

# MUHAMMAD ZEESHAN SHAH

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## PROFESSIONAL SUMMARY

Highly motivated and results-driven Ph.D. Candidate (expected March 2026) with expertise in polymer chemistry, lipid biochemistry, and nanobiotechnology, specifically focused on developing next-generation polymer-lipid nanodiscs (VEMA, SMALP) for the structural and functional characterization of membrane proteins. Proven track record in complex synthetic methodologies (RAFT, VEMA copolymerization), advanced instrumental analysis (EPR, DLS, NMR, SEC), and a strong publication record, including first-author papers in high-impact journals. Seeking a challenging Postdoctoral Research position to leverage advanced polymer and biophysical techniques to solve complex problems in materials science or structural biology.

Education	Years
Ph.D. in Chemistry Miami University (Focused on Polymers, Lipids, nanodiscs)	Expect March/April 2026
M.S Chemistry (Focused on Polymers, Lipids, nanodiscs)	2023
M.S Chemistry (Focused on removal of azodyes from water)	2017
Bachelor of Science, Chemistry	2015
Master of Education (M.S)	2018

## SKILLS SUMMARY

Wet Lab Skills	Instrumentation:	Software:
RAFT Chain Transfer agent synthesis, Kinetics of Polymerization, Polymer synthesis, Polymer-Lipids interactions, Lipid nanodiscs, Vesicles, Electron paramagnetic resonance (EPR) based analysis of membrane protein, Dye Degradation Expertise, Gamma irradiation treatment, Material characterization.	Nuclear magnetic Resonance Spectroscopy (DOSY and Proton), Dynamic Light Scattering (DLS), Transmission Electron Microscopy (TEM), Scanning electron microscope (SEM), Electron paramagnetic resonance (EPR), Size Exclusion Chromatography (SEC), Ultraviolet-Visible Spectroscopy, Infrared Spectroscopy, Atomic Absorption Spectroscopy (AAS), Inductively Coupled Plasma – Optical Emission Spectroscopy (ICP-OES), Gas Chromatography – Mass Spectrometry (GC-MS), Regeometer, DSC, Instron, Prusa 3D printing.	KeleidaGraph, Topspin, Adobe Illustrator, Autodesk Fusion 360, Python (moderate level), Microsoft Office (Word, Powerpoint), Fiji/ImageJ Software related to mentioned instruments

## RESEARCH EXPERIENCE

### Laboratory of Dominik Konkolewicz, Ph.D. | Miami University (May 2021 – Present)

- **Developed** an advanced Vinyl Ether Maleic Anhydride (VE-MA) polymer-lipid nanodisc system, successfully establishing a novel native-like environment for membrane protein analysis.
- **Investigated** the kinetics of Vinyl Ethers interaction with Maleic Anhydride, confirming successful chain extensions for diverse applications in polymer science.
- **Engineered** VEMA block copolymers with controlled tail hydrophobicity (VEMA Block Butyl Acrylate) and derivatized VEMA copolymers with varying nucleophiles to systematically study the effect of polymer charge and structure on lipid nanodiscs (Two first-author papers).
- **Explored** the use of spin-labeled VEMA polymer to gain biophysical insights into the dynamic formation and structure of polymer-based lipid nanodiscs via Electron Paramagnetic Resonance (EPR).

- **Explored** research into using VE-MA polymers for water treatment applications, demonstrating the material's versatility beyond biophysics.

## Laboratory of Dr. Majid Munir, Ph.D. | Government College University Faisalabad, Pakistan (2015 – 2017)

- **Discovered** a method for the degradation of a mixture of organic dyes (Reactive Orange 12 and Reactive Red 24) using high-energy gamma radiation in an aqueous medium.
- **Determined** the persistence and breakdown characteristics of industrial organic dyes in textile wastewater to inform environmental remediation strategies.

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## PUBLICATIONS (6 total: 2 first-author)

1. **Shah, M. Z.**; Rotich, N. C.; et al.; Konkolewicz, D. Vinyl Ether Maleic Acid Polymers: Tunable Polymers for Self-Assembled Lipid Nanodiscs and Environments for Membrane Proteins. *Biomacromolecules* **2024**. DOI: [10.1021/acs.biomac.4c00772](https://doi.org/10.1021/acs.biomac.4c00772). (First Author)
2. **Shah, M. Z.**; Rotich, N. C.; et al.; Konkolewicz, D. VEMA Block Copolymers: A Versatile Platform for Tunable Self-Assembled Lipid Nanodiscs and Membrane Protein Characterization (2025). Accepted in *Polymer Chemistry RSC, Awaiting publication*. (First Author)
3. Okorafor, E. A., Gordon, E. A., Sahu, I. D., **Shah, M. Z.**, Konkolewicz, D., & Lorigan, G. (2025). Influence of lipid saturation on the structural properties of styrene maleic acid lipid nanoparticles (SMALPs). *Biochimica et Biophysica Acta (BBA)-Biomembranes*, 184424.
4. Gary A Lorigan, Emma Gordon, Evelyn Okorafor, Kevin Burridge, **Muhammad Shah**, Dominik Konkolewicz (2025). The Effect of Lipid Saturation on the Formation of Styrene Maleic Acid Lipid Nanoparticles (Smalps). SSRN 5286470.
5. Gordon, E. A., Richardson, Y. B., **Shah, M. Z.**, Burridge, K. M., Konkolewicz, D., & Lorigan, G. A. (2022). Formation of styrene maleic acid lipid nanoparticles (SMALPs) using SMA thin film on a substrate. *Analytical Biochemistry*, 647, 114692.
6. Burridge, K. M., Rahman, M. S., et al.; **Shah, M. Z.**, & Konkolewicz, D. (2022). Network polymers incorporating lipid-bilayer disrupting polymers: towards antiviral functionality. *Polymer Chemistry*.

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## PRESENTATIONS

### Invited and Conference Presentations

- Presentation on Polymer systems for studying membrane proteins in International Conference on Functional Materials and Emerging Technologies (Nov-2024).
- Presentation on Polymer based Lipid nano discs at Graduate Research Forum 2024 at Miami University (Nov-2024).
- Presentation on Vinyl Ethers- Maleic anhydride Lipid nano discs in SMALPs Conference 2023 at University of Tennessee (Nov 2023).
- Presentation on Lipid discs formation and Kinetic study of butyl vinyl ether and maleic anhydride copolymerization in ACS Spring 2023 Conference Indianapolis (March 2023).
- Flash Talk – Poly/PMSE Chapter ACS at the University of Cincinnati (July 2023).

### Poster Presentations

- Poster Presentation on Vinyl Ethers- Maleic anhydride Lipid nano discs in ACS Fall 2025 (PMSE and POLY Sections) Conference Washington DC (August 2025).
- Poster Presentation at SMALPs conference 2023 in University of Tennessee (Nov 2023).

## **TEACHING & MENTORING EXPERIENCE**

### **Research Assistantship | Miami University**

- **Mentored** undergraduate students (11 total, listed below) on projects involving polymer-lipid nanodiscs synthesis, resulting in one published research paper with undergraduates as co-authors (Fall 2023 – Continued).

### **Teaching Assistantship | Miami University**

- Organic Chemistry (CHM244 & CHM245, Fall'22 to Spring'23).
- General Chemistry (CHM144 & CHM145, Spring'21 to Spring'22).

### **Undergraduate Students Mentored at Miami University (2021-Continued):**

Quinn Henoch, Godfred Agyemang, Gabby Demidovich, Julia Kilbey, Jeremy Eapen, Mary Eisenhart, Audrey Woodruff, Camaryn Bennett, Manjot Singh, Ben Cubberly, Natalie Hicov.

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## **AWARDS & SERVICE**

- **Approved for National Interest Waiver (NIW) EB2** by USCIS (Priority date Feb 2025).
- **President** (2024-2025) and **Treasurer** (2022-2023) in Poly/PMSE chapter Cincinnati Division of the American Chemical Society.
- **Working on a NIH-funded research project** in Dr. Konkolewicz's lab (Since 2022).
- Recipient of **Best Presenter recognition** at ACS Chapter of SW OH (Oct-2024).
- Recipient of **Graduate Research Fellowship** (May 2023, May 2022).
- Volunteering as a **reviewer** for *Journal on Excellence in College Teaching* (Since 2023).
- Recipient of Multiple **Graduate Travel Funds** for national conferences (ACS Spring 2023, SMALPs 2023, ACS Fall 2025).