Exponent®
Engineering & Scientific Consulting

Marshall Allen, Ph.D.

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Professional Profile

Dr. Allen is a trained chemical engineer and polymer scientist who utilizes his expertise in polymer mechanics, photo-curing, and materials characterization to consult on complicated projects related to failure analysis and optimization of elastomer, plastic, and adhesive products. He frequently consults for clients in industries including consumer electronics, medical devices, and automation. Dr. Allen's professional interests focus on the analysis and optimization of polymer products for improved reliability and performance.

Dr. Allen has widespread experience in characterization of polymer materials including dynamic mechanical analysis (DMA), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), rheology, Fourier transformed infrared spectroscopy (FTIR), real-time reaction monitoring (RT-FTIR), tensile and fracture testing of polymers, gel permeation chromatography (GPC), nuclear magnetic resonance spectroscopy (NMR), X-ray scattering (SAXS), as well as a range of spectroscopic and elemental analyses.

Before joining Exponent, Dr. Allen completed his Ph.D. in Chemical Engineering at the University of Texas at Austin where he was a National Science Foundation graduate research fellow. His research focused on developing novel light-based methods for control and patterning of mechanical properties in polymer materials. Through his research, he developed a robust knowledge of polymer mechanics and characterization, light-based 3D-printing, and membrane materials.

Academic Credentials & Professional Honors

Ph.D., Chemical Engineering, University of Texas, Austin, 2023

B.S., Chemical Engineering, Oregon State University, 2018

NSF Graduate Research Fellow

Cockrell School of Engineering Thrust 2000 Fellow

Prior Experience

NSF Graduate Research Fellow, University of Texas at Austin, 2020-2023

Professional Affiliations

American Chemical Society (ACS)

American Institute of Chemical Engineers (AIChE)

Materials Research Society (MRS)

Publications

Allen M. J., Lien H.-M., Prine N., Burns, C., Adrian R., Gu X., Mangolini F., Cox L., Freeman B. D., Page Z. A., “Multimorphic Materials: Spatially Tailoring Mechanical Properties via Selective Initiation of Interpenetrating Polymer Networks”. Advanced Materials 2022; 2210208.

Rylski A. K., Cater H. L., Mason K. S., Allen M. J., Arrowood A. J., Freeman B. D., Sanoja G. E., and Page Z. A., “Polymeric multimaterials by photochemical patterning of crystallinity”. Science 2022; 378, 6616, 211-215

Cater H. L. Balynska I., Allen M. J., Freeman B. D., and Page Z. A. “User Guide to Ring Opening Metathesis Polymerization of endo-2 Norbornene Monomers with Chelated Initiators”. Macromolecules. 2022; 55, 15, 6671–6679

Wang H., Jones L. O., Hwang I., Allen M. J., Tao D., Lynch V. M., Freeman B. D., Khashab N. M., Schatz G. C., Page Z. A., and Sessler J. L. “Selective Separation of Lithium Chloride by Organogels Containing Strapped Calix[4]pyrroles.” Journal of The American Chemical Society. 2021; 143, 48, 20403–20410

Allen, M. J., Sujanani, R., Chamseddine, A., Freeman, B., Page, Z. “Mechanically robust hydrophobized double network hydrogels and their fundamental salt transport properties.” Journal of Polymer Science 2021; 59:2581-2589

Ju, X., Allen, M., Zhao, P., Salvo, P., Dryer F.B., and Beaudry, C. “Synthetic Studies toward Bazzanin K: Regioselective and Chemoselective Three-Component Suzuki Coupling.” The Journal of Organic Chemistry 2019; 84, 18, 12246-12252

Choi, C., David, M., Gao, Z., Chang, A., Allen, M., Wang, H., Chang, C. “Large-scale Generation of Patterned Bubble Arrays on Printed Bi-functional Boiling Surfaces.” Scientific Reports 2016; 6, 23760.

Choi, C., Gorecki, J., Fang, Z., Allen, M., Li, S., Lin, L., Chang, C. “Low-temperature, inkjet printed p-type copper(i) iodide thin film transistors”. Journal of Materials Chemistry C 2016; 4, 43, 10309- 10314

Luo, W., Allen, M., Raju, V., Ji, X. “An Organic Pigment as a High-Performance Cathode for Sodium-Ion Batteries”. Advanced Energy Materials 2014; 4, 15 1400554.

Luo, W., Wang, B., Heron, C., Allen, M. J., Morre, J., Maier, C., Ji, X. “Pyrolysis of cellulose under ammonia leads to nitrogen-doped nanoporous carbon generated through methane formation”. Nano Letters, 2014; 14, 4, 2225-9.

Presentations

Allen M. J. “Mechanical Patterning in Polymer Materials using Light.” Invited Talk, University of Bologna Department of Chemical Engineering, Bologna Italy, 2023.

Allen M. J., Burns C., Freeman B. D., Page Z. A. “Spatial control over mechanical properties of polymer networks from single resin feedstocks.” Oral Presentation, Fall 2023 ACS National Meeting, San Francisco, CA, 2023.

Allen M. J., Burns C., Freeman B. D., Page Z. A. “Macro to Micro: Emulating Natural Toughening Mechanisms in Multimorphic Soft Materials Via Orthogonal Interpenetrating Polymer Networks.” Oral Presentation 2022 AIChE Annual Meeting, Phoenix AZ, 2022.

Allen M. J., Sujanani, R., Freeman B. D., Page Z. A. “Mechanically robust hydrophobized double network hydrogels and their fundamental salt transport properties.” Poster Presentation, Tosoh Polymer Conference, Hollywood CA, 2022.

Peer Reviews

Polymer