Sean McSherry

mcsherry@umich.edu | 267-337-3033 | https://github.com/sean-mcsherry

EDUCATION

University of Michigan, Ann Arbor, MI — 3.93
Ph.D. Candidate, Department of Chemical Engineering, *Lenert Lab* — Expected Jan 2023
M.S.E., Chemical Engineering — December 2018

Lafayette College, Easton, PA — 3.99
B.S., Chemical Engineering — May 2017

SKILLS

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

RESEARCH EXPERIENCE

Department of Chemical Engineering, University of Michigan, Ann Arbor, MI — Fall 2017-Present
Doctoral Thesis: *Spectral control of thermal emission at high temperatures and in the near field*

- Designed and fabricated an ultracompact infrared spectrometer (chemical sensor) that uses high-resolution calorimetry to capture thermal radiation between a custom microbolometer and analyte
- 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)
- Spearheaded aspects of all projects, including computational modeling of light and heat transport in complex structures, high temperature (> 2000 °C) thermal emission spectroscopy, all aspects of cleanroom nanofabrication, and calorimetry to measure conductive and radiative heat flows in nanomaterials

Department of Chemical Engineering, Lafayette College, Easton, PA — Fall 2016-Spring 2017
Honors Thesis: *Percolation Network Characterization in Segmented Polycarbonate-Polyurethanes*

- Investigated the behavior of a percolation network within segmented polyurethane blends for applications in selective transport of gases (Awarded NSF – GRFP with preliminary results)

SELECT FELLOWSHIPS AND AWARDS

Excellence in Research Award, 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

Rackham Predoctoral Fellowship Program, 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

National Science Foundation Graduate Research Fellowship, Lafayette College — Spring 2017
Grant (value of $140K) funded based on undergraduate research proposal

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

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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 July 2022
Oral Research Presentation; Columbus, OH

Materials Research Society Conference May 2022
Oral Research Presentation; Honolulu, HI

Summer Heat Transfer Conference July 2019
Oral Research Presentation; Bellevue, WA

Electronic Materials Conference June 2019
Oral Research Presentation; Ann Arbor, MI

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 1st 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