Zachary Swain
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EDUCATION

University of Delaware, Newark DE
• PhD Materials Science and Engineering *June 2019 - Dec. 2024*
• Bachelor of Mechanical Engineering *Sept. 2015 - June 2019*
Aerospace Engineering Concentration, Mathematics Minor

EXPERIENCE

Graduate Researcher *June 2019 - Dec. 2024*
University of Delaware, Materials Science and Engineering, Newark DE
• Inventor of 3 intellectual properties now under patenting process by UD
• Selected as inaugural Innovation Delaware Fellow with financial award from US SBA & UD Eng.
• Responsible for $5M grant efforts to efficiently accelerate innovation in technology development to translate laboratory research to consumer-ready products in emerging and underserved markets
• Lead researcher of NIH clinical trial for materials conducted with human participants at NFB Baltimore
• Investigated surface chemistry modification for interfacial mechanics, adhesion & friction dynamics for human factors, surface wear & fouling mechanisms for durability, advanced additive manufacturing systems for high performance, nonisothermal heat transfer & rheological modeling for property prediction
• Developed novel advanced extrusion systems for 3D printing of new composite materials with localized properties, novel surface chemistry friction modification for non-visual information and communication
• Funding from Army Research Lab, Center for Plastics Innovation DOE EFRC, Chemours, NIH R01

Undergraduate Researcher *Nov. 2015 - June 2019*
University of Delaware, Materials Science and Engineering, Newark DE
• Additive manufacturing, flow modeling, polymer processing, mechanical & thermal design
• Investigated flow-induced molecular orientation and computational fluid dynamics for part strength
• Developed math models for generalized extruder performance and thermorheological melt process
• Funding from Army Research Lab, National Science Foundation, National Institute of Standards & Tech.

SKILLS

• Demonstrated ability in technology innovation & translation, commercialization strategy, development / prototyping / production, lean deployment, orienting strategic objectives, team building & management
• Proficient in report & proposal writing, programming (Python, Matlab, Fortran), CAD (slicers, Inventor, Solidworks), simulation (FEA, CFD, FVM), machine design, image analysis, class 100 cleanroom trained

Materials Characterization

• Mechanical testing	• Thermogravimetric analysis (TGA)	• Differential scanning calorimetry (DSC)
• Capillary & rotational rheology	• Dynamic mechanical analysis (DMA)	• Scanning electron microscopy (SEM)
• Spectroscopic ellipsometry	• Atomic force microscopy (AFM)	• Energy dispersive X-ray spec. (EDX)
• X-ray reflectometry (XRR)	• X-ray photoelectron spec. (XPS)	• Fourier-transform infrared spec. (FTIR)

PUBLICATIONS

• Swain, “Mechanics of material interfaces for translational engineering design” In Preparation *Dec. 2024*
• Swain et al. "Self-assembled thin films as alternative surface textures..." *RSC Materials Chemistry B* *Sept. 2024*
• Nguyen et al. "One pot photomediated ... conductive hydrogels” *ACS Polymers Au* *Oct. 2023*
• "*Positive displacement pump material delivery system*..." U.S. Patent App. 18/131,669 *Aug. 2023*
• Naqi et al. "Dual material fused filament fabrication..." *ACS Applied Polymer Materials* *Feb. 2023*
• Phan et al. "Computational fluid dynamics simulation..." *Additive Manufacturing* *May 2020*
• Edwards et al. "Maximal 3D printing extrusion rates" *IMA Journal of Applied Mathematics* *Oct. 2019*
• Phan et al. “Rheological and heat transfer effects...” *Journal of Rheology* *Sept. 2018*
• Mackay et al. “The performance of the hot end in a plasticating...” *Journal of Rheology* *Mar. 2017*

CONFERENCE PRESENTATION

• *Extrudate instabilities in fused filament fabrication...* Society of Rheology 92nd Annual Meeting *Oct. 2021*

ACTIVITIES

• College of Engineering Leadership & Policy - University of Delaware *Jan. 2023 - Present*
• NSF Innovation Corps - National Science Foundation, Northeast Region *June 2021 - Present*
• SAMPE - Society for the Advancement of Material and Process Engineering *Sept. 2016 - Present*
• Intramural Basketball - University of Delaware *Sept. 2015 - Present*

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