Zachary Swain

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EDUCATION

University of Delaware, Newark DE

- PhD, Materials Science and Engineering
- Bachelor of Mechanical Engineering

Aerospace Engineering Concentration, Mathematics Minor

June 2019 - Dec. 2024 Sept. 2015 - June 2019

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 in US and EU
- Selected as inaugural Innovation Delaware Fellow with financial award from US SBA
- Lead researcher of NIH clinical trial for haptic materials conducted with participants at NFB Baltimore
- Responsible over efforts for \$5M grant to efficiently accelerate innovation in technology development to translate laboratory research to consumer-ready products in emerging and underserved markets
- Investigated surface chemistry for interface mechanics of haptics, design for touch perception, adhesion and friction dynamics for human factors, surface wear and fouling mechanisms for durability, advanced additive manufacturing systems for high performance, rheological modeling for property prediction
- Developed novel surface modification for time-tunable haptic information on everyday surfaces, novel advanced 3D printing systems for manufacturing of new composite materials with localized properties

Undergraduate Researcher

Nov. 2015 - June 2019

University of Delaware, Materials Science and Engineering, Newark DE

- Managed undergraduate team, process line restructuring, equipment design, prototyping & production
- Investigated mechanical & thermal design, flow modeling, additive manufacturing, polymer processing
- Developed models for generalizable extruder performance and thermorheological melt process

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)
 - Energy dispersive X-ray spec. (EDX)

- Spectroscopic ellipsometry • X-ray reflectometry (XRR)
- Atomic force microscopy (AFM) • X-ray photoelectron spec. (XPS)
- Fourier-transform infrared spec. (FTIR)

PUBLICATIONS

- Swain, "Mechanics at 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 Oct. 2023
- Nguyen et al. "One pot photomediated ... conductive hydrogels" ACS Polymers Au • "Positive displacement pump material delivery system..."

U.S. Patent App. 18/131,669 Aug. 2023

- Nagi 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
- Journal of Rheology Mar. 2017 • Mackay et al. "The performance of the hot end in a plasticating 3D printer"

CONFERENCE PRESENTATION

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

ACTIVITIES

- Adhesion Society Alexandria, VA
- NSF Innovation Corps National Science Foundation, Northeast Region
- Intramural Basketball University of Delaware

Jan. 2023 - Present

June 2021 - Present

Sept. 2015 - Present

Research Updates

Google Scholar

Linkedin