

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  
Advisors: Yung-Eun Sung

Seoul, Korea  
2015–2020

## Research Experiences

### Graduate Researcher, University of Minnesota

2020–present

- Ferroelectric origin of fluorite  $\text{HfO}_2$  (Work in progress)
  - Identified microscopic mechanisms of single-domain phase transition from tetragonal to ferroelectric  $\text{HfO}_2$  and its polarization switching.
- Octahedral rotation-induced antiferroelectricity in perovskite structure crystals
  - Constructed Landau free energy expression of perovskite structures with space group  $I4cm$ , using polarization and octahedral rotation as order parameters.
  - Identified minimum electric enthalpy pathway of polarization switching and discovered antiferroelectric hysteresis at the interface of  $I4cm$ - $P4mm$  phase.
  - Designed antiferroelectric Ruddlesden-Popper phases and superlattice structures based on phonon frequencies and rotation-polarization coupling.
- DFT modelling of dynamic catalysis on ferroelectric catalytic capacitors
  - Developed polarized-ground state calculation for VASP (commercial ab initio quantum mechanical calculations software) using Fortran and Python.
  - Analyzed ferroelectric thin-film  $\text{Pt/PbTiO}_3$  systems at different support polarization geometrically and electronically using Bader, DDEC6 charges, (integrated) PDOS, real-space charge density, demonstrating interface effects on surface active sites.
  - Predicted adsorption energy changes related to d-band structure changes, and discovered breaking of transition-state scaling relations using CI-NEB.

### Research Intern, Seoul National University and Korea Center for Artificial Photosynthesis

2018–2019

## Awards and Honors

### Kokes Award

2023

- North American Catalysis Society

### The Lanny & Charlotte Schmidt and Duane Goetsch & Nancy M. Dickerson Fellowship

2021

<ul style="list-style-type: none"> <li>• CEMS, University of Minnesota</li> </ul>	
Fridley Fellowship	2021
<ul style="list-style-type: none"> <li>• CEMS, University of Minnesota</li> </ul>	
Peter and Gene Pierce Fellowship	2021
<ul style="list-style-type: none"> <li>• CEMS, University of Minnesota</li> </ul>	
Samsung Convergence Software Course Scholarship	2017–2020
<ul style="list-style-type: none"> <li>• Samsung Electronics. Minor program with scholarship for selected non-computer science major students</li> </ul>	
National Scholarship for Science and Engineering (full tuition)	2015–2020
<ul style="list-style-type: none"> <li>• Ministry of Science and ICT, Korea. Provided full tuition coverage for 48 months</li> </ul>	

## External Research Resources

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Discover ACCESS Allocations	2023–2024
<ul style="list-style-type: none"> <li>• National Science Foundation</li> </ul>	
ACCESS (formerly XSEDE) Startup Allocations	2022–2023
<ul style="list-style-type: none"> <li>• National Science Foundation</li> </ul>	

## Teaching and Mentorship

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Teaching Assistant, University of Minnesota	
<ul style="list-style-type: none"> <li>• ChEn 3101: Chemical Engineering Thermodynamics</li> </ul>	Spring 2023
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>– Head TA and Recitation TA. Taught 10 sessions of recitation to students, provided office hours and supplementary course materials.</li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li>• ChEn 4401W: Senior Chemical Engineering Lab (Unit Ops)</li> </ul>	Fall 2021
<ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>– Lab TA for distillation, gas membrane separation, non-Newtonian pipe flow, ion exchange, humidification &amp; water-cooling experiments. Grading TA for humidification &amp; water-cooling experiment.</li> </ul> </li> </ul>	
Mentor, Hyeonseo (Harry) Park	
<ul style="list-style-type: none"> <li>• Mentorship on DFT calculations, solid state physics, group theory and research topic: charge density wave phase diagram of dichalcogenide <math>\text{TiSe}_2</math></li> </ul>	

## Talks and Conferences

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AICHE Annual Meeting, San Diego, CA	Oct 2024
“Microscopic Mechanism of Polarization Switching in Ferroelectric $\text{HfO}_2$ ”	
“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 $\text{SrTiO}_3$ and $\text{BaZrO}_3$ ”	
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”	

## Programming Skills

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Python; MATLAB; Java; Unix; LaTeX; HTML/CSS; JavaScript; Git; PyTorch; C; C++; FORTRAN;

## Publications

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**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. “Rotation-Induced, Antiferroelectric-like Double Hysteresis in SrTiO<sub>3</sub>” (To be submitted, manuscript available upon request)

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)

**Jung S.**, Birol, T. “Origin of ferroelectricity in fluorite HfO<sub>2</sub>” (In Progress)