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*
Thesis: *Compatible Blends of n-Type Polymer Semiconductors: Impact on the Morphology and Mechanics of Flexible Optoelectronics*

California Institute of Technology (Caltech)
Pursuing Ph.D. in Materials Science
Advisor: Katherine Faber

II. Research Experience

Summer 2022 — **NASA Proposal Writing & Evaluation Experience (NWPEE) (10 hrs/week)**
National Aeronautics and Space Administration | Virtual

- Worked in a multi-disciplinary team to develop innovative proposals for new technologies and concepts that enable NASA objectives and enhance mission capabilities
- Wrote, reviewed, and scored proposals through the lens of a NASA reviewer

2019 – 2022 — **Undergraduate Researcher (20 hrs/week)**
Xiaodan Gu Research Group
School of Polymer Science and Engineering | USM

- 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 (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 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 (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 **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 Scholar**
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 – 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

V. Publications

A. Statistics via Google Scholar

Peer-reviewed publications: 6
h-index: 5
Total citations: 176
Number of high-impact factor (IF>10) articles: 4
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. American Chemical Society Spring Meeting, Virtual, Oral.

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

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)

Academic Memberships

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

Campus & Community Involvement

U.S. Graduate Student Action Network (**Leadership Board** 2022 – Present)
Caltech Graduate Student Council (**Director** 2022 - Present)

Caltech Engineering and Applied Science Committee on Diversity, Equity, and Inclusion (**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 (**Chair of Diversity** 2021, **President** 2020, **Treasurer** 2019)
USM Women in Science and Engineering (Honorary Member 2020-2022)

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