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OF WYOMING

College of Engineering
and Physical Sciences

Chemical and Biomedical
Engineering

Hosted By

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Direct Ink Write and Vat Photopolymerization Additive Manufacturing of Soft Elastomers

Date – 15 Sept

Time – 1:00pm

Room – EN2102

Dr. Daniel Rau

Mechanical & Energy

Systems Engineering

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Abstract

Additive manufacturing (AM) has revolutionized the fabrication of complex three-dimensional structures, but its ability to produce soft and elastomeric materials remains largely untapped. Current AM techniques are limited to a few thermoplastic elastomers and photocrosslinkable networks with a limited range of stiffness and stretchability. Expanding AM to include processing high-performance soft elastomers will unlock new opportunities including soft robotics, flexible electronics, and biocompatible implants.

This presentation will explore the design of novel soft elastomers tailored for Direct Ink Write (DIW) and Vat Photopolymerization (VP) AM. Dr. Rau will discuss the development of innovative polymer architectures, including dual-network and bottlebrush-based networks, engineered to achieve superior combinations of softness and stretchability. The adaptation of these polymers for successful DIW and VP printing will be highlighted with the critical interplay between polymer structure, rheology, and printability discussed. Finally, the potential of these new materials will be demonstrated by showing how additively manufactured impact-absorbing structures are being used to protect brains from impact injuries.

Bio

Dr. Daniel Rau is an assistant professor in the Mechanical & Energy Systems Engineering department at the University of Wyoming. Dr. Rau received his BS and PhD in Mechanical Engineering from Virginia Tech. During his PhD he focused on developing new high-performance polymers for additive manufacturing and better understanding the physics of printing processes. Between 2022 and 2024 he conducted postdoctoral work at the University of Virginia where he continued to work on developing the next generation of materials, specifically soft elastomers, for AM. Dr. Rau's current research is at the intersection of material innovation, process development, and functional applications. He is working to improve the materials available for printing, improve the process quality/speed/reliability, and enable the production of multimaterial and multifunctional parts.