

Seonggyun Kim

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SUMMARY

Chemical engineering graduate passionate about industry decarbonization and sustainable energy solutions. Experienced in process simulation, numerical modelling, and techno-economic analysis, with hands-on research expertise in carbon capture processes and hydrogen economy. Strong background in process optimization, energy storage, and industrial-scale applications of low-carbon technologies.

EDUCATION

KTH Royal Institute of Technology

Jun. 2025 (Expected)

M.Sc., Chemical Engineering for Energy and Environment

Stockholm, Sweden

- Fields of interest: Industrial energy processes, combined heat and power, process modelling and optimization, energy storage and conversion, industry decarbonization, carbon capture, and utilization.
- Thesis: Dynamic process modeling for flexible production of chemical hydrogen carriers (work in progress).

Hanyang University

Feb. 2023

B.S., Chemical Engineering

Seoul, South Korea

- Thesis: Simulation and optimization of MDEA-based CO₂ capture process using Aspen HYSYS.
- Fields of interest: Thermodynamics, Reaction engineering, Process optimization.

Nanyang Technological University

Jul. 2018

Summer Exchange Program

Singapore

- Completed "Introduction to Energy" course.

WORK EXPERIENCE

AVEVA

Sep. 2024 – Nov. 2024

Process Simulation Intern / Solver/Thermo Team, R&D Aveva Process Simulation

Lake Forest, California (Remote)

- Expanded the thermodynamic database for AVEVA Process Simulation, enhancing industry adoption of advanced carbon capture technologies (Benfield process, AMP-PZ solvent).
 - Developed electrolyte-NRTL fluid/reaction models for K₂CO₃-CO₂-H₂O and AMP-PZ-CO₂-H₂O systems.
 - Conducted thermophysical property regression using Python scripts to align with experimental data.
- Built process simulation files for headless testing and documented findings on carbon capture processes.

Fraunhofer UMSICHT

Sep. 2022 – Feb. 2023

Research Assistant / Department of Low Carbon Technologies

Oberhausen, Germany

- "Ammonia to Hydrogen" project: a system-level analysis of ammonia decomposition process for hydrogen production.
 - Designed and optimized an Aspen PLUS process simulation for ammonia-to-hydrogen scenarios with techno-economic evaluation.
 - Assembled and tested an electrically heated fixed-bed reactor for ammonia decomposition, optimizing temperature profiles based on activated carbon packing.

ACADEMIC PROJECTS

Techno-economic Analysis of CCUS in Sweden ([link](#))

Dec. 2024

- Modeled MEA-based carbon capture and CO₂ hydrogenation processes using Aspen Plus V14.
- Evaluated economic feasibility for storage and utilization scenarios in Sweden's cement (Slite) and pulp (Korsnäs) industries.
- Led methanol production process design, optimizing kinetic models and reporting levelized costs for breakeven analysis.

AVEVA Process Simulation Academic Competition 2024 - Hydrogen Economy ([link](#))

Feb. 2024

- Designed a green ammonia synthesis process integrating solar hydrogen production in AVEVA Process Simulation.
- Optimized heat integration using high- and low-pressure steam, comparing EAOC and NPV against pipeline transport.
- The simulation and technical report entries in the three-part project won "Best Overall" prize in Europe.

Metal Recovery Using Supercritical CO₂ ([link](#))**Feb. 2024**

- Investigated scCO₂ extraction for recovering rare earth elements and heavy metals from coal fly ash, ores, and batteries.
- Demonstrated industrial potential with recovery rates up to 97% for uranium and 90% for rare earth elements.
- Assessed the technology readiness level (TRL 4) and selectivity challenges for industrial implementation.

Nickel-rich Electrodes for Li-ion Batteries ([link](#))**Dec. 2023**

- Reviewed Ni-rich electrodes for lithium-ion batteries, highlighting their structural configurations, degradation mechanisms, and commercial applications.
- Identified performance limitations and degradation during cycling, and challenges in finding suitable electrolytes.
- Addressed the need to replace cobalt in existing electrodes and the overall impact on the commercial viability of Ni-rich materials.

Pressurized Pilot-scale Fluidized Bed Gasifier: A Risk Analysis ([link](#))**Dec. 2023**

- Conducted a Preliminary Hazard Analysis (PHA) and What-if analysis on an existing gasification plant at KTH.
- Provided risk assessments and recommendations for process safety enhancements.

Thermodynamic Analysis of a Biomass-fueled Combined Heat and Power Plant with a Fuel Drier ([link](#))**Oct. 2023**

- Thermodynamic analysis of the system components (compressors, turbines, heat exchangers, and a drier).
- Presented graphical results from pinch analysis and heat exchange calculations.
- Economic analysis based on different scenarios varying electricity, fuel, and green certificate prices.

Simulation and Optimization of MDEA-based CO₂ Capture Process ([link](#))**Jun. 2022**

- Developed Aspen HYSYS simulations for process optimization and sensitivity analysis.
- Verified the relationship between absorber L/G ratio, CO₂ recovery, lean loading, and specific reboiler duty.

NRTL Parameter Optimization for Alkane/Sulfolane Binary Mixtures ([link](#))**Nov. 2021**

- Optimized NRTL parameters to accurately calculate liquid-liquid equilibria using MATLAB.
- Achieved improved accuracy by adding a linear term to the τ term in the conventional model.

Estimation of Energy Penalty in Post-Combustion CCS ([link](#))**Jun. 2021**

- Estimated energy consumption of CO₂ compression and refrigeration using Lee-Kesler equation of state programmed in MATLAB.
- Optimized compression processes for high-pressure storage and low-pressure transport pathways.

Eigenfaces: Face Recognition Machine Learning Algorithm ([link](#))**Dec. 2020**

- Developed a face recognition machine learning algorithm in MATLAB using PCA and SVD.
- Trained on Yale_B dataset and successfully identified faces outside the training set.
- Applied dimensionality reduction and pattern recognition techniques for real-world image data.ilt a face image recognition algorithm using MATLAB.

COMPUTER SKILLS

- **Programming:** MATLAB, Python, Fortran, MS Excel VBA (Intermediate level); MS Visual C++, C (Basic level)
- **Application:** AVEVA Process Simulation, Aspen HYSYS, Aspen PLUS, COMSOL; MS Office

LANGUAGES

- Korean: Native
- English: Proficient
- Swedish: Beginner

OTHER

- Hobbies: Jazz performance/composition, Linux ricing