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I. Education

California Institute of Technology (Caltech)

Pursuing Ph.D. in Materials Science

Advisor: Katherine Faber

*NSF Graduate Research Fellow***Caltech**

M.S. in Materials Science

June 2024 | 3.8/4.0 GPA

The University of Southern Mississippi (USM)

B.S. in Polymer Science and Engineering (ABET Accredited) | Minor in Chemistry

May 2022, *Magna Cum Laude*Thesis: *Compatible Blends of n-Type Polymer Semiconductors: Impact on the Morphology and Mechanics of Flexible Optoelectronics***II. Research Experience**

2022 - Present

Graduate Researcher | Caltech

Katherine Faber Research Group

- Developing a hybrid additive manufacturing approach integrating laser powder bed fusion (LPBF) and reaction bonding (RB) for high-temperature ceramic fabrication in collaboration with NASA's Jet Propulsion Laboratory.
- Investigating phase transformations, oxidation kinetics, and volumetric expansion effects to optimize material densification and thermal stability.
- Utilizing characterization techniques (XRD, SEM/EDS, TGA) to analyze microstructural evolution and interfacial properties in LPBF-RB processed ceramics.

2023 - Present

Visiting Student Researcher | NASA Jet Propulsion Laboratory

Mech. Fabrication & Test Section 357

- **Co-led Materials International Space Station flight experiment (MISSE-21, JAXA HTV-X1)** on high-temperature oxide ceramics; fabricated flight coupons with JPL engineers and delivered for low Earth orbit exposure to atomic oxygen and radiation; responsible for pre-flight characterization and post-flight analysis plan (XRD, SEM/EDS, TGA). *Status as of Oct 2025: onboard ISS; awaiting return for evaluation.*

- Developing the kinetic models for structural control processes that design ordered, reproducible, and dimensionally uniform porous structures for spacecraft assimilation.
- Characterizing the physical, chemical, and mechanical behavior of materials manufactured through a novel additive manufacturing process to establish property-processing relationships in aluminum oxide-based systems.

2019 – 2022

Undergraduate Researcher | USM

Xiaodan Gu Research Group

School of Polymer Science and Engineering

- Investigated the morphology of semiconducting polymers for applications in solar cells
- Studied mechanics of conjugated polymer blends for improvement of optoelectronic devices
- Performed X-ray diffraction studies for academic and industry professionals via SAXS/WAXS

Summer 2021

Research Intern | UMass Amherst

Reika Katsumata Research Group

Department of Polymer Science and Engineering

- Led independent project studying the dewetting patterns of thin film polymers
- Performed contact angle measurements to quantify wetting for multi-layered systems
- Presented weekly literature reviews to faculty and graduate students

2020 – 2021

Research Scholar | USM

Ronald E. McNair Scholar Program

- Developed an independent project that addressed the balance of ductility and electrical performance in organic devices
- Assembled a comprehensive literature review regarding advances in OFET devices

Summer 2020

Research and Development Intern | Heritage Plastics

Picayune, MS

- Planned experiments to test the performance of products designed with various mineral fillers
- Reverse engineered defective products to determine source of defect
- Prepared polymer samples via injection molding, blow molding, compression molding, etc

III. Publications

A. Statistics via Google Scholar

Peer-reviewed publications: 9

h-index: 7

Total citations: 582

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B. Publications List

- 2026 **Chase Z**; Chyung, A.; Seager, T.; McEnerney, B.; Firdosy, S.; Faber, K. T. Eutectic-Activated Oxide Destabilization: A Microstructural Homogenization Strategy for Additively Manufactured Ceramics. *Addit. Manuf.* **2026**, 105252. DOI: 10.1016/j.addma.2026.105252
- 2025 **Chase Z**; Seager, T.; Cheikh, D.; Li, B. C.-Y.; McEnerney, B.; Guerra, J.; Borgonia, J. P.; Firdosy, S.; Faber, K. T. Integrating laser-powder bed fusion and reaction bonding: A hybrid approach to high-temperature ceramic fabrication. *Scr. Mater.* **2025**, 268, 116881. DOI: 10.1016/j.scriptamat.2025.116881
- 2024 Mehrehjedy A, Kumar P, **Chase Z**, et al. Fast and Facile Synthesis of Cobalt-Doped ZIF-8 and Fe₃O₄/MCC/Cobalt-Doped ZIF-8 for the Photodegradation of Organic Dyes under Visible Light. *ACS Omega*. <https://pubs.acs.org/doi/full/10.1021/acsomega.4c06142>
- 2022 Galuska L, Ocheje M, **Chase Z**, Rondeau-Gagné S, Gu, X. Elucidating the Role of Hydrogen Bonds for Improved Mechanical Properties in a High-Performance Semiconducting Polymer. *Chem. Mater.* **2022**, DOI: 10.1021/acs.chemmater.1c04055
- 2021 Zhang, Q.; Conkle, K.; **Chase, Z.**; Ray, P.; Kolodziejczyk, W.; Hill, G.; Gu, X.; Dai, Q. (FA0.83MA0.17)0.95Cs0.05Pb(I0.83Br0.17)3 Perovskite Films Prepared by Solvent Volatilization for High-Efficiency Solar Cells. *Solar RRL*. **2021**, 5, 2100640. DOI: 10.1002/solr.202100640
- 2021 Zhang, S.; Alesadi, A.; Mason, G.T.; Chen, K.L.; Freychet, G.; Galuska, L.; Cheng, Y.H.; St. Onge, P.B.J.; Ocheje, M.U.; Ma, G.; Qian, Z.; Dhakal, S.; **Chase, Z.**; Wang, C.; Chiu, Y.; Rondeau-Gagne, S.; Xia, W.; Gu, X. Molecular Origin of Strain-Induced Chain Alignment in PDPP-Based Semiconducting Polymeric Thin Films. *Adv. Funct. Mater.* **2021**, 31, 2100161. DOI: 10.1002/adfm.202100161
- 2021 Li, B.; Zhang, Q.; Zhang, S.; **Chase, Z.**; Chidanguro, T.; Davis, A.H.; Simon, Y.C.; Gu, X.; Zheng, W.; Pradhan, N.; Dai, Q. Spontaneously Supersaturated Nucleation Strategy for High Reproducible and Efficient Perovskite Solar Cells. *Chem. Eng. J.* **2021**, 405, 126998. DOI: 10.1016/J.Cej.2020.126998

- 2020 Li, Q.Y.; Yao, Z.F.; Lu, Y.; Zhang, S.; **Chase, Z.**; Wang, J.Y.; Gu, X.; Pei, J. Achieving High Alignment of Conjugated Polymers by Controlled Dip-Coating. *Adv. Elec. Mater.* **2020**, *6*, 2000080. DOI: 10.1002/aelm.202000080
- 2019 Yan, X.; Xiong, M.; Li, J.T.; Zhang, S.; **Chase, Z.**; Lu, Y.; Wang, Z.Y.; Yao, Z.F.; Wang, J.Y.; Gu, X.; Lei, T. Pyrazine-Flanked Diketopyrrolopyrrole (DPP): A New Polymer Building Block for High-Performance n-Type Organic Thermoelectrics. *J. Am. Chem. Soc.* **2019**, *141*, 20215-20221. DOI: 10.1021/jacs.9b10107

IV. Patents

Firdosy, S.; Faber, K.; Chase, Z.; et al. Reaction Bonding of Ceramics via Fusion Additive Manufacturing. Provisional. NPO 53202

V. Presentations

- 2026 Chase, Z. et al. *Disruption of Oxide Barriers in Reaction Bonded, 3D Printed Ceramics via Surface-Applied In-Ga Eutectic*. 155th TMS Conference, San Diego, CA.
- 2025 Chase, Z. et al. *In-Ga-Activated Al to Al₂O₃ Conversion in Hybrid Laser Powder Bed Fusion*. XIX ECerS Conference, Dresden, Germany.
- 2024 Chase, Z. et al. *Novel Additive Manufacturing of Ceramic Components via Reaction Bonding*. JPL Research Poster Symposium. Poster, JPL, Pasadena, CA.
- 2024 Chase, Z. et al. *Hybrid Additive Manufacturing of High-Temperature Ceramics: Enhancing Densification and Dimensional Accuracy via Reaction Bonding*. International Congress on Ceramics (ICC'10). Oral, Montreal, QC, CAN.
- 2024 Chase, Z. et al. *Additive Manufacturing of High-Temperature Ceramic Components via Reaction Bonding*. 48th International Conference and Exposition on Advanced Ceramics and Composites. Oral, Daytona Beach, FL.
- 2021 Chase, Z. *Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics*. American Chemical Society Spring Meeting, Virtual, Oral.
- 2021 Chase, Z. *Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics*. 48th Annual Waterborne Symposium, Virtual, Poster.
- 2021 Chase, Z. *Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics*. Mississippi Honors Conference, Virtual, Poster. **(1st Place)**
- 2021 Chase, Z. *Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics*. Undergraduate Symposium, USM, Virtual, Poster. **(1st Place)**

- 2021 Chase, Z. *Effect of Backbone Rigidity on Ductility for Optoelectronic Applications*. NSF EPSCoR: CEMOS Site Visit, Virtual, Oral.
- 2021 Chase, Z. *Blends of Partially and Fully Conjugated Polymers for High Ductility and Electrical Performance in Optoelectronics*. Mississippi McNair Scholars Symposium, Oral.

VI. Awards and Fellowships

- 2025 Young Science Star, Young Scientist Hub
- 2024 Dean's Leadership Award, Caltech
- 2024 New Horizons Diversity, Equity, and Inclusion Award
- 2024 Keck Institute for Space Studies Affiliate
- 2022 **NSF Graduate Research Fellowship**
- 2022 **Engineering & Applied Science Chair Scholars Fellowship, Caltech**
- 2022 **Knight-Hennessy Scholarship, Stanford** (Finalist)
- 2022 Excellence in Research Award – USM Honors College
- 2022 Honors College Research Persistence Award
- 2022 Who's Who Leadership Award at USM
- 2021 **Barry M. Goldwater Scholarship**
- 2021 Olliphant Honors Scholarship
- 2021 University of Southern Mississippi Undergraduate Symposium – **1st Place**
Materials Synthesis, Modification and Analysis Poster
- 2021 Mississippi Honors Conference – **1st Place** STEM Poster
- 2021 Mississippi Manufacturers Association Scholarship
- 2020 **Ronald E. McNair Scholarship**
- 2020 CIEF Frank Borrelle Leadership Scholarship
- 2020 Honors Keystone Scholarship
- 2020 Kristen Bower Scholarship
- 2020 School of Polymer Science and Engineering Student of the Month (January 2020)

VII. Teaching and Mentoring Experience

2024 - Present	Undergraduate Research Mentor Caltech Katherine Faber Research Group • Mentored Audrey Chyung, Mark Luo, and Fernando Milach Teixeira in optimizing sintering protocols for laser-printed and reaction-bonded alumina ceramics in collaboration with NASA's Jet Propulsion Laboratory • Advised on experimental design, materials characterization (SEM, EDS, XRD), and data analysis to improve processing efficiency and material integrity
2023 – Present	Teaching Assistant Caltech Engineering and Applied Science Division • Led office hours, developed assignments, and graded coursework for <i>MS 115: Fundamentals of Materials Science</i> and <i>MS/ME 166: Brittle Fracture of Materials</i> • Delivered lectures in place of the instructor, reinforcing core concepts in materials structure, properties, and processing
2023 – Present	Inaugural Chair of Graduate Student Advisory Board Engineering and Applied Science Division Caltech • Spearheaded the first EAS Graduate Student Advisory Board, aligning activities with divisional goals and enhancing student program quality • Partnered in developing student-focused initiatives, addressing holistic academic and social needs • Served as a liaison for student engagement and advocacy, streamlined communication, and facilitated community-building efforts
2023 – Present	Caltech Peer Mentor Graduate Summer Research Institute Student Faculty Programs Caltech • Mentoring six first-year graduate students from underrepresented backgrounds in higher education • Provide advice and assistance to the students in a range of topics from choosing appropriate classes that align with their interests, to identifying resources on campus that aid in their success
2021 – 2022	Research Mentor Xiaodan Gu Research Group School of Polymer Science and Engineering USM

- Trained and supervised a 2nd year undergraduate in SAXS/WAXS, AFM, and mechanical testing methods
- Mentored 4 additional students per semester in laboratory research activities

2018 – 2019

Learning Assistant

Mathematics Department | USM

- Tutored students in group settings and one-on-one for college algebra classes
- Independently led class meetings for small groups of students

VIII. Outreach and Involvement

Professional Memberships

American Chemical Society (Member 2020 – Present)

Society for Industrial and Applied Mathematics (Member 2019 - Present)

Society for the Advancement of Material and Process Eng. (**President** of USM Chapter 2021)

American Ceramic Society (Member 2023 – Present)

Academic Memberships

Sigma Xi Research Honor Society (Caltech Chapter President 2023 - Present)

National Society of Leadership and Success (Member 2022 - Present)

Campus & Community Involvement

Caltech Graduate Student Council (**Chair** 2025 – Present)

Caltech EAS Graduate Student Advisory Board (**Founder and Chair** 2024 - 2025)

U.S. Graduate Student Action Network (**Leadership Board** 2022 – 2023)

Caltech Graduate Student Council (**Director** 2022 - 2024)

Caltech EAS Committee on Community and Student Success (**Committee Member** 2022 – Present)

Caltech PRISM/oSTEM (**Leadership Councilor** 2022)

Mississippi Council for the Blind (**Councilor** 2017 - 2022)

USM Honors College Leadership Council (**Vice President** 2021)

USM Polymer Science Association (**President** 2020, **Treasurer** 2019)