air energy storage coupled with liquefied natural gas cold energy: focus on efficiency, energy capacity, and flexibility." *Energy* 216 (2021): 119308.
12. Jinwoo Park, Meng Qi, Jeongdong Kim, **Wonjun Noh**, Inkyu Lee*, and Il Moon*. "Exergoeconomic optimization of liquid air production by use of liquefied natural gas cold energy." *Energy* 207 (2020): 118193.

HONORS & AWARDS

1. Outstanding Paper, PNU-BK21, 2024
2. Best Oral Presentation, KICChE, 2023
3. Outstanding Paper, PNU-BK21, 2023
4. PNU-Fellowship, PNU, 2023
5. Best Poster Presentation, KSIEC, 2021
6. Premier Graduate Scholarship, PNU, 2020-2021
7. Premier Undergraduate Scholarship (full funding for BS), PNU, 2014-2019

Teaching Experience

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|--|------------------------------|
| ■ Teaching Assistance, Pusan National University | <i>Spring, 2020</i> |
| Class: Computer Programming with Prof. Inkyu Lee | |
| ■ Teaching Assistance, Pusan National University | <i>Fall, 2020</i> |
| Class: Computer-aided Chemical Process Design with Prof. Inkyu Lee | |
| ■ Teaching Assistance, Pusan National University | <i>Spring, 2022</i> |
| Class: Chemical Engineering Thermodynamics with Prof. Inkyu Lee | |
| ■ Research Tutoring and Consulting, Pusan National University | <i>Sep. 2024 - Feb. 2025</i> |
| Mentee: Jeongheon Kim, Doyeong Ahn, and Duho Kang | |
| Role: Design and optimization of hydrogen liquefaction processes & Career counseling | |

LEADERSHIP & SERVICE

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| ■ Lab Student Manager, iPSE | <i>Mar. 2020 - Aug. 2022</i> |
| ■ Graduate School Student Council, Pusan National University | <i>Mar. 2021 - Feb. 2022</i> |
| Role: Coordinated cultural programs and academic workshops for graduate students | |

RESEARCH SKILLS

- **Process Simulation:** Aspen Plus, Aspen HYSYS, Aspen HYSYS Dynamics
- **Process Analysis:** TEA, LCA, GCAM (early stage)
- **Others:** Python, Bayesian optimization, Genetic algorithm, GREET, open LCA

PRESENTATIONS

1. **Wonjun Noh** and Inkyu Lee. "Integrated Process of Autothermal Reforming Hydrogen Production and CO₂ Electrolysis Towards Hydrogen Shot" *In Korean Institute of Chemical Engineers (KIChE) Autumn Meeting, 2024*
2. **Wonjun Noh** and Inkyu Lee. " Optimization of the Integrated Process for Autothermal Reforming Hydrogen Production and CO₂ Electrolysis Systems" *In Korean Society of Clean Technology (KSCT) Autumn Meeting, 2024*
3. **Wonjun Noh** and Inkyu Lee. "Synergy between hydrogen production and carbon dioxide electrolysis: Strengthening the competitiveness of blue hydrogen in sustainable energy systems" *In Korean Society of Industrial and Engineering Chemistry (KSIEC) Autumn Meeting, 2024*
4. **Wonjun Noh** and Inkyu Lee. "Techno-economic evaluation of carbon utilization through carbon dioxide electrolysis in blue hydrogen production" *In KIChE Spring Meeting, 2024*
5. **Wonjun Noh** and Inkyu Lee. "Electrochemical utilization of CO₂ in blue hydrogen production: Process design and Techno-economic evaluation" *In KSIEC Spring Meeting, 2024*
6. **Wonjun Noh** and Inkyu Lee. "Electrochemical use of carbon dioxide in blue hydrogen production: Process design and techno-economic evaluation" *In KSCT Spring Meeting, 2024*
7. **Wonjun Noh**, Juyeong Seo, and Inkyu Lee. "A Novel Carbon Emission Optimization Method for Chemical Processes Based on Thermodynamic 1st and 2nd Law: Naphtha Cracking Center Application" *In AIChE Annual Meeting, 2023*
8. **Wonjun Noh** and Inkyu Lee. "A Novel ATR-based Blue Hydrogen Production Process with Cryogenic Carbon Capture" *In KIChE Autumn Meeting, 2023*
9. **Wonjun Noh**, Juyeong, and Inkyu Lee. "A process-level carbon tracking (PLCT) method: Naphtha cracking center process application" *In KIChE Spring Meeting, 2023*
10. **Wonjun Noh**, Juyeong, and Inkyu Lee. "A novel hybrid model of digital twin and machine learning for the control parameter optimization of the plant: LNG fuel gas supply system application" *In KIChE Autumn Meeting, 2022*
11. **Wonjun Noh**, Sihwan Park, Sieun Oh, and Inkyu Lee. "Auto-tuning model for digital twin development based on Bayesian optimization: LNG fuel gas supply system application" *In KIChE Spring Meeting, 2022*
12. **Wonjun Noh**, Sihwan Park, and Inkyu Lee. "Hydrogen liquefaction process with cold energy of LNG considering o-p conversion heat: Design, Optimization, Economic Analysis" *In KIChE Autumn Meeting, 2021*
13. **Wonjun Noh**, Sihwan Park, and Inkyu Lee. "Design and optimization of hydrogen production and liquefaction process from LNG considering liquefaction ratio" *In KIChE Spring Meeting, 2021*

RESEARCH PROJECT

1. **Development of Systems Design and Optimization Methodology for Carbon Negative Green Hydrogen Value Chain via AI-based Process Module**, National Research Foundation of Korea, 750,000,000 for 3 years, 2024-Current
2. **Carbon Reduction Process Design Model Development**, Ministry of Trade, Industry and Energy, ₩1,272,000,000 for 3 years, 2022-2024
3. **Design and Optimization for Cryogenic Energy System on Liquefied Natural Gas Using Liquid Air as A Cold Carrier**, National Research Foundation of Korea, ₩168,000,000 for 3 years, 2020-2023
4. **Development of FGSS process analysis model based on digital twin and machine learning**, HD Hyundai Heavy Industries, ₩176,000,000 for 2 years, 2020-2022

REFERENCES

Prof. Inkyu Lee (Ph.D. Advisor)

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Prof. Junghwan Kim

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