

**Zachary Ahmad** (*he/him*)

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**I. Education**

**The University of Southern Mississippi (USM)**

B.S. in Polymer Science and Engineering (ABET Accredited) | Minor in Chemistry  
May 2022, *Magna Cum Laude*

**California Institute of Technology (Caltech)**

Pursuing Ph.D. in Materials Science  
Advisor: Prof. Wei Gao, Medical Engineering

**II. Research Experience**

- 2022 – Present      **NASA Proposal Writing & Evaluation Experience (NWPEE) (10 hrs/week)**  
National Aeronautics and Space Administration | Virtual
- Working in a multi-disciplinary team to develop innovative proposals for new technologies and concepts that enable NASA objectives and enhance mission capabilities
  - Writing, reviewing, and scoring proposals through the lens of a NASA reviewer
- 2019 – Present      **Undergraduate Researcher (20 hrs/week)**  
Xiaodan Gu Research Group  
School of Polymer Science and Engineering | USM
- Investigate the morphology of semiconducting polymers for applications in solar cells
  - Study mechanics of conjugated polymer blends for improvement of optoelectronic devices
  - Perform X-ray diffraction studies for academic and industry professionals via SAXS/WAXS
- Summer 2021      **Research Intern (40 hrs/week)**  
Reika Katsumata Research Group  
Department of Polymer Science and Engineering | UMass Amherst
- 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 (10 hrs/week)**  
Ronald E. McNair Scholar Program | USM

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

Summer 2020

**Research and Development Intern (40 hrs/week)**  
Heritage Plastics, Inc. | 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. Awards and Scholarships**

2022	<b>NSF Graduate Research Fellowship</b>
2022	<b>Knight-Hennessy Scholarship, Stanford</b> (Finalist)
2022	<b>Engineering &amp; Applied Science Chair Scholars Fellowship, Caltech</b>
2022	Excellence in Research Award – USM Honors College
2022	Honors College Research Persistence Award
2022	Who’s Who Leadership Award at USM
2021	<b>Barry M. Goldwater Scholarship</b>
2021	Olliphant Honors Scholarship
2021	University of Southern Mississippi Undergraduate Symposium – <b>1st Place</b> Materials Synthesis, Modification and Analysis Poster
2021	Mississippi Honors Conference – <b>1st Place</b> STEM Poster
2021	Mississippi Manufacturers Association Scholarship
2020	<b>Ronald E. McNair Scholar</b>
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)

### **IV. Teaching and Mentoring Experience**

2021 – Present	<b>Research Mentor</b> Xiaodan Gu Research Group School of Polymer Science and Engineering   USM
	<ul style="list-style-type: none"> <li>• Train and supervise a 2nd year undergraduate in SAXS/WAXS, AFM, and mechanical testing</li> <li>• Mentor 4 additional students per semester in laboratory research activities</li> </ul>
2018 – 2019	<b>Learning Assistant</b> 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

## V. Publications

### A. Statistics via Google Scholar

Peer-reviewed publications: 6  
 h-index: 4  
 Total citations: 155  
 Number of high-impact factor (IF>10) articles: 3  
 ORCID iD: 0000-0002-3308-8198

### B. Publications List

- 2022 Galuska, L.; Ocheje, M.; **Ahmad, 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.; **Ahmad, 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.; **Ahmad, 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.; **Ahmad, 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.; **Ahmad, 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.; **Ahmad, 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

### C. Pending Review

- Galuska, L.; Thapa, K.; **Ahmad, Z.**; Gu, X. In-Situ Spectroscopic Ellipsometry of D-A Conjugated Polymers - Thermal Transition and Aggregation Behavior. *ACS Macro Lett.* (In preparation)
- Galuska, L.; Huang, L.; **Ahmad, Z.**; Azoulay, J.; Gu, X. The Role of Side Chain Length and Position on the Thermomechanics of Intrinsically Conductive CDT-Qx Polymers. *Adv. Funct. Mater.* (In preparation)

## VI. Presentations

- 2021 Ahmad, Z. Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics. 48th Annual Waterborne Symposium, Virtual, Poster.
- 2021 Ahmad, Z. Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics. Mississippi Honors Conference, Virtual, Poster. **(1st Place)**
- 2021 Ahmad, Z. Compatible Conjugated Blends: Impact on the Morphology and Mechanics of Flexible Electronics. Undergraduate Symposium, USM, Virtual, Poster. **(1st Place)**
- 2021 Ahmad, Z. Effect of Backbone Rigidity on Ductility for Optoelectronic Applications. NSF EPSCoR: CEMOS Site Visit, Virtual, Oral.
- 2021 Ahmad, Z. Blends of Partially and Fully Conjugated Polymers for High Ductility and Electrical Performance in Optoelectronics. Mississippi McNair Scholars Symposium, Oral.

## VIII. Memberships and Involvement

### Professional Memberships

1. American Chemical Society (2020-Present)
2. Soc. for Industrial and Applied Mathematics (2019-Present)
3. SAMPE (**President** of USM Chapter 2021)

### Academic Memberships

1. **Sigma Xi** Research Honor Society (Associate Member 2021-Present)
2. National Society of Leadership and Success (2022-Present)

### Campus & Community Involvement

1. Mississippi Council for the Blind (2017–Present)
2. Honors College Leadership Council (**VP** 2021)
3. The Polymer Science Assn. (**Chair of Diversity, President** 2020, **Treasurer** 2019)
4. Women in Science and Engineering (Honorary Member 2020-Present)

## **IX. Skills**

### *Materials Characterization:*

SAXS/WAXS, AFM, UV-Vis, DSC, TGA, DMA, OIT, NMR, IR, Mass-Spec, Ellipsometry, Goniometry

### *Modeling & Numerical:*

MATLAB, Python, C++

### *Processing Systems:*

Batch Reactors, Continuous Reactors, Carbon Fiber Prepreg, Autoclave, Injection Molding, Compression Molding, Blow Molding, RTM, VARTM