

CONTACT INFORMATION	<p>Department of Chemical Engineering & Materials Science Ewha Womans University 52, Ewhayeodae-gil, Seodaemun-gu, Seoul 03760 Republic of Korea</p>	<p><i>Office: Jinseonmi-gwan Rm. 208</i> <i>E-mail: jgna@ewha.ac.kr</i> <i>Homepage: https://nagroup.ewha.ac.kr</i></p>
RESEARCH INTERESTS	<ol style="list-style-type: none"> 1. Autonomous discovery of non-intuitive process systems designs through artificial intelligence and multiscale simulations 2. Conceptual design of non-traditional processes that improve sustainability in the chemical industry 	
RESEARCH EXPERIENCE	<p><i>Assistant Professor (Mar. 2020 –)</i> Ewha Womans University, Seoul, Republic of Korea</p> <p><i>Postdoctoral Research Fellow (Jul. 2019 – Feb. 2020)</i> Carnegie Mellon University, Pittsburgh, PA USA</p> <ul style="list-style-type: none"> • Principal Investigator: Professor Nikolaos V. Sahinidis <p><i>Postdoctoral Research Fellow (Mar. 2018 – Jun. 2019)</i> Korea Institute of Science and Technology (KIST), Seoul, Republic of Korea</p> <ul style="list-style-type: none"> • Principal Investigator: Dr. Ung Lee <p><i>Visiting Student (Aug. 2017 – Dec. 2017)</i> Massachusetts Institute of Technology (MIT), Cambridge, MA, USA</p> <ul style="list-style-type: none"> • Host Adviser: Professor Richard D. Braatz 	
EDUCATION	<p><i>Ph.D. in Chemical and Biological Engineering (Mar. 2013 – Feb. 2018)</i> Seoul National University, Seoul, Republic of Korea</p> <ul style="list-style-type: none"> • Ph.D. Adviser: Professor Won Bo Lee • Ph.D. Thesis on <i>Computational science approach for design and optimization of sustainable process and its industrial applications</i> <p><i>B.S. in Chemical and Biological Engineering with honors (Cum Laude) (Mar. 2009 – Feb. 2013)</i> Seoul National University, Seoul, Republic of Korea</p> <ul style="list-style-type: none"> • <i>Minor Economics</i> • Senior Thesis Adviser: Professor Chonghun Han • Senior Thesis on <i>Quantitative analysis of heat exchanger network synthesis for applying theoretical networks to the real industry</i> <p><i>Secondary Education in Science (Mar. 2006 – Feb. 2009)</i> Korea Science Academy of KAIST, Busan, Republic of Korea</p>	
AWARDS, FELLOWSHIPS, AND HONORS	<p><i>AIChE Travel Award, Hanwha-Chemical&Total, 2019</i> <i>DAELIM Graduate Research Award, DAELIM, 2014</i> <i>KIChE Best Poster Presentation Award, KIChE, 2014</i> <i>Korea Process Simulation Olympiad Invensys Award, KIChE, 2012</i> <i>Doosan Heavy Industry Green Energy Project 1st place, Doosan Heavy Industry, 2012</i> <i>Presidential Science Scholarship, National Research Foundation, Mar. 2009 – Feb. 2013</i></p>	

1. Choi, W., Park, S., Jung, W., Won, D. H., **Na, J.***, & Hwang, Y. J.* (2022). Origin of Hydrogen Incorporated into Ethylene during Electrochemical CO₂ Reduction in Membrane Electrode Assembly. *ACS Energy Letters*, 7, 939-945.
[Highlights on Front Cover Article]
2. Seo, S. K., Yoon, Y. G., Lee, J. S., **Na, J.***, & Lee, C. J.* (2022). Deep Neural Network-based Optimization Framework for Safety Evacuation Route during Toxic Gas Leak Incidents. *Reliability Engineering & System Safety*, 218, 108102.
3. Choi, S., Jung, I., Kim, H., **Na, J.***, & Lee, J. M.* (2022). Physics-informed deep learning for data-driven solutions of computational fluid dynamics. *Korean Journal of Chemical Engineering*, 39, 515-528.
4. Kim, M., Cho, S., Jang, K., Hong, S., **Na, J.***, Moon, I.*, Data-driven Robust Optimization for Minimum Nitrogen Oxide Emission Under Process Uncertainty. *Chemical Engineering Journal*. **2022**, 428, 130971.
5. Shin, S., Choi, S., **Na, J.**, Jung, I., Kim, M.-K., Park, M.-Y.*, Lee, W.B.* , CFD modeling for the prediction of molecular weight distribution in the LDPE autoclave reactor: Effects of non-ideal mixing. *Chemical Engineering Journal*. **2022**, 427, 131829.
6. Kim, H., **Na, J.***, & Lee, W. B.* (2021). Generative Chemical Transformer: Neural Machine Learning of Molecular Geometric Structures from Chemical Language via Attention. *Journal of Chemical Information and Modeling*, 61(12), 5804-5814.
[Highlights on Back Cover Article]
7. Jung, B.†, Park, S.†, Lim, C., Lee, W.H., Lim, Y., **Na, J.**, Lee, C.-J., Oh, H.-S.*, Lee, U.* , Design methodology for mass transfer-enhanced large-scale electrochemical reactor for CO₂ reduction. *Chemical Engineering Journal*, **2021**, 424, 130265.
8. Kim, D., Choi, W., Lee, H.W., Lee, S.Y., Choi, Y., Lee, D.K., Kim, W., **Na, J.**, Lee, U.* , Hwang, Y.J.* , Won, D.H.* , Electrocatalytic Reduction of Low Concentrations of CO₂ Gas in a Membrane Electrode Assembly Electrolyzer. *ACS Energy Letters*. **2021**, 6(10), 3488-3495.
9. Shams, M.H., Niaz, H., **Na, J.**, Anvari-Moghaddam, A.* , Liu J., Machine learning-based utilization of renewable power curtailments under uncertainty by planning of hydrogen systems and battery storages. *Journal of Energy Storage*. **2021**, 41, 103010.
10. **Na, J.**, Bak, J.H., Sahinidis, N.* , Efficient Bayesian inference using adversarial machine learning and low-complexity surrogate models. *Computers & Chemical Engineering*, **2021**, 151, 107322.
11. Lee, D., **Na, J.**, Park, D., Lee, J.M.* , Bayesian Optimization of Semicontinuous Carbonation Process Operation Recipe. *Industrial & Engineering Chemistry Research*. **2021**, 60(27), 9871-9884.
12. Park, S., Atwair, M., Kim, K., Lee, U., **Na, J.**, Zahid, U.* , Lee, C.-J.* , Bayesian optimization of industrial-scale toluene diisocyanate liquid-phase jet reactor with 3-D computational fluid dynamics model. *Journal of Industrial and Engineering Chemistry*, **2021**, 98, 327-339.
13. Park, D., **Na, J.**, Lee, J.M.* , Clustered Manifold Approximation and Projection for Semisupervised Fault Diagnosis and Process Monitoring. *Industrial & Engineering Chemistry Research*. **2021**, 60(26), 9521-9531.
14. Jang, K., Hong, S., Kim, M., **Na, J.***, & Moon, I.* (2021). Adversarial Autoencoder Based Feature Learning for Fault Detection in Industrial Processes. *IEEE Transactions on Industrial Informatics*, 18(2), 827-834.

15. Back, S.†, **Na, J.†**, & Ulissi, Z.*, Efficient Discovery of Active, Selective, and Stable Catalysts for Electrochemical H₂O₂ Synthesis through Active Motif Screening. *ACS Catalysis*, **2021**, *11*(5), 2483-2491.
16. Park, S.†, Wijaya, D. T.†, **Na, J.***, & Lee, C. W.* Towards the Large-Scale Electrochemical Reduction of Carbon Dioxide. *Catalysts*, **2021**, *11*(2).
17. Kim, J.†, **Na, J.†**, Kim, K., Bak, J.H., Lee, H., & Lee, U.* Learning the properties of a water-lean amine solvent from carbon capture pilot experiments. *Applied Energy*, **2021**, *283*, 116213.
18. Back, S.†, **Na, J.†**, Tran, K. & Ulissi, Z. W. In silico discovery of active, stable, CO-tolerant and cost-effective electrocatalysts for hydrogen evolution and oxidation. *Physical Chemistry Chemical Physics*. **2020**, *22*, 19454-19458.
19. Sa, Y. J.†, Lee, C. W.†, Lee, S. Y.†, **Na, J.**, Lee, U.* , & Hwang, Y. J.* Catalyst–electrolyte interface chemistry for electrochemical CO₂ reduction. *Chemical Society Reviews*. **2020**, *49*, 6632-6665.
20. Kim, K., Lee, W. H., **Na, J.**, Hwang, Y. J., Oh, H.-S., & Lee, U.* , Data driven pilot optimization for electrochemical CO mass production. *Journal of Materials Chemistry A*. **2020**, *44*, 8781–8798.
21. Lee, H. W., Kim, K., An, J., **Na, J.**, Kim, H., Lee, U.* Toward the practical application of direct CO₂ hydrogenation technology for methanol production. *International Journal of Energy Research*. **2020**, *44*(11), 1– 18.
22. Nguyen, D. L. T.†, Lee, C. W.†, **Na, J.†**, Kim, M.-C. Tu, N. D. K., Lee, S. Y., Sa, Y. J., Won, D. H., Oh, H.-S., Kim, H., Han, S. S., Min, B. K., Lee, U.* , Hwang Y. J.* , Mass transport control by surface graphene oxide for selective CO production from electrochemical CO₂ reduction. *ACS Catalysis*, **2020**, *10*(5), 3222-3231.
23. **Na, J.**, Seo, B., Kim, J., Lee, C. W., Lee, H., Hwang, Y. J., Min, B. K., Lee, D. K., Oh, H.-S.* , Lee, U.* , General technoeconomic analysis for electrochemical coproduction coupling carbon dioxide reduction with organic oxidation. *Nature Communications*. **2019**, *10*, 5193.
Also appeared in *Nature Research Device and Materials Engineering Community*, **2019**
[Editor’s Highlights in Nature Communications]
24. Lee, Y., Jeon, K., Cho, J., **Na, J.**, Park J., Jung, I., Park, J., Park, M.J., Lee, W.B.* , Multicompartment Model of an Ethylene–Vinyl Acetate Autoclave Reactor: A Combined Computational Fluid Dynamics and Polymerization Kinetics Model. *Industrial & Engineering Chemistry Research*. **2019**, *58*, 16459-1641.
25. Hwang, J., Kim, J., Lee, H. W., **Na, J.**, Ahn, B. S., Lee, S. D., Kim, H.S., Lee, H., Lee, U.* , An experimental based optimization of a novel water lean amine solvent for post combustion CO₂ capture process. *Applied Energy*. **2019**, *248*, 174-184.
26. **Na, J.†**, Park, S.†, Bak, J. H., Lee, D., Yoo, Y., Kim, I., Park, J., Lee, U., Lee, J.M.* , Bayesian Parameter Estimation of Aqueous Mineral Carbonation Kinetics. *Industrial & Engineering Chemistry Research*. **2019**, *58*(19), 8246-8259.
27. Jeon, K., Yang, S., Kang, D., **Na, J.**, Lee, W.B.* , Development of surrogate model using CFD and deep neural networks to optimize gas detector layout. *Korean Journal of Chemical Engineering*. **2019**, *36*(3), 325-332.
28. Lee, Y.†, **Na, J.†**, Lee, W.B.* , Robust design of ambient-air vaporizer based on time-series clustering. *Computers & Chemical Engineering*. **2018**, *118*, 236-247
29. Park, S., **Na, J.**, Kim, M., Lee, J.M.* , Multi-objective Bayesian optimization of chemical reactor design using computational fluid dynamics. *Computers & Chemical Engineering*. **2018**, *119*, 25-37.

30. Lee, W.-J.†, **Na, J.†**, Kim, K., Lee, C., Lee, Y., Lee, J.M.* , NARX Modeling for Real-Time Optimization of Air and Gas Compression Systems in Chemical Processes. *Computers & Chemical Engineering*. **2018**, *115*, 262-274.
31. **Na, J.†**, Kshetrimayum, K. S.†, Jung, I., Park, S., Lee, Y., Kwon, O., Mo, Y., Chung, J., Yi, J., Lee, U., Han, C.* , Pilot Scale Compact Gas-to-Liquid Process: Design and Operation of Microchannel Reactor for Fischer-Tropsch Synthesis. *Chemical Engineering and Processing: Process Intensification*. **2018**, *128*, 63-76.
32. **Na, J.†**, Jeon, K.†, Lee, W.-B.* , Toxic gas release modeling for real-time analysis using variational autoencoder with convolutional neural networks. *Chemical Engineering Science*, **2018**. *181*, 68-78.
33. Kim, M., **Na, J.**, Park, S., Park, J.-H., Han, C.* , Modeling and validation of a pilot-scale aqueous mineral carbonation reactor for carbon capture using computational fluid dynamics. *Chemical Engineering Science*, **2018**, *177*, 301-312.
34. An, J.†, **Na, J.†**, Lee, U.* , Han, C.* , Design of carbon dioxide dehydration process using derivative-free superstructure optimization. *Chemical Engineering Research and Design* **2018**, *129*, 344-355.
35. Shin, S., Lee, G., Ahmed, U., Lee, Y., **Na, J.**, Han, C.* , Risk-based underground pipeline safety management considering corrosion effect. *Journal of Hazardous Materials* **2018**, *342* (Supplement C), 279-289.
36. Kshetrimayum, K., **Na, J.**, Park, S., Jung, I., Lee, Y., Han, C., Intensified Low-Temperature Fischer-Tropsch Synthesis Using Microchannel Reactor Block: A Computational Fluid Dynamics Simulation Study. *Journal of the Korean Institute of Gas* **2017**, *21* (4), 92-102.
37. **Na, J.**, Lim, Y., Han, C.* , A modified DIRECT algorithm for hidden constraints in an LNG process optimization. *Energy* **2017**, *126*, 488-500.
38. **Na, J.**, Kshetrimayum, K. S., Lee, U.* , Han, C.* , Multi-objective optimization of microchannel reactor for Fischer-Tropsch synthesis using computational fluid dynamics and genetic algorithm. *Chemical Engineering Journal* **2017**, *313*, 1521-1534.
39. Jung, I., **Na, J.**, Park, S., Jeon, J., Mo, Y.-G., Yi, J.-Y., Chung, J.-T., Han, C.* , Optimal design of a large scale Fischer-Tropsch microchannel reactor module using a cell-coupling method. *Fuel Processing Technology* **2017**, *159*, 448-459.
40. Park, S., **Na, J.**, Kim, M., An, J., Lee, C., Han, C., CO₂ Mineral Carbonation Reactor Analysis using Computational Fluid Dynamics: Internal Reactor Design Study for the Efficient Mixing of Solid Reactants in the Solution. *Korean Chemical Engineering Research* **2016**, *54* (5), 612-620.
41. Shin, S., Lee, Y., Song, K., **Na, J.**, Park, S., Lee, Y., Lee, C.-J., Han, C.* , Design and economic analysis of natural gas hydrate regasification process combined with LNG receiving terminal. *Chemical Engineering Research and Design* **2016**, *112*, 64-77.
42. Park, S., Jung, I., Lee, Y., Kshetrimayum, K. S., **Na, J.**, Park, S., Shin, S., Ha, D., Lee, Y., Chung, J., Lee, C.-J.* , Han, C.* , Design of microchannel Fischer-Tropsch reactor using cell-coupling method: Effect of flow configurations and distribution. *Chemical Engineering Science* **2016**, *143*, 63-75.
43. Kshetrimayum, K. S., Jung, I., **Na, J.**, Park, S., Lee, Y., Park, S., Lee, C.-J.* , Han, C.* , CFD Simulation of Microchannel Reactor Block for Fischer-Tropsch Synthesis: Effect of Coolant Type and Wall Boiling Condition on Reactor Temperature. *Industrial & Engineering Chemistry Research* **2016**, *55* (3), 543-554.
44. Jung, I., Kshetrimayum, K. S., Park, S., **Na, J.**, Lee, Y., An, J., Park, S., Lee, C.-J.* , Han, C.* , Computational Fluid Dynamics Based Optimal Design of Guiding Channel Geometry in U-Type

- Coolant Layer Manifold of Large-Scale Microchannel Fischer–Tropsch Reactor. *Industrial & Engineering Chemistry Research* **2016**, 55 (2), 505-515.
45. Lee, Y., Jung, I., **Na, J.**, Park, S., Kshetrimayum, K. S., Han, C., Analysis on Thermal Effects of Process Channel Geometry for Microchannel Fischer-Tropsch Reactor Using Computational Fluid Dynamics. *Korean Chemical Engineering Research* **2015**, 53 (6), 818-823.
 46. Park, S., Jung, I., Lee, U., **Na, J.**, Kshetrimayum, K. S., Lee, Y., Lee, C.-J.*, Han, C.*, Design and modeling of large-scale cross-current multichannel Fischer–Tropsch reactor using channel decomposition and cell-coupling method. *Chemical Engineering Science* **2015**, 134, 448-456.
 47. **Na, J.**, Jung, J., Park, C., Han, C.*, Simultaneous synthesis of a heat exchanger network with multiple utilities using utility substages. *Computers & Chemical Engineering* **2015**, 79, 70-79.
 48. **Na, J.**, Jung, I., Kshetrimayum, K. S., Park, S., Park, C., Han, C., Computational Fluid Dynamics Study of Channel Geometric Effect for Fischer-Tropsch Microchannel Reactor. *Korean Chemical Engineering Research* **2014**, 52 (6), 826-833.
 49. Park, C., Jung, I., Park, S., **Na, J.**, Kshetrimayum, K., Han, C., Lee, J. Y., Jung, J., Modeling of Liquid Hold-up in Fixed-bed Reactor for Fischer-Tropsch Synthesis. *Journal of the Korean Institute of Gas* **2014**, 18 (4), 63-67.
 50. Park, S., Park, C., Lee, U., Jung, I., **Na, J.**, Kshetrimayum, K. S., Han, C.*, Comparative Study of Process Integration and Retrofit Design of a Liquefied Natural Gas (LNG) Regasification Process Based on Exergy Analyses: A Case Study of an LNG Regasification Process in Republic of Korea. *Industrial & Engineering Chemistry Research* **2014**, 53 (37), 14366-14376.
 51. Jung, I., Park, C., Park, S., **Na, J.**, Han, C.*, A Comparative Study of Various Fuel for Newly Optimized Onboard Fuel Processor System under the Simple Heat Exchanger Network. *Korean Chemical Engineering Research* **2014**, 52 (6), 720-726.
 52. Jung, J., Song, K., Park, S., **Na, J.**, Han, C.*, Optimal operation strategy of batch vacuum distillation for sulfuric acid recycling process. *Computers & Chemical Engineering* **2014**, 71, 104-115.

Proceedings, Reports, and Expositions

1. **Na, J.** Autonomous discovery in the process systems design. *NICE (News & Information for Chemical Engineers)* **2021**, 39.2, 207-216.
2. **Na, J.**, Lee, U. Research trends of process optimization using machine learning and its applications. *NICE (News & Information for Chemical Engineers)* **2018**, 36.1, 4-8.
3. Lee, Y., **Na, J.**, Lee, W.-B. Optimal Design of an Ambient Air Vaporizer using Numerical Model and DIRECT Algorithm. *Computer Aided Chemical Engineering* **2018**, 44 (eds Mario R. Eden, Marianthi G. Ierapetritou, & Gavin P. Towler), 1795-1800.
4. **Na, J.**, Jung, J., Park, C., Han, C., Simultaneous Optimization Models for Heat Exchanger Network Synthesis with Multiple Utilities: A New Strategy by Using Utility Sub-stage. *Computer Aided Chemical Engineering* **2015**, 33 (eds Jiří Jaromír Klemeš, Petar Sabev Varbanov, & Peng Yen Liew), 1675-1680.
5. Kshetrimayum, K. S., Park, S., Jung, I., **Na, J.**, Han, C. Simulation Study of Heat Transfer Enhancement due to Wall Boiling Condition in a Microchannel Reactor Block for Fischer-Tropsch Synthesis. *Computer Aided Chemical Engineering* **2015**, 37 (eds Krist V. Gernaey, Jakob K. Huusom, & Rafiqul Gani), 1355-1360.

PATENT

1. Lee, Hyun Joo; Lee, Ung; Kim, Jeongnam; Lee, Hewon; **Na, Jonggeol**, Ether-functional Diamine-based Carbon Dioxide Absorbents having a Low Regeneration Energy, Kr 10-2155236-0000 (*Patent application*)
2. Lee, Wonbo; **Na, Jonggeol**; Jeon, Kyeongwoo, APPARATUS AND METHOD FOR RELEASE MODELING OF TOXIC GASES, Kr 10-2196820-0000 (*Patent application*)
3. **Na, Jonggeol**; Park, Seungeun; Kim, Minjun; Ahn, Jinjoo; Lee, Chaehee, CARBON DIOXIDE COLLECTING APPARATUS USING ROTATING REACTOR, Kr 10-1711466-0000 (*Patent application*)

INVITED TALKS

- *Colloquium*. “Electrochemical Carbon Dioxide Reduction: Device and Process”. Feb. 07, 2022. Korea Institute of Science and Technology (KIST), Seoul, Republic of Korea
- *Invited Seminar*. “Autonomous Design of Products and Processes”. Dec. 30, 2021. EDRC, Seoul National University, Seoul, Republic of Korea
- *Invited Short Courses*. “Introduction to Reinforcement Learning”. Dec. 28, 2021. EDRC, Seoul National University, Seoul, Republic of Korea
- *Invited Seminar*. “Pilot Scale compact GTL Process: Design and Operation of Microchannel Fischer-Tropsch Reactor”. Dec. 09, 2021. Korea Institute of Machinery & Materials (KIMM), Daejeon, Republic of Korea
- *Invited Seminar*. “Artificial Intelligence for Process and Product Design”. Dec. 01, 2021. Seoul National University College of Medicine, Seoul National University, Seoul, Republic of Korea
- *Invited Short Courses*. “인공지능과 빅데이터 활용 에너지 시스템 최적화 연구”. Nov. 25, 2021. Dongkuk University, Gyeongju, Republic of Korea
- *Invited Seminar*. “Explainable Artificial Intelligence for Process and Product Design”. May. 13, 2021. Korea Research Institute of Chemical Technology (KRICT), Daejeon, Republic of Korea
- *Invited Seminar*. “Machine Learning Technologies Towards Enhancing Interpretability in Process Systems Engineering”. Jan. 13, 2021. EDRC, Seoul National University, Seoul, Republic of Korea
- *Invited Seminar*. “Machine Learning and Multiscale Simulations Towards Enhancing Interpretability in Chemical Engineering”. Apr. 01, 2020. Ewha Womans University, Seoul, Republic of Korea
- *Invited Seminar*. “디지털 트윈의 화학/제약 산업에서의 응용: Manufacturing of Thin Films for Pharmaceutical Applications”. Nov. 05, 2020. Process Systems & Safety Engineering Laboratory, Chung-Ang University, Seoul, Republic of Korea
- *Invited Seminar*. “Stochastic multiscale model-based optimal design and control via Bayesian inference and polynomial chaos expansion”. Nov. 19, 2019. Process Systems & Safety Engineering Laboratory, Chung-Ang University, Seoul, Republic of Korea
- *Invited Seminar*. “Stochastic multiscale model-based optimal design and control via Bayesian inference and polynomial chaos expansion”. Nov. 19, 2019. Process Systems & Safety Engineering Laboratory, Chung-Ang University, Seoul, Republic of Korea
- *Invited Flash Presentation*. “General technoeconomic analysis for electrochemical coproduction coupling carbon dioxide reduction with organic oxidation”. Nov. 13, Emerging Junior Investigator Open Innovation Forum’, Hanwha Travel Award at 2019 AIChE Annual Meeting, Orlando, USA
- *Invited Seminar*. “Computational science approach for applying artificial intelligence to process systems engineering field”. Feb. 29, 2019. Yonsei University, Seoul Republic of Korea
- *SNU-KIST joint Seminar*, Invited speaker. “General techno-economic analysis for paired electrolysis of CO₂ reduction and anodic oxidation”. Feb. 15, 2019. Seoul National University, Seoul Republic of Korea

- *NTNU-SNU-KIST joint Seminar, Invited speaker.* “Stochastic model development using Bayesian inference and its applications”. Oct. 19, 2018. Seoul National University, Seoul Republic of Korea
- *Invited Seminar.* “Current issues on autoclave reactor multi-scale modeling and simulation for polyethylene and its copolymers (EVA, EAA)”. Oct. 1st, 2018. SK Innovation, Daejeon, Republic of Korea
- *Invited Seminar.* “Toxic gas release modeling for real-time analysis using variational autoencoder with convolutional neural networks”. Aug. 8th, 2018. Process Systems & Safety Engineering Laboratory, Chung-Ang University, Seoul, Republic of Korea
- *Invited Lecturer.* “Introduction to process systems engineering and related software (Aspen Plus, Hysys, Fluent)”, Apr. 20th, 2016. Engineering Development Research Center, Seoul National University, Seoul, Republic of Korea
- *Invited Seminar.* “Derivative-free optimization using modified DIRECT algorithm for black-box models with hidden constraints”. Mar. 28th, 2016. Offshore Process Systems Engineering Laboratory, Seoul National University, Seoul, Republic of Korea
- *KSASF in Korea Science Academy, Invited sectional lecturer.* “What are Differences between Science and “Engineering”: How Your Course Works Can Be Applied in The Real Engineering Industry?”. Aug. 16th, 2015. Korea Science Academy of KAIST, Busan, Republic of Korea

CONFERENCE TALKS

[International]

- AICHE Virtual meeting, United States. Nov. 2020.
“Efficient Bayesian Inference for First-Principle Simulation Via Adversarial Networks and Low-Complexity Surrogate Models”
- AICHE Orlando, FL, United States. Nov. 2019.
“General Techno-Economic Analysis for Electrochemical Coproduction of CO₂ Reduction and Anodic Oxidation”
- AICHE Pittsburgh, PA, United States. Oct. 2018.
“Stochastic Multiscale Model-Based Predictive Control Via Polynomial Chaos Theory: Manufacturing of Thin Films for Pharmaceutical Applications”
- PSE ASIA Tokyo, Japan. Jul. 2016.
“Derivative-Free Optimization Using Modified DIRECT Algorithm for Black-Box Models with Unknown Infeasible Region”
- AICHE Salt Lake City, Utah, United States. Nov. 2015.
“Multi-Objective Optimization for High Heat Removal and Productivity in Fischer-Tropsch Synthesis Microchannel Reactor Using Discrete Catalyst Dilution Zone”
- ESCAPE Budapest, Hungary. Jun. 2014
“Simultaneous Optimization Models for Heat Exchanger Network Synthesis with Multiple Utilities: A New Strategy by Using Utility Sub-stage”

[Domestic]

- KSIEC Daegu, Republic of Korea. Nov. 2021
“Conceptual design of non-equilibrium ultrasonic separation for clean chemical processes”
- KSIEC Busan, Republic of Korea. May. 2021
“Conditional variational de novo molecular generation based on a deep understanding of chemical language”
- KSBB Jeju Island, Republic of Korea. Apr. 2021
“Process design and assessment of electrochemical carbon and nitrogen reduction processes”
- KICHE Busan, Republic of Korea. Apr. 2021

- “Supervised machine learning techniques for process and reactor modeling”
- *KIChE Online*, Republic of Korea. Oct. 2020
“Efficient Bayesian Inference for First-Principle Simulation Via Adversarial Networks and Low-Complexity Surrogate Models”
- *KSIEC Gwangju*, Republic of Korea. Oct. 2020
“Physics-informed deep learning for data-driven solutions of computational fluid dynamics”
- *KIChE Daegu*, Republic of Korea. Oct. 2018
“The electrochemical CO₂ reduction process using solar energy: multi-scale simulation, techno-economic analysis, and pilot plant”
- *KIChE Changwon*, Republic of Korea. Apr. 2018.
“Toxic gas release modeling for real-time analysis using variational autoencoder with convolutional neural networks”
- *KIChE Daejun*, Republic of Korea. Oct. 2016.
“A Model of Mineral Carbonation Kinetics for Carbon Capture, Utilization and Storage (CCUS) Technology”
- *KIChE Busan*, Republic of Korea. Apr. 2016.
“Developing simultaneous design procedure for carbonation reactor and CCU process using integrated platform of process simulator and CFD”
- *KIChE Jeju*, Republic of Korea. Apr. 2015.
“Multi-Objective Optimization in Discrete Catalyst Dilution Zone of Fischer-Tropsch Microchannel Reactor”
- *KIChE Daejeon*, Republic of Korea. Oct. 2014.
“Text Analytics in Chemical Accident Databases for Extracting Knowledge”
- *KIChE Changwon*, Republic of Korea. Apr. 2014.
“Computational Fluid Dynamics Study of Channel Geometric Effect for Fischer-Tropsch Microchannel Reactor”
- *KIGAS Jeju*, Republic of Korea. Nov. 2013.
“Quantitative Analysis of Heat Exchanger Network Synthesis for Applying Theoretical Networks to the Gas Industry”
- *KIChE Daegu*, Republic of Korea. Oct. 2013.
“Simultaneous Optimization Models for Multiple Utility Heat Exchanger Networks”

RESEARCH
GRANT

- [NRF] 이공분야기초연구사업 – 기초연구실, Jun. 2021 – Feb. 2024.
- [KIAT] 제조분야 온실가스 미세먼지 동시저감 기술개발사업, Apr. 2021 – Dec. 2025.
- [NRF] 이공분야기초연구사업 – 우수신진연구, Mar. 2021 – Feb. 2025.
- [NRF] 원천연구개발사업 – C1 가스 리파이너리 사업, Jan. 2021 – Feb. 2024.
- [KIAT] 산업기술혁신사업, Jan. 2021 – Dec. 2021.
- [NRF] 4단계BK21사업 – 혁신인재양성, Sep. 2020 – Aug. 2027.
- [NRF] 원천기술개발사업 – Carbon to X 기술개발사업, Jul. 2020 – Jan. 2025.
- [NRF] 이공분야기초연구사업 – 기본연구, Jun. 2020 – May. 2021.

PROFESSIONAL
ACTIVITIES &
SERVICE

Professional affiliations

- American Institute of Chemical Engineers, 2015 – present
- Korea Institute of Chemical Engineers, 2013 – present
 - 공정시스템 부문위원회 학술간사, Jan. 2021 – Dec. 2021
 - 공정시스템 부문위원회 교육간사, Jan. 2022 – Dec. 2022

- Korean Society of Industrial and Engineering Chemistry, 2020 – present
 - 화학공정분과 재무간사, Jan. 2022 – Dec. 2022

Public service

- Referee for journals
 - *Computers & Chemical Engineering*
 - *Energy and Environmental Science*
 - *Industrial & Engineering Chemistry Research*
 - *Chemical Engineering Research and Design*
 - *Korean Journal of Chemical Engineering*
 - *Korean Chemical Engineering Research*

TEACHING EXPERIENCE

Short Courses

- KIChE Tutorial Series
 - *Speaker*, Introduction to Techno-economic Analysis and Life-cycle Assessment for Chemical Process, 2022
 - Organizer/Chair/Specker, Artificial Intelligence Based Chemical Process Technologies, 2021

Mentorship/Adviser

- Carnegie Mellon University, Pittsburgh, PA, United States
 - *Adviser*, MS. students (Swapnil Agrawal, Lihan Liu, Kanishk Mair, Muyi Song, Yao Zhao) graduation projects related to “black-box optimization”, Jul. 2019 – Present.
- Korea Institute of Science and Technology, Seoul, Republic of Korea
 - *Adviser*, Ph.D. candidates (Donggu Han, Hee Won Lee, Michael Shincheon Jee) projects related to “electrochemical CO₂ reduction and C1 chemistry”, Mar. 2018 – Jun. 2019.
- Seoul National University, Seoul, Republic of Korea
 - *Co-Adviser with Prof. Won Bo Lee*, Seung Jae Kwak, Jan. 2019 – Present.
 - *Co-Adviser with Prof. Won Bo Lee*, Changjoon Ko, Jan. 2019 – Present.
 - *Adviser*, MS. Exchange program by EDRC, Mar. 2016 – Jul. 2016.
 - *Adviser*, process design Olympiad by KIChE, Jun. 2015 – Aug. 2015.
 - *Adviser*, process design Olympiad by KIChE, Jun. 2014 – Aug. 2014.

Teaching assistant

- Seoul National University, Seoul, Republic of Korea
 - Chemical & biological engineering process experiment, Spring 2015.
 - Chemical & biological engineering basic experiment, Fall 2014.
- EDRC (Engineering Development Research Center), Seoul National University, Seoul, Republic of Korea
 - Thermodynamics for chemical engineering, Apr. 2016.
 - Advanced oil&gas process design, Mar. 2016.
 - Advance reactor design, Aug. 2015.
 - Conceptual design and techno-economic analysis, Jan. 2015.

TECHNICAL SKILLS

- Programming Language: Matlab, GAMS, Python, Fortran, C++
- Simulations: Aspen (Plus/HYSYS), gPROMS, CFD (Fluent/CFX/Comsol/OpenFOAM), Tensorflow, Keras, PyTorch, KMC (Zacros), DFT (VASF)

REFERENCES

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