



# Exponent<sup>®</sup>

Engineering & Scientific Consulting

## Emily Fitzharris, Ph.D., P.E.

Managing Engineer | Polymers & Chemistry

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## Professional Profile

Dr. Fitzharris consults on a wide variety of polymer-related matters including thermal, mechanical and rheological characterization, rubber compounding and processing, environmental stress cracking, and polymer process-structure-property relationships. She has practical experience in traditional polymer processing applications such as extrusion, batch mixing, and compression molding as well as particular expertise related to novel additive manufacturing and 3D printing techniques. She also regularly consults on fiber and textile related matters, including characterization, testing, and failure analysis of fabric reinforced composites as well as woven and nonwoven based products.

Dr. Fitzharris applies her experience to both proactive and reactive projects in numerous fields, including consumer products, medical devices, textile and fiber applications, construction and infrastructure, and the oil and gas industry. Dr. Fitzharris has also supported clients in intellectual property analyses related to polymeric materials, including assistance in trade secret, prior art analysis, claim interpretation, infringement, and validity matters.

Dr. Fitzharris has broad experience related to traditional polymer characterization techniques (e.g., fractography, differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), peel testing, tensile testing, dynamic mechanical analysis (DMA), and capillary rheometry) as well as emerging polymer characterization techniques such as fast scanning calorimetry (FSC). In addition to regular use of standard material test methods, she has developed custom testing procedures for industry specific applications. She has applied her materials understanding to a range of commercial plastics, including high-performance polymers such as polyphenylene sulfide (PPS), polyether ether ketone (PEEK), polyetherimide (PEI, ULTEM<sup>®</sup>), and a polyphenylene ether and polystyrene blend (PPE/PS, NORYL<sup>®</sup>).

Prior to joining exponent, Dr. Fitzharris earned her Ph.D. at the Georgia Institute of Technology. Her research focused on material extrusion additive manufacturing of high-performance polymers. In this work, Dr. Fitzharris utilized finite element modeling and statistical design of experiments to aid in materials selection and process optimization efforts in emerging additive manufacturing technologies. She additionally utilized various polymer characterization techniques to understand the rheological and crystallization behavior specific to the additive manufacturing process and to establish relationships between additive manufacturing process parameters and end-use properties of fabricated products.

## Academic Credentials & Professional Honors

Ph.D., Materials Science and Engineering, Georgia Institute of Technology, 2019

B.Sc., Polymer and Fiber Engineering, Georgia Institute of Technology, 2014

## Licenses and Certifications

Professional Engineer Mechanical, California, #40541

Professional Engineer Mechanical, Massachusetts, #60144

## Academic Appointments

Worcester Polytechnic Institute Department of Mechanical & Materials Engineering, Adjunct Professor, 2025

## Professional Affiliations

Society of Plastics Engineers

Rubber Division, American Chemical Society

## Patents

US Patent Application 15/306, 315: Chromically indicating Sterile Wipes, February 2017 (Ready IV WJ, Campbell LJ, Esposito G, Fitzharris ER, Kovacs TM, Orr MP).br>

## Publications

Lee D, Kirkpatrick E, Fitzharris E, Levitt A, Posson M, Siskey R, Roberts M. "Standardizing Barrier Face Covering Testing." Textile World. 25 July 2021.

Lee D, Kirkpatrick E, Gladman AS, Fitzharris E, Posson M, Roberts M. "Textiles & The Coronavirus (SARS-CoV-2): Understanding the regulations and critical characteristics of personal protective equipment (PPE)" Textile World. 27 May 2020.

Fitzharris ER, Rosen DW, Shofner ML. Fast scanning calorimetry for semicrystalline polymers in fused deposition modeling. Polymer 2019; 166:196-205.

Fitzharris ER, Watt I, Rosen DW, Shofner ML. Interlayer bonding improvement of material extrusion parts with polyphenylene sulfide using the Taguchi method. Additive Manufacturing 2018; 24:287-297.

Fitzharris ER, Watanabe N, Rosen DW, Shofner ML. Effects of material properties on warpage in fused deposition modeling parts. The International Journal of Advanced Manufacturing Technology 2018; 95:2059-2070

## Presentations

Moll J, Fitzharris E, Liffland S, Lyons C. Medical Disinfecting Agents Induced Embrittlement in a Polycarbonate-Acrylonitrile Butadiene Styrene (PC-ABS) Resin. International Materials Applications & Technologies Conference and Exposition – IMAT, Cleveland, OH, October 2024.

Lee C, Fitzharris E, Kreder M, Moll J. Effect of Stress, Material, and Exposure Route on ESC. International Materials Applications & Technologies Conference and Exposition – IMAT, Cleveland, OH, October 2024.

Fitzharris, E., Kreder, M., Lee, C., Moll, J. ESC Fractography: A Study Varying Stress in Two Amorphous Polymers. International Materials Applications & Technologies Conference and Exposition – IMAT, New Orleans, September 2022.

Shofner ML, Fitzharris ER, Rosen DW. Implications of Crystallization on the Performance of Polyphenylene Sulfide with Material Extrusion Additive Manufacturing. Conference presentation, American Physical Society March Meeting, Boston, MA, 2019.

Fitzharris ER, Rosen DW, Shofner ML. Fast scanning differential calorimetry for semicrystalline polymers in fused deposition modeling. Conference presentation, The 29th Annual International Solid Freeform Fabrication Symposium, Austin, TX, 2018.

Fitzharris ER, Watt I, Rosen DW, Shofner ML. Mechanical property improvement of fused deposition modeling parts with polyphenylene sulfide using the Taguchi method, Poster presentation, 6th Annual MSE Poster Competition, Atlanta, GA, 2018

Fitzharris ER, Watt I, Rosen DW, Shofner ML. Mechanical property improvement of fused deposition modeling parts with polyphenylene sulfide using the Taguchi method, Poster presentation, 4th Annual SPN Symposium, Atlanta, GA, 2018

Fitzharris ER, Watanabe N, Rosen DW, Shofner ML. Effects of material properties on warpage in fused deposition modeling parts, Poster presentation, 5th Annual MSE Poster Competition, Atlanta, GA, 2017