

Exponent®
Engineering & Scientific Consulting

Ryan Wade, Ph.D.

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Professional Profile

Dr. Wade's expertise includes polymer design, synthesis, and characterization, with broad experience in the failure analysis of plastic and rubber components for various applications. He is particularly experienced in the development of polymeric systems for biomedical applications with experience in designing, executing, reviewing, and presenting test plans and results for submissions to regulatory bodies, including FDA.

Additional areas of focus include hydrogel development, micro and nano-particle formulation, polymeric biodegradation, biocompatibility of materials, and drug delivery.

The interdisciplinary nature of Dr. Wade's background has given him extensive experience in chemical, mechanical, and biological characterization of polymeric materials. In particular, he is well versed in polymer synthesis, solid-phase peptide synthesis, and a wide variety of chemical characterization techniques including UV-Visible spectroscopy, Fourier transform infrared spectroscopy (FTIR), 1H nuclear magnetic resonance spectroscopy (NMR), mass spectroscopy (MALDI-TOF), and gel permeation chromatography (GPC). Additionally, he is proficient in mechanical characterization techniques including nano-indentation, oscillatory rheometry, and dynamic mechanical analysis with a particular focus on the mechanical behavior of hydrogels. He is experienced in both in vitro (cell culture, enzymatic degradation and protein release from polymers, confocal and scanning electron microscopy) and in vivo (material erosion, protein staining, near-infrared imaging) characterization for the evaluation of the biocompatibility of polymeric materials.

Prior to joining Exponent, Dr. Wade's academic research developed multiple hydrogel systems to control cell-material interactions by designing biophysical and biochemical signals into polymeric materials. Before completing his Ph.D., Dr. Wade worked at Merck & Co. as a Manufacturing Facilitator for bulk protein purification of the Gardasil ® vaccine and is experienced in GMP compliant manufacturing practices.

Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, University of Pennsylvania, 2015

B.S., Materials Science and Engineering, Johns Hopkins University, 2008

National Science Foundation Graduate Research Fellow, University of Pennsylvania, 2011-2015

Materials Science Senior Achievement Award, Johns Hopkins University, 2008

Senior Design Research Award, Johns Hopkins University, 2008

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Tau Beta Pi Appreciation Award, National Engineering Honor Society, Johns Hopkins University, 2008

Licenses and Certifications

ISO 10993-1:2018 - Biological evaluation of medical devices — Part 1: Evaluation and testing within a risk management process

Academic Appointments

Drexel University - Biomedical Engineering, Science and Health Systems, Adjunct Teaching Professor, 2019-Present

- Biomaterials I, Biomaterials II, Biomaterials III

Prior Experience

Graduate Research Assistant, University of Pennsylvania, 2010-2015

Manufacturing Facilitator, Merck, 2008-2010

Teaching Assistant - Materials Lab I, Johns Hopkins University, 2008

Professional Affiliations

University of Pennsylvania Engineering Alumni Society Board

American Chemical Society

Society of Plastics Engineers

Tau Beta Pi Engineering Honor Society

Publications

Rau AC, Rodriguez Quijada C, Wade R, Stabler CT. A Risk-Based Approach To Assess Particulate Generation For Cardiovascular Devices. Med Device Online. 2023.

Wade, RJ. Engineering extracellular matrix signals into fibrous hyaluronic acid hydrogels. University of Pennsylvania Doctoral Thesis. 2015.

Rodell CB, Wade RJ, Purcell BP, Dusaj N, Burdick JA. Selective proteolytic degradation of guest-host assembled, injectable hyaluronic acid hydrogels. ACS Biomaterials Science & Engineering 2015; 1.

Wade RJ, Bassin EJ, Rodell CB, Burdick JA. Protease-degradable electrospun fibrous hydrogels. Nature Communications 2015; 6.

Wade RJ, Bassin EJ, Gramlich WM, Burdick JA. Nanofibrous hydrogels with spatially patterned biochemical signals to control cell behavior. Advanced Materials 2015; 27.

Rodell CB, MacArthur JW, Dorsey SM, Wade RJ, Wang LL, Woo YJ, Burdick JA. Shear-thinning supramolecular hydrogels with secondary autonomous covalent crosslinking to modulate viscoelastic

properties in vivo. Advanced Functional Materials 2014; 25.

Wade RJ, Burdick JA. Advances in nanofibrous scaffolds for biomedical applications: From electrospinning to self-assembly. Nano Today 2014.

Highley CB, Rodell CB, Kim IL, Wade RJ, Burdick JA. Ordered, adherent layers of nanofibers enabled by supramolecular interactions. Journal of Materials Chemistry B 2014; 2.

Purcell BP, Lobb D, Charati MB, Dorsey SM, Wade RJ, Zellars KN, Doviak H, Pettaway S, Logdon CB, Shuman JA, Novak C, Gorman JH, Gorman RC, Spinale FG, Burdick JA. Injectable and bioresponsive hydrogels for on-demand matrix metalloproteinase inhibition. Nature Materials 2014; 13.

Purcell BP, Lobb D, Charati MB, Wade RJ, Zellers KN, Doviak H, Pettaway S, O'Neill J, Khakoo A, Lee TW, Logdon CB, Shuman J, Novak C, Spinale FG, Burdick JA. On-demand Delivery of TIMP-3 From Matrix Metalloproteinase Degradable Hydrogels Attenuates Post Myocardial Infarction Remodeling. Circulation 2013; 128 (suppl 22).

Wade RJ, Burdick JA. Engineering ECM signals into biomaterials. Materials Today 2012; 15.

Wade RJ, Burdick JA. MMP-sensitive and photopolymerizable hyaluronic acid macromers to fabricate biomimetic fibrous scaffolds. Abstracts of Papers of The American Chemical Society 2012; 244.

University Lectures

Wade, RJ. Case studies in materials analysis. Department of Chemical Engineering Seminar. University of Virginia. Fall 2022.

Wade, RJ. EVE 394: Materials in the Environment. Arizona State University. 2020 – 2022.

Wade RJ. Failure Analysis. ENGR 299 - Rachleff Scholars Program, University of Pennsylvania. 2018 – 2022.

Presentations

Wade, RJ, Pittelli, S, Reitman M TF. Stability of polypropylene mesh to acid, base, and peroxide chemical challenge. Singh Center for Nanotechnology Annual User Meeting. University of Pennsylvania. 2021.

Wade, RJ, Kiel J, Reitman M TF. Oxidative stability of polypropylene for biomedical applications. 257th American Chemical Society Meeting. Orlando FL 2019.

Wade RJ, Kiel J. Case studies in Failure Analysis. Singh Nanovation Conference. University of Pennsylvania. 2017.

Wade RJ, Burdick JA. Patterning biochemical signals into nanofibrous hydrogels to spatially control cell behavior. Society for Biomaterials, Charlotte, NC, 2015.

Rodell CB, MacArthur JW, Wade RJ, Dorsey SM, Burdick JA. Injectable dual-crosslinking hydrogels to decouple material retention and mechanical properties in vivo. Society for Biomaterials, Charlotte, NC, 2015.

Wade RJ, Gramlich WM, Bassin EJ, Burdick JA. Biomimetic patterned biochemical and biophysical properties within electrospun nanofibrous hydrogels. Materials Research Society Spring Meeting, San Francisco, CA, 2014.

Wade RJ, Bassin EJ, Burdick JA. Engineered MMP sensitivity within electrospun nanofibrous hydrogels. Materials Research Society Spring Meeting, San Francisco, CA, 2014.

Wade RJ, Burdick JA. Fibrous hyaluronic acid scaffolds with engineered degradation through MMP sensitivity. Society for Biomaterials, Boston, MA, 2013.

Burdick JA, Kim IL, Wade RJ. Engineered fibrous scaffolds that mimic features of natural ECM. ASME 2nd Global Congress on Nanoengineering for Medicine and Biology, Boston, MA, 2013.

Wade RJ, Burdick JA. MMP-sensitive and photopolymerizable hyaluronic acid macromers to fabricate biomimetic fibrous scaffolds. 244th American Chemical Society Meeting, Philadelphia, PA, 2012.

Wade RJ, Burdick JA. Hyaluronic acid macromers in tissue engineering. Penn Polymer Seminar Series, Philadelphia, PA, 2012.

Wade RJ, Burdick JA. MMP-sensitive and photopolymerizable hyaluronic acid macromers to fabricate biomimetic fibrous scaffolds. Gordon Research Conference: Signal Transduction by Engineered Extracellular Matrices, Biddeford, ME, 2012.