

Megan Wancura, Ph.D.

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SUMMARY

I am a driven Analytical Chemist with 10 years of research experience in academic settings. My research has focused primarily on polymer biomaterials, where my expertise includes analytical method development, polymer and small molecule synthesis, and structural and mechanical characterization. My training has included experience with NMR, IR, GPC, UV/Vis, SEM, confocal microscopy, nano-indentation, and tensile and compression testing. I have extensive knowledge of hydrogel design including robust coating methods and complex networks (ionic and hydrogen bonding interactions, high functionality crosslinkers, interpenetrating and double networks).

SKILLS

- Strong knowledge of structure property relationships of polymers and hydrogels with extensive experience with mechanical (Instron, DMA, and nanoindentation), chemical (GPC, GC, and FT-IR, UV/Vis, and NMR (^1H , ^{13}C , ^{31}P , ^{19}F , COSY, ROSSY, HSQC) spectroscopy), and spectroscopic (SEM, optical and confocal microscopy) analysis methods
- Experienced in organic synthesis of monomers and polymers including recrystallization, extraction, distillation, and column chromatography (silica, sephadex, HPLC)
- Adept at materials evaluation and optimization including troubleshooting across a range of analytical instruments and characterization assays

EDUCATION

The University of Texas at Austin, Austin, TX 2017- 2022
Ph.D. in Analytical Chemistry

- **Dissertation:** Damage Resistant Hydrogel Coatings for Bioactive Small Diameter Vascular Grafts
- **Advisors:** Dr. Elizabeth Cosgriff-Hernandez and Dr. Jason Shear
- **Committee:** Dr. Cassandra Callmann, Dr. Zachariah Page, and Dr. Nicholas Peppas

Smith College, Northampton, MA 2013- 2017
Bachelor of Arts in Chemistry, GPA: 3.89

EXPERIENCE

Laboratory Manager, *Amherst College* Jan.-Aug. 2024
Department of Environmental Science, Advisor: Dr. Rebecca Hewitt

- Lead sample processing of four large-scale environmental projects, managing 14 undergraduate researchers in the handling of >2,000 temperature sensitive soil samples, tracking each sample across a range of characterizations (wet weight, dry weight, pH, rock density, root weight, DNA extract amount and quality) and logging and curating data.
- Coordinated project details and time-sensitive sample exchange across the country with advisor, collaborators, and external labs with minimal oversight.

Visiting Organic Chemistry I Lecturer, *Smith College* Jan.-May 2024
Department of Chemistry

- Worked in teaching team with two additional professors, co-writing exams and establishing curriculum
- Taught 52 first year students in combined lecture/ discussion classroom including writing and grading 3x weekly problem sets, 2 quizzes, 3 exams, and a final

Instrumentation Specialist, Amherst College
Department of Biology

Jan.-Dec. 2023

- Managed maintenance, use, and training of all departmental instrumentation, including nanodrops, plate readers, gel imagers, and pH meters. Prepared quick-start guides for instruments and managed use logs.
- Coordinated purchasing and repairs of equipment with external vendors when necessary, shopping to find best and lowest cost options.

Graduate Student, The University of Texas at Austin
Department of Biomedical Engineering, Advisor: Dr. Elizabeth Cosgriff-Hernandez

Aug. 2017-Aug. 2022

- Developed damage-resistant poly(ethylene)glycol(PEG)-based hydrogel coatings with interpenetrating networks composed of *N*-acryloyl-glycinamide and bisacrylamide, optimizing ultimate elongations and modulus through modulating molecular weight, concentration, and degree of hydrogen bonding.
- Designed a diffusion-mediated crosslinking method with redox-based free radical polymerization chemistry for conformal PEG-acrylate coatings and demonstrated scalability to various substrate sizes, fabricating coatings for electrospun small diameter grafts and heart valves.
- Conducted extensive mechanical property characterizations of structure-property relationships of hydrogels including via swelling, tension, compression, and nanoindentation testing.
- Developed a biostable formation of high molecular weight acrylate-functionalized PEGs and optimized synthesis to limit impurities as characterized via NMR and GPC.
- Synthesized biodegradable poly(ether ester urethane) urea block polymers with variable length hard segments and characterized polymer with IR, NMR, and tensile properties of films.
- Mentored two graduate students and five undergraduate students, delegating research tasks as project manager while educating on project scope and importance of each task, and teaching research skills including management.
- Worked as a teaching assistant for four semesters, managing class and office hour schedules and grading on top of research. Excelled in this position as evidenced by being awarded two teaching awards.

Undergraduate Researcher, Smith College
Department of Chemistry, Advisor: Dr. Maren Buck

Jan. 2016– May 2017

- Developed physical and chemical patterning methods for “click-type” azlactone functional hydrogels using topographically patterned PDMS substrates and reactive fluorescent compounds and characterized efficacy with confocal microscopy.
- Synthesized azlactone polymer and range of functionalized hydrogels and characterized degree of functionalization via FTIR as well as the effect of functionalization on swelling properties and diffusivity.

PUBLICATIONS

13. Rodriguez-Rivera, G.; Post, A.; John, M.; Bashe, D.; Xu, F.; LaRue, T.; Nkansah, A.; **Wancura, M.**; Chwatko, M.; Waldron, C.; Kalkunte, N.; Zoldan, J.; Arseneault, M.; Elgalad, A.; Rausch, M.; Razavi, M.; Cosgriff-Hernandez, E. (2024). Injectable hydrogel conductors: Advancing material design to transform cardiac pacing. (Submitted).
12. Robinson, A.; Nkansah, A.; Jones, S.; Fairley, A.; Leung, J.; **Wancura, M.**; Sacks, M.; Cosgriff-Hernandez, E. (2024). Hydrogel-polyurethane fiber composites with enhanced microarchitectural control for heart valve replacement. *J. Biomed. Mater. Res. A.* 12(4): 586-599.
11. **Wancura, M.**; Nkansah, A.; Robinson, A.; Chwatko, G.; Toubbeh, S.; Jones, A.; Fairley, A.; Cosgriff-Hernandez, E. (2023). Interpenetrating network design of bioactive hydrogel coatings with enhanced damage resistance. *J. Mater. Chem. B.* 11(24): 5416-5428.
10. **Wancura, M.**; Nkansah, A.; Robinson, A.; Talanker, M.; Toubbeh; Cosgriff-Hernandez, E. (2023). PEG-Based Hydrogel Coatings: Design Tools for Biomedical Applications. *Annal. Biomed. Engineer.* 1-12.

9. Wang, L.; Wong, Y.; Correira, J.; **Wancura, M.**; Geiger, C.; Webster, S.; Butler, B.; O'Toole, G.; Langford, R.; Brown, K.; Dortdivanlioglu, B.; Webb, L.; Cosgriff-Hernandez, E.; Gordon, V. (2023). The accumulation and growth of *Pseudomonas aeruginosa* on surfaces is modulated by surface mechanics via cyclic-di-GMP signaling. *NPJ Biofilms Microbiomes*. 9(1): 78.
8. Motiwale, S.; Russell, M.; Conroy, O.; Carruth, J.; **Wancura, M.**; Robinson, A.; Cosgriff-Hernandez, E.; Sacks, M. (2022). Anisotropic elastic behavior of a hydrogel-coated electrospun polyurethane: Suitability for heart valve leaflets. *J. Mech. Behav. Biomed. Mater.* 125: 104877.
7. Rodriguez-Rivera, G.; Post, A.; John, M.; Buchan, S.; **Wancura, M.**; Chwatko, M.; Cosgriff-Hernandez, E. (2021). Towards prevention of re-entrant arrhythmias: Injectable hydrogel electrodes enable direct capture of previously inaccessible cardiac tissues. *bioRxiv*: 2021-11.
6. **Wancura, M.**; Talanker, M.; Toubbeh, S.; Bryan, A.; Cosgriff-Hernandez, E. (2020). Bioactive Hydrogel Coatings of Complex Substrates using Diffusion-Mediated Redox Initiation. *J. Mater. Chem. B*. 8.
5. Richbourg, N.; **Wancura, M.**; Gilchrist, A.; Toubbeh, S.; Harley, B.; Cosgriff-Hernandez, E.; Peppas, N. (2020). Precise control of synthetic hydrogel network structure via linear, intended synthesis-swelling relationships. *Sci. Adv.* 7(7).
4. Roseen, M.; Lee, R.; Post, A.; **Wancura, M.**; Cosgriff-Hernandez, E.; Grade-Allen, K. (2020). Poly(ethylene glycol)-based coatings for bioprosthetic valve tissues: toward restoration of physiological behavior. *ACS Appl. Bio Mater.* 3 (12).
3. **Wancura, M.**; McCracken, J.; Cosgriff-Hernandez, E.; Hakim, J. (2019). Emerging Technologies in Pediatric Gynecology: New Paradigms in Women's Health Care. *Curr. Opin. Obstet. Gynecol.* 31(5).
2. **Wancura, M.**; Carrol, A.; Anex-Ries, Q.; P. Hindocha; Garcia, A.; Buck, M. (2017). Fabrication, chemical modification, and topographical patterning of reactive gels assembled from azlactone-functionalized polymers and a diamine. *J. Polym. Sci. Part A: Polym. Chem.* 55(19), 3185-3194.
1. **Wancura, M.**; Yan, Y.; Katz, L.; & Maurer-Alcalá, X. (2017). Nuclear Features of the Heterotrich Ciliate *Blepharisma americanum*: Genomic Amplification, Life Cycle, and Nuclear Inclusion. *J. Eukaryot. Microbiol.* 65(1), 4-11.

CONFERENCE PROCEEDINGS

10. Nkansah, A.; **Wancura, M.**; Robinson, A.; Cosgriff-Hernandez, E. (2022). Control of Redox Diffusion-Mediated Crosslinking for Conformable Hydrogel Coatings. Society for Biomaterials Annual Meeting, Baltimore, MD. (Oral Presentation).
9. **Wancura, M.**; Nkansah, A.; Robinson, A.; Cosgriff-Hernandez, E. (2022). Interpenetrating Network Hydrogel Coatings for Cardiovascular Applications. Society for Biomaterials Annual Meeting, Baltimore, MD. (Poster).
8. Robinson, A.; Bhat, S.; Jones, S.; **Wancura, M.**; Sacks, M.; Dasi, L.; Cosgriff-Hernandez, E. (2022) Evaluation of a Hydrogel-Coated Electrospun Mesh as a Synthetic Heart Valve. Society for Biomaterials Annual Meeting, Baltimore, MD. (Oral Presentation).
7. Nkansah, A.; **Wancura, M.**; Robinson, A.; Cosgriff-Hernandez, E. (2022) Control of Redox Diffusion-Mediated Crosslinking for Conformable Hydrogel Coatings. Society for Biomaterials Annual Meeting. Baltimore, MD. (Oral Presentation).
6. Motiwale, S.; Russell, M.; **Wancura, M.**; Robinson, A.; Cosgriff-Hernandez, E.; Sacks, M. (2021). Mechanical Performance of a Hydrogel-Fiber Mesh Composite as a Synthetic Heart Valve Material. Society for Biomaterials Annual Meeting, Virtual Meeting. (Oral Presentation).
5. **Wancura, M.**; Robinson, A.; Cosgriff-Hernandez, E. (2021). Design of Hydrogel Coatings of Electrospun Vascular Grafts via Diffusion-Mediated Redox Polymerization. Society for Biomaterials Annual Meeting, Virtual Meeting. (Rapid Fire Talk).
4. **Wancura, M.**; Talanker, M.; Toubbeh, S.; Bryan, A.; Cosgriff-Hernandez, E. (2019). Diffusion-Mediated Redox Initiation for Micro-Scale Conformable Hydrogel Coatings. Materials Research Society Spring Conference, Phoenix, Arizona. (Oral Presentation).

3. **Wancura, M.**; Talanker, M.; Toubbeh, S.; Morales, B.; Cosgriff-Hernandez, E. (2019). Tough, Bioactive Hydrogel Coatings for Multilayer Vascular Grafts. Rice University Biomaterials Day Conference, Houston, Texas. 2019. (Poster Presentation).
2. **Wancura, M.**; Talanker, M.; Post, M.; Cosgriff-Hernandez, E. (2018). Development of a Tunable Redox Hydrogel Coating Method for Multilayer Vascular Grafts. Texas A&M Biomaterials Day Conference, College Station, Texas. (Poster Presentation).
1. **Wancura, M.**; Talanker, M.; Post, M.; Arseneault, M.; Cosgriff-Hernandez, E. (2018). Development of a Tunable, Tough Hydrogel Layer for Multilayer Vascular Grafts. Rice University Tissue Engineering Short Course, College Station, Texas. (Poster Presentation).

TALKS

3. **Wancura, M.** (2023). "After Smith: Ph.D. Struggles, Building Resilience, and Figuring Out What Comes Next" Smith College. (Invited Talk)
2. **Wancura, M.** (2021). "From Smith to UT Austin & Cardiovascular Hydrogel Coatings" Smith College. (Invited Talk).
1. **Wancura, M.** (2020). "Bioactive and Tough PEG-based Hydrogel Coatings for Cardiovascular Applications" The University of Texas at Austin.