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 **Dec. 2025**
M.Sc., Chemical Engineering for Energy and Environment *Stockholm, Sweden*
- Thesis: Dynamic reactor modeling and operational optimization of flexible e-methanol production.
- Fields of interest: Industrial energy processes, combined heat and power, process modelling and optimization, energy storage and conversion, industry decarbonization, carbon capture, and utilization.

Hanyang University **Feb. 2023**
B.S., Chemical Engineering *Seoul, South Korea*
- Thesis: Simulation and optimization of MDEA-based CO_2 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 K_2CO_3-CO_2-H_2O and AMP-PZ-CO_2-H_2O systems.
  - Conducted thermophysical property regression using Python scripts to align with experimental data.
- Built process simulation files for headless testing and prepared technical documents 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 (link)

Dynamic Reactor Modeling and Operational Optimization of Flexible E-Methanol Production (link) **Dec. 2025**
- Built steady-state process model and dynamic reactor model in Aspen Dynamics for Power-to-Methanol process.
- Developed MILP optimization framework integrating dynamic constraints to determine optimal operating schedules against Swedish electricity prices (2019–2023).
- Achieved cost reductions up to 24.5% through flexibility-aware scheduling during high price volatility periods.

Techno-economic Analysis of CCUS in Sweden (link) **Dec. 2024**
- Modeled MEA-based carbon capture and CO_2 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 CO_2 (link) **Feb. 2024**
- Investigated $scCO_2$ 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 CO_2 Capture Process (link) **Jun. 2022**
- Developed Aspen HYSYS simulations for process optimization and sensitivity analysis.
- Verified the relationship between absorber L/G ratio, CO_2 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 CO_2 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.

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