Sabin Baral

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EDUCATION

The University of Southern Mississippi — Hattiesburg,MS
Bachelors of Science in Polymer Science and Engineering | Minor: Chemistry — **May, 2028**
Relevant Coursework: Polymer Rheology, Polymer Mechanics,Special Elucidation of Structure,Calc 3
GPA: **4.0/4.0 (President's List)**

EXPERIENCE

Undergraduate Research Assistant — **May 2025 – Present**
Gu Research Group — Hattiesburg, MS
High Throughput Block Copolymer Thin Film Fabrication and Characterization

- Investigate nanoscale morphology and self-assembly of **di-block and tri-block** copolymer thin films to advance high-throughput materials discovery.
- Prepare polymer blends by dissolving copolymers and homopolymers in optimized solvent systems and introducing selective additives to enhance annealing and structural ordering.
- Operate an **automated Nova Robot** system to spin-coat thin films with high precision and reproducibility, enabling large-scale sample generation for analysis.
- Collaborate on developing an **in-house closed-loop** platform that integrates fabrication, characterization, and data feedback to accelerate materials optimization.
- Conduct advanced structural characterization using synchrotron X-ray scattering (GIWAXS/GISAXS) at LBNL **(ALS)** and Brookhaven National Laboratory **(NSLS-II)**.
- Develop automated data-processing scripts to streamline analysis, improve throughput, and support iterative feedback within the closed-loop workflow.

Research Assistant — **Sept 2025**
Lawrence Berkeley National Lab — Berkeley,CA

- Collaborated with staff scientists to design a **comprehensive sample database**, enabling **pre-screening** by polymer type and creating a massive data repository for future materials discovery and analysis.
- Utilized automated Atomic Force Microscopy (AFM) to characterize surface morphology and phase-separation behavior across **500+** high-throughput thin-film samples.
- Assembled and optimized a multifunctional robotic system for spin coating and thermal annealing, enabling automated thin-film fabrication.
- Trained collaborating researchers on robotic system operation and thin-film preparation protocols for diverse block copolymer and polymer blend systems.

Undergraduate Research Assistant **Oct 2024 – May 2025**
Center for Optoelectronics and Devices Hattiesburg,MS
Fabrication and Thermal Stability Analysis of Organic Solar Cells

- Fabricated and optimized organic solar cells using blends of p-type conjugated polymers and n-type small-molecule acceptors to achieve efficiencies in the **15–18%** range.
- Systematically tested different **donor–acceptor material** combinations to evaluate morphology, charge separation efficiency, and optical absorption.
- Focused on enhancing **device stability**, investigating degradation pathways that occur under heat, light, and environmental exposure.
- Conducted all fabrication and testing in a nitrogen glovebox to prevent oxygen and moisture interference.
- Utilized **accelerated heating systems** to analyze thermal deposition and determine how fabrication parameters influence stability and performance.
- Characterized active layers using UV-Vis spectroscopy, AFM, and I–V measurements, and interpreted data using Python to correlate processing conditions with device behavior.

Independent Project – Design and Prototyping Engineer **Dec 2024 – Present**
Gu Research Group – Additive Manufacturing Initiative Hattiesburg, MS
Real-World Problem Solving Through 3D Printing

- Designed and manufactured custom 3D-printed components to **streamline** laboratory workflows and **maximize** space efficiency.
- Engineered thin-film sample holders that increased capacity by **500%**, from 20 to 100 samples within the same footprint.
- Created specialized vial and pipette holders for diverse lab setups, including **fume-hood** and **bench-top** applications.
- **Modeled** and fabricated load-cell covers and mounting systems to protect sensitive instruments.
- Conceptualized and constructed a soccer robot with enhanced ball-handling and defensive performance, providing a competitive advantage.

SKILLS

Polymer Characterization & Analysis: **GISAXS, GIWAXS, AFM, DLS, DSC, TGA, FTIR, UV-Vis Spectroscopy**
Programming **: Igor Pro, MATLAB, Python**
Software & Data Processing: **Igor Pro**, **OriginPro, ChemDraw**
3D Modeling: **AutoCAD, OpenSCAD**

HONOR AND AWARDS:

Winner, RoboSoccer Tournament – Google Developer Student Clubs, USM **2025**
Valedictorian and **Student Body President** Scholarship **2024**