

Curriculum Vitae

Seongjoo Jung

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Education

University of Minnesota

Ph.D. Candidate, Chemical Engineering (GPA 4.00/4.00)
Department of Chemical Engineering and Material Science (CEMS)
Advisors: Turan Birol, Paul J. Dauenhauer

Minneapolis, MN, USA
2020–present

Seoul National University

Bachelor of Science, Major in Chemical and Biological Engineering
Minor in Computer Science and Engineering
Honors: summa cum laude
Advisor: Yung-Eun Sung

Seoul, Korea
2015–2020

Publications

Jung S., Pizzolitto C., Biasi P., Dauenhauer P. J., Birol, T. “Programmable catalysis by support polarization: elucidating and breaking scaling relations”, *Nature Communications* **14**, 7795 (2023)

Jung S., Birol, T. “Octahedral rotation induced, antiferroelectric-like double hysteresis in strained perovskites” *Nano Letters*, (2025)

Jung S., Birol, T. “Triggered ferroelectricity in HfO₂ from polar hybrid zone-boundary phonon instability” (arXiv:2502.08633)

Gathmann S. R., **Jung S.**, Frisbie D., Dauenhauer P. J. “Catalytic resonance theory: parametric uncertainty on microkinetic predictions of dynamic rate enhancement” (To be submitted, manuscript available upon request)

Jung S., Birol, T. “Hybrid-triggered antiferroelectric-ferroelectric continuity in thin film ZrO₂” (In progress)

Park H., **Jung S.**, Birol, T. “Group theoretical analysis of charge density wave transition and chirality in 1T-TiSe₂” (In progress)

Skills

Density Functional Theory, Group Theory, Solid-State Physics, Programming (Python, C/C++, etc.), Machine Learning (PyTorch, scikit-learn)

Teaching and Mentorship

Teaching Assistant, University of Minnesota

- ChEn 3101: Chemical Engineering Thermodynamics Spring 2023
 - Head TA and Recitation TA. Taught 10 sessions of recitation to students, provided office hours and supplementary course materials.
- ChEn 4401W: Senior Chemical Engineering Lab (Unit Ops) Fall 2021
 - Lab TA for distillation, gas membrane separation, non-Newtonian pipe flow, ion exchange, humidification & water-cooling experiments. Grading TA for humidification & water-cooling experiment.

Mentor, Hyeonseo (Harry) Park

- Mentorship on DFT calculations, solid state physics, group theory and research topic: charge density wave phase diagram of dichalcogenide TiSe_2

Awards and Honors

Kokes Award	2023
• North American Catalysis Society	
The Lanny & Charlotte Schmidt and Duane Goetsch & Nancy M. Dickerson Fellowship	2021
• CEMS, University of Minnesota	
Fridley Fellowship	2021
• CEMS, University of Minnesota	
Peter and Gene Pierce Fellowship	2021
• CEMS, University of Minnesota	
Samsung Convergence Software Course Scholarship	2017–2020
• Samsung Electronics. Minor program with scholarship for non-computer science major students	
National Scholarship for Science and Engineering (full tuition)	2015–2020
• Ministry of Science and ICT, Korea. Provided full tuition coverage for 48 months	

Talks and Conferences

American Physical Society March Meeting, Anaheim, CA	Mar. 2025
“Novel Mechanism of Ferroelectricity in HfO_2 ”	
AICHE Annual Meeting, San Diego, CA	Oct. 2024
“Microscopic Mechanism of Polarization Switching in Ferroelectric HfO_2 ”	
“Rotation-Induced Double Hysteresis of Perovskites for Energy Storage”	
“Computational Modelling of Dynamic Charge and Adsorption Responses”	
IEEE Ultrasonics, Ferroelectrics, and Frequency Control Joint Symposium, Taipei, Taiwan	Sep 2024
“Rotation Induced Antiferroelectric-Like Double Hysteresis of SrTiO_3 and BaZrO_3 ”	
American Physical Society March Meeting, Minneapolis, MN	Mar. 2024
“Rotation Induced Antiferroelectric-like Double Hysteresis of Perovskites”	
North American Catalysis Society Meeting, Providence, RI	Jun. 2023
“Support Polarization Control of Catalysts: Elucidating and Breaking Scaling Relations”	
Gordon Conference—Catalysis, New London, NH (Accepted)	Jun. 2022
“Catalyst Charge Injection via Polarized Ferroelectric Support-Metal Interaction”	

External Research Resources

Discover ACCESS Allocations	2023–2024
• National Science Foundation	
ACCESS (formerly XSEDE) Startup Allocations	2022–2023
• National Science Foundation	

Research Experience

Peer Reviewer

- *Physical Review Materials*

2024

Graduate Researcher, University of Minnesota

2020–present

- Hybrid-triggered ferroelectricity in fluorite $\text{HfO}_2/\text{ZrO}_2$
 - Identified the hybrid-triggered zone-boundary mode instability as the origin of ferroelectricity in HfO_2 , from trilinear and quadlinear symmetric mode couplings using DFT, LGD theory and group theory.
- Octahedral rotation induced antiferroelectricity in perovskites
 - Demonstrated that the coupling between polarization and non-polar octahedral rotations in perovskites can cause antiferroelectric-like double hysteresis by phonon frequency tuning using epitaxial strain and oxide layering.
- DFT modeling of dynamic catalysis on ferroelectric catalytic capacitors (with Casale SA)
 - Developed polarized-ground state calculation for VASP using FORTRAN, analyzed ferroelectric thin-film systems at different support polarization geometrically and electronically and its effect to adsorption.