

Jaeheon Lee

Department of Chemical and Biomolecular Engineering, University of California, Berkeley, Berkeley, CA, USA
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Online CV

Appointments

University of California, Berkeley (UC Berkeley)

GRADUATE STUDENT RESEARCHER, THE MCCLOSKEY LAB

GRADUATE STUDENT INSTRUCTOR, DEPT. OF CHEMICAL AND BIOMOLECULAR ENGINEERING

Berkeley, CA, USA

01/2023 -

Spring 2024

Lawrence Berkeley National Laboratory (LBNL)

AFFILIATE SCIENTIST, ENERGY STORAGE AND DISTRIBUTED RESOURCES DIVISION

Berkeley, CA, USA

02/2023 -

Agency for Defense Development (ADD)

MILITARY RESEARCHER, ARMY FIRST LIEUTENANT, CHEM-BIO TECHNOLOGY CENTER

Daejeon, Republic of Korea

06/2019 - 05/2022

Education

University of California, Berkeley (UC Berkeley)

PH.D. IN CHEMICAL ENGINEERING

• Advisor: Bryan D. McCloskey

Berkeley, CA, USA

08/2022 - 05/2027

Pohang University of Science and Technology (POSTECH)

B.S. IN MECHANICAL ENGINEERING

B.S. IN CHEMICAL ENGINEERING

• Advisor: Woonbong Hwang

• Capstone Project: Development of Smart Janggi (Korean Chess) Machine

• Korea National University of Arts, Seoul, Republic of Korea (Summer 2016)

• Technische Universität Berlin (TU Berlin), Berlin, Germany (Summer 2018)

Pohang, Republic of Korea

03/2015 - 02/2019

Hansung Science High School

MAJOR IN SCIENCE

• 1 year early graduation for gifted students

Seoul, Republic of Korea

03/2013 - 02/2015

Teaching Experiences

Spring 2024 **CHMENG 150A – Transport Processes:** Graduate Student Instructor
• Led 1hr/wk discussion section of 35 students, and 2hr/wk office hour

UC Berkeley

Spring 2018 **MATH 110 – Calculus:** Mentor, 2hr/wk teaching section

POSTECH

Fall 2018 **CSED 101 – C Programming:** Mentor, 2hr/wk teaching section

POSTECH

Summer 2016 **General Physics:** Instructor, 5hr/wk teaching section

Hansung Science High School

Honors & Awards

08/2024 **Graduate Division Conference Travel Grant Award**

UC Berkeley

08/2024 **Outstanding Graduate Student Instructor Award, CHMENG 150A**

UC Berkeley

08/2024 **KSEA-KUSCO Graduate Scholarship**

KSEA & KUSCO

Spring 2024 **The Eugene E. Petersen Endowed Graduate Student Fellowship**

UC Berkeley

09/2023 **Korean Honor Scholarship**

Embassy of the Republic of Korea

2023 **Departmental Award**

UC Berkeley

Fall 2022 **Berkeley Fellowship** (Full Tuition & Stipend)

UC Berkeley

02/2019 **Grand Prize**, Undergraduate Group Research Program (UGRP)

POSTECH

06/2018 **Study Abroad Program Scholarship**

POSTECH

2018 **Student Mentor Program Scholarship**

POSTECH

2017 - 2018 **National Scholarship of Excellence (Science & Engineering)** (Full Tuition)

Republic of Korea

2015 - 2016 **Jigok Scholarship** (Full Tuition)

POSTECH

Skills

Advanced Level

- Test and Evaluation Device Design and Development & Device control with Labview program
Representative Works: Packed-bed based Micro and Bulk Module Breakthrough Testing Device
Controlled Humidity Differential Electrochemical Gas Monitoring System
- Electrochemical Measurement using Differential Electrochemical Mass Spectrometry (DEMS)
- Unknown sample analysis using Agilent, SRI Gas, and Liquid Chromatography with various detectors (FID, FPD, TCD, MS)
- Mechatronics using Arduino (**Representative Works:** [ARSI0](#))
- Physisorption analysis using ASAP2020
- 3D Design (SolidWorks, CATIA)
- FT-IR, TGA, SEM-EDS Analysis

Upper-Intermediate Level

- C, C++, MATLAB, Deep Learning with Python
- Water vapor sorption analysis using DVS-Intrinsic
- CMS based website building (**Representative Works:** [UC Berkeley KGSA](#), [Personal website](#))
- Surface treatment using plasma and iCVD
- Computational fluid dynamics (CFD) using COMSOL

Languages

- English (Full Professional)
- Korean (Native)

Certificates

05/2020	COMSOL Multiphysics - General Training I, II	Altsoft
10/2020	Agilent 5977 GC/MS Techniques and Operation with ChemStation Data Analysis	Agilent Technologies
11/2020	COMSOL Multiphysics - Fluid & Heat Modeling	Altsoft
07/2024	BURET (Bring Out the Best in Your Undergraduate Researchers Teaching & Mentoring in Scientific Research Groups)	UC Berkeley

Research Experiences

University of California, Berkeley & Lawrence Berkeley National Laboratory

Berkeley, CA, USA

THE MCCLOSKEY LAB

- Stable and High-Energy Density Solid-State Air Batteries
- Understanding Electrochemical Properties of MnO₂ based Lithium-metal Batteries
- Electrochemical Regeneration of Aqueous Alkaline CO₂ Sorbent via Electrolysis
- Development of Redox Mediator for Lithium-oxygen Batteries

Agency for Defense Development

Daejeon, Republic of Korea

CHEM-BIO TECHNOLOGY CENTER

- Optimizing Respiratory Resistance of the Purifier using Numerical Study
- Development of High-Efficiency Adsorption Materials for Gas Mask and Protective Cloth
- Highly durable super-hydrophobic and oleophobic technology based on 3D nano-structure
- Mobile AR System for Detecting & Classifying Military Equipment Based on Deep Learning

Pohang University of Science and Technology

Pohang, Republic of Korea

- Art & Engineering Collaborate Project – CocktailPiano, Undergraduate Group Research Program (Fall 2018)
- Development of Seebeck Coefficient Rapid Screening Device, Advisor: Hyungyu Jin – TE Lab (Summer 2017)

Publication

*Denotes equal contribution †Denotes corresponding author

10. Y. Hyun, G. Oh, **J. Lee**, H. Jung, M.-K. Kim[†], J.-I. Choi[†]. Bayesian predictive modeling for gas purification using breakthrough curves. *Journal of Hazardous Materials* 2024, 472, 134311.
9. Y. Zeng, F. Shen, B. Zhang, **J. Lee**, D. Chalise, Q. Zheng, Y. Fu, S. Kaur, S. D. Lubner, V. Battaglia, B. D. McCloskey, M. C. Tucker, R. Prasher[†]. Nonintrusive thermal-wave sensor for operando quantification of degradation in commercial batteries. *Nature Communication* 2023, 14, 8203.
8. **J. Lee**, J. Bae, J. Koo, K. Jeong, S. M. Lee, H. Jung, M.-K. Kim[†]. Understanding the catalytic chemisorption of the cyanogen chloride via breakthrough curve and genetic algorithm. *Chemical Engineering Journal* 2023, 473, 145301.
7. G. Oh, Y. Hyun, J.-I. Choi[†], **J. Lee**, M.-K. Kim, H. Jung. Computational fluid dynamics modeling of contaminant transport with adsorption inside planar-shaped air-purifying respirator canister. *Chemical Engineering Research and Design* 2023, 196, 171-183.
6. **J. Lee**, J. Seo, K. M. Cho, J. Heo, H. Jung, S. Park, J. Bae, S. Lee[†], J. Hong[†], M.-K. Kim[†], Y. Jin[†]. Ultralight and ultrathin electrospun membranes with enhanced air permeability for chemical and biological protection. *ACS Applied Materials & Interfaces* 2022, 14(28), 32522-32532.
5. G. Oh, Y. Hyun, J.-I. Choi[†], **J. Lee**, M.-K. Kim, H. Jung. Numerical study of respiratory resistance and internal temperature change in gas mask during breathing cycles. *Journal of Computational Fluids Engineering* 2022, 27(2), 46-56.

4. D. Heo, M. Song, S.-H. Chung, K. Cha, Y. Kim, J. Chung, P. T.J. Hwang, **J. Lee**, H. Jung, Y. Jin, J. Hong[†], M.-K. Kim[†], S. Lee[†]. Inhalation-driven vertical flutter triboelectric nanogenerator with amplified output as a gas-mask-integrated self-powered multifunctional system. *Advanced Energy Materials* 2022, 12, 2201001.
3. **J. Lee**, D. Ka, H. Jung, K. Cho, Y. Jin[†], M. Kim[†]. UiO-66-NH₂ and zeolite-templated carbon composites for the degradation and adsorption of nerve agents. *Molecules* 2021, 26(13), 3837.
2. D. Ka^{*}, S. Jang^{*}, M.-K. Kim, H. Jung, **J. Lee**, H. Jung, Y. Jin[†]. UiO-66-NH₂/graphene oxide nanocomposites as reactive adsorbents for soman upon long-term exposure to high-humidity environment. *Materials Letters* 2021, 285, 129105.
1. H. Jung[†], M.-K. Kim, J. Lee, J. Kwon, **J. Lee**. Characterization of the zirconium metal-organic framework (MOF) UiO-66-NH₂ for the decomposition of nerve agents in solid-state conditions using phosphorus-31 solid state-magic angle spinning nuclear magnetic resonance (³¹P SS-MAS NMR) and gas chromatography – mass spectrometry (GC-MS). *Analytical Letters* 2021, 54(3), 468-480.

Intellectual Property

[†]Denotes lead inventor

[Patent]

12. S. J. Yu[†], H. Jung, H. Jung, G. Kim, **J. Lee**. Device and method for evaluation protection performance using dynamic swatch testing cell. US Patent Application 18/231555, 2023.
11. M.-K. Kim[†], H. Jung, **J. Lee**, J.-I. Choi, Y. Hyun, G. Oh. Apparatus and method for analyzing adsorption performance of fixed bed adsorbent. KR Patent 10-2577490, 2023.
10. **J. Lee**[†], M.-K. Kim, H. Jung, S. Lee, J. Bae. Canister with flow pass. KR Patent 10-2529422, 2023.
9. H. Jung[†], M.-K. Kim, **J. Lee**, J.-I. Choi, G. Oh, Y. Hyun. Purifying canister with an internal structure inducing uniform air flow distribution. KR Patent 10-2510691, 2023.
8. S. J. Yu[†], H. Jung, H. Jung, G. Kim, **J. Lee**. Device and method for evaluation protection performance using specimen dynamic. KR Patent 10-2486655, 2022.
7. H. Jung[†], M.-K. Kim, **J. Lee**. Adsorption filter structure or helmet with adsorption filter structure. US Patent Application 17/552031, 2021.
6. M.-K. Kim[†], **J. Lee**, H. Jung, S. Lee, U. Oh. Canister. KR Patent 10-2443661, 2022.
5. **J. Lee**[†], M.-K. Kim, H. Jung. Purification module and helmet comprising the same. KR Patent 10-2319167, 2021.
4. **J. Lee**[†], H. Jung, H. Jung, Y. Jin, M.-K. Kim, S. Lee. Functional fiber for removing harmful substances and personal protective clothing including the same. KR Patent 10-2293323, 2021.
3. H. Jung[†], M.-K. Kim, **J. Lee**, D. Ka, H. Jung. Adsorption filter structure or helmet with adsorption filter structure. KR Patent 10-2449970, 2020.
2. M.-K. Kim[†], H. Jung, H. Jung, H. Lee, Y. Jin, D. Ka, **J. Lee**. Canister having planar absorption layer and military mask comprising thereof. KR Patent 10-2185627, 2020.
1. I. Kim[†], **J. Lee**. Method and apparatus for key input. KR Patent 10-1509353, 2015.

[Software]

4. **J. Lee**[†], M.-K. Kim, S. Lee, H. Jung. Species Transport Parameter Estimation Program based on Genetic Algorithm and Breakthrough Curve [Python]. Republic of Korea Copyright C-2021-043443, 2021.
3. **J. Lee**[†], M.-K. Kim, S. Lee, H. Jung. Breakthrough Curve Analysis Program based on Adsorption models [Matlab]. Republic of Korea Copyright C-2021-043437, 2021.
2. **J. Lee**[†], M.-K. Kim, Y. Jin, H. Jung. Database Program for Experiment of Protective Cloth Protection Performance (Swatch Testing) [Python]. Republic of Korea Copyright C-2021-011232, 2021.
1. **J. Lee**[†], H. Jung, J. H. Kwon, J. Lee, Database Program for Experiment of Super-hydrophobic and Super-oleophobic Surface Formation [Matlab]. Republic of Korea Copyright C-2020-009721, 2020.

Selected Conference Presentation

11. Understanding the Electrochemistry of Solid-State Lithium-Oxygen Batteries Under Humid Environments. *ECS PRIME 2024 - The Electrochemical Society*, Honolulu, HI, USA.
10. Development of a Controlled Humidity Differential Electrochemical Gas Monitoring System. *245th ECS Meeting - The Electrochemical Society*, San Francisco, CA, USA.
9. Multi-purpose High Air/water Permeable Membrane for CBRN Protection. *2022 Chemical and Biological Defense Science & Technology Conference*, San Francisco, CA, USA.
8. Real Time Analysis and Computational Models of CWAs Penetration through Swatches of Various Protective Layer. *2022 Chemical and Biological Defense Science & Technology Conference*, San Francisco, CA, USA.
7. Improving the canister performance and utility by optimizing flow path design. *2022 Spring Symposium of The Korean Society of Chemical, Biological & Radiological Defense*, Jeju, Republic of Korea.
6. In-situ SWATCH test system for analyze of fabric penetration properties of CWAs. *2022 Spring Symposium of The Korean Society of Chemical, Biological & Radiological Defense*, Jeju, Republic of Korea.

5. Analysis of CK breakthrough and adsorption performance for Metal and TEDA impregnated Highly ordered microporous carbon. *2021 Fall Symposium of The Korean Society of Chemical, Biological & Radiological Defense*, Seongnam, Republic of Korea.
4. Application of Metal-Organic Frameworks and Zeolite-Template Carbon composites to the CBRN Personal Protection System. *2021 Korean Ceramic Society*, Jeju, Republic of Korea.
3. Breakthrough Adsorption Studies on Highly Porous Carbons impregnated with ASZM and TEDA for a Highly Volatile Asphyxiant CK. *2021 Korean Institute of Chemical Engineers Fall Meeting and International Symposium*, Gwangju, Republic of Korea.
2. Initiated Chemical Vapor Deposition Process and its Application to ChemBio Protection. *2021 Spring Symposium of The Korean Society of Chemical, Biological & Radiological Defense*, Seongnam, Republic of Korea.
1. Mobile AR System for Detecting and Classifying Military Equipment Based on Deep Learning. *2020 Conference of the Korea Institute of Military Science and Technology*, Republic of Korea.

Service & Outreach

University of California, Berkeley

Berkeley, CA, USA

- **Korean Graduate Students Association**
President, Webmaster (2024 - 25), Vice President, Webmaster (2023 - 24)
- **CBE Graduate Student Advisory Committee**
First-year Mentorship Mentor (2024 - 25), Recruitment Chair (2023 - 24)
- **ECS University of California-Berkeley Student Chapter**
Vice President (2024)
- **Research Mentor**
Jiyun Kang, Undergraduate in Chemical and Biomolecular Engineering (08/2023 - Present)

Republic of Korea Army

Republic of Korea

FIRST LIEUTENANT, RESEARCH OFFICERS FOR NATIONAL DEFENSE

- 3rd year of Research Officers for National Defense / 26th year of Professionalized Officer (04/2019 – 05/2022)
- Representative of Research Officers for National Defense (06/2021 – 05/2022)
- Research Officers for National Defense 4th year Mentorship Mentor (06/2020 – 05/2022)
- Commission as Second Lieutenant (06/2019)

ARSIO

Republic of Korea

CHIEF ENGINEER

- ARSIO is a technology-oriented art studio for planning and producing transformative installations and performances that combine art & technology. Work as chief engineer for engineering design (mechatronics).
- **Project**
'Hybrid Cooperation Sequence', Kyungtaek Roh, Gallery 2, Seoul (08/2023)
'The green sound', Kyungtaek Roh, So. one gallery, Seoul (10/2022)
'ㄱ ㅏ ㅓ ㅕ ㅗ ㅛ ㅜ ㅠ', Dawool Park, Sejong Center, Seoul (07/2022)
- **Exhibition**
'Dynamic Consensus', 2022 Posthuman: Story Telling for Earthly Survival, Asia Culture Center, Gwangju (12/2022)
'Cocktail Piano', Undergraduate Group Research Program, POSTECH, Pohang (02/2019)

Pohang University of Science and Technology

Pohang, Republic of Korea

- **POSTECH Orchestra**
President, Concertmaster (10/2017 – 02/2019)
- **POSTECH Undergraduate Student Association**
Head of Graduation Preparation TF (2018)
- **POSTECH Dormitory Union**
Representative of Dormitory Building 8 (2018)
- **Education and Outreach**
Jigok Elementary School Education and Outreach Program (08/2016, 08/2017)
Education Sharing People – Education and Outreach Program (07/2015 – 08/2015)
Earth Hour Korea Youth Guidance (03/2015)