

# Sean McSherry | Ph.D.

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## EDUCATION

<b>University of Michigan</b> , Ann Arbor, MI	3.93
Ph.D., Chemical Engineering, <i>Lenert Lab</i>	Jan 2023
M.S.E., Chemical Engineering	December 2018
<b>Lafayette College</b> , Easton, PA	3.99
B.S., Chemical Engineering	May 2017

## SKILLS

- Optical, thermal, and electrical characterization of thin film materials at high temperatures (>1000 °C)
- Computational modeling of light and heat transfer in complex structures (MATLAB, Python, COMSOL)
- Circuit design and fabrication, data acquisition systems, microcontrollers (ARDUINO), lock-in amplifiers
- Cleanroom and nanofabrication processes: photolithography, deposition, etching, bonding, etc.
- On-chip sensor design and fabrication, chemical sensing, and visible and infrared spectroscopy
- Experimental design, instrumentation, automation, data collection and analysis, troubleshooting
- Project management, verbal and written communication, grant/proposal writing, laboratory management

## RESEARCH EXPERIENCE

<b>Department of Chemical Engineering, University of Michigan</b> , Ann Arbor, MI	Fall 2017-Present
Doctoral Thesis: <i>Spectral control of thermal emission at high temperatures and in the near field</i>	
<ul style="list-style-type: none"><li>• Conceptualized and implemented a materials design framework to discover materials systems that enable control over the propagation of light (and thus heat) at extreme temperatures, resulting in the fabrication of optical coatings that are thermally stable up to ~1100 °C in air (500 °C improvement over similar designs)</li><li>• Designed and fabricated an ultracompact infrared spectrometer (chemical sensor) that uses high-resolution calorimetry to capture thermal radiation between a custom microbolometer and analyte</li><li>• Spearheaded aspects of all projects, including computational modeling of light and heat transport in complex structures, high temperature (&gt; 2000 °C) thermal emission spectroscopy, all aspects of cleanroom nanofabrication, and calorimetry to measure conductive and radiative heat flows in nanomaterials</li></ul>	
<b>Department of Chemical Engineering, Lafayette College</b> , Easton, PA	Fall 2016-Spring 2017
Honors Thesis: <i>Percolation Network Characterization in Segmented Polycarbonate-Polyurethanes</i>	
<ul style="list-style-type: none"><li>• Investigated the behavior of a percolation network within segmented polyurethane blends for applications in selective transport of gases (Awarded NSF – GRFP with preliminary results)</li></ul>	

## INDUSTRY EXPERIENCE

<b>Air Products Inc.</b> , Allentown, PA	Summer 2016
<i>Intern on the Continuous Improvement Team</i>	
<ul style="list-style-type: none"><li>• Programmed automated report system for tractor breakdowns (Project savings ≈ \$20,000).</li></ul>	
<b>Zzyzx Polymers (Start Up)</b> , Easton, PA	Summer 2014-Spring 2016
<i>Research Intern</i>	
<ul style="list-style-type: none"><li>• Created 3D printing filament by recycling unconventional polymer blends such as single-use coffee pods (coffee included), resulting in 2<sup>nd</sup> place poster presentation at 2015 AIChE Annual Meeting</li></ul>	

## SELECT FELLOWSHIPS AND AWARDS

<b>Excellence in Research Award</b> , University of Michigan	Fall 2022
Highest merit-based award for graduate students in chemical engineering at UM, awarded to students that show dedication to research, exceptional communication skills, and novelty in proposing research ideas	
<b>Rackham Predoctoral Fellowship Program</b> , University of Michigan	Spring 2022
Highest merit-based award for all graduate students at UM, awarded to doctoral candidates working on dissertations that are unusually creative, ambitious, and impactful	
<b>National Science Foundation Graduate Research Fellowship</b> , Lafayette College	Spring 2017
Grant (value of \$140K) funded based on undergraduate research proposal	

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## PUBLICATIONS

- S. McSherry\*, M. Webb\*, J. T. Heron, A. Lenert, et al. | Nanophotonic control of thermal emission under extreme temperatures in air | **Nature Nanotechnology** | 2022
- S. McSherry, J. Barreda, A. Lenert. | On-chip infrared spectroscopy with near-field thermal sensing | **In prep.** | 2022
- S. McSherry, A. Lenert. | Design of a gradient epsilon-near-zero refractory metamaterial with temperature-insensitive broadband directional emission | **Applied Physics Letters** | 2022
- M. Webb, S. McSherry, J. T. Heron, A. Lenert, et al. | Geometric defects induced by Stranski-Krastanov growth in thin film oxide superlattices | **Journal of Applied Physics** | 2022
- S. McSherry, A. Lenert. | OPTICHEM: A python package to extract refractive index from attenuated total reflectance measurements. | **Python package published, paper in prep.** | 2022
- B. Roy-Layinde, T. Burger, D. Fan, B. Lee, S. McSherry, S. Forrest, A. Lenert. | Sustaining efficiency at elevated power densities in InGaAs airbridge thermophotovoltaic cells | **Solar Energy Materials and Solar Cells** | 2021
- D. Fan, T. Burger, S. McSherry, B. Lee, A. Lenert, S. Forrest | Near-perfect photon utilization in an air-bridge thermophotovoltaic cell | **Nature** | 2020
- H. Kim, S. McSherry, B. Brown, A. Lenert | Selectively enhancing solar scattering for direct radiative cooling through control of polymer nanofiber morphology | **ACS Applied Materials & Interfaces** | 2020
- S. McSherry, A. Lenert. | Extending the thermal near field through compensation in hyperbolic waveguides | **Physical Review Applied** | 2020
- S. McSherry, T. Burger, and A. Lenert. | Effects of narrowband transport on near-field and far-field thermophotonic conversion | **Journal of Photonics for Energy** | 2019

## SELECT ORAL PRESENTATIONS

- AIChE National Conference** Fall 2022 (2 abstracts accepted)  
*Oral Research Presentation; Phoenix, AZ*
- Electronic Materials Conference** Summer 2022  
*Oral Research Presentation; Columbus, OH*
- Summer Heat Transfer Conference** July 2019  
*Oral Research Presentation; Bellevue, WA*

## TEACHING AND MENTORING EXPERIENCE

- Graduate Student Instructor (GSI), University of Michigan, Ann Arbor, MI** Spring 2021  
*CHE 542: Graduate Heat and Mass Transfer*
- Created homework, provided solutions, and maintained weekly office hours
  - Created COMSOL tutorial to connect class principles and theory to my research experiments
  - Received positive evaluations from students and professor ~ 4.8/5
- Graduate Student Peer Mentor, University of Michigan, Ann Arbor, MI** 2019-2021  
*CHE 595: Chemical Engineering Research Survey and Peer Mentoring*
- Led weekly classes for two groups of six 1<sup>st</sup> year graduate students (over 2 years) in preparation for the doctoral candidacy exam

## SELECT LEADERSHIP & OUTREACH

- ChE Diversity, Equity, and Inclusion Curriculum Team, University of Michigan** 2020-2021  
*Developed homework questions that incorporated lessons on broader societal impacts with technical components*
- University of Michigan 2019 ChE Recruitment Chair, University of Michigan** 2018-2019  
*Coordinated all aspects of graduate recruitment (56 students), including faculty – student meetings*
- Outreach Chair of Chemical Engineering Graduate Society, University of Michigan** 2018-2019  
*Coordinated and developed outreach events with local Ann Arbor communities and organizations*
- President of AIChE, Lafayette College** 2016-2017