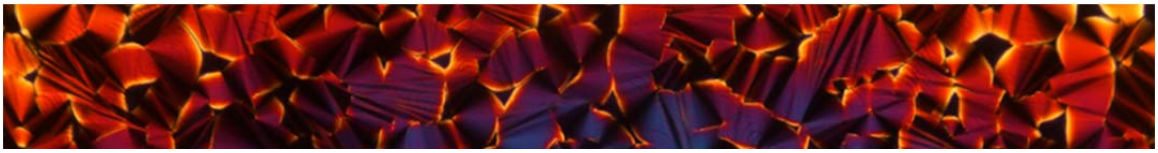

SOFT MATERIALS RESEARCH CENTER

SPECIAL SEMINAR SERIES

Shape-Shifting and Dissipating Liquid-Crystalline Elastomers for 3D Printing and Biomedical Applications

Christopher M. Yakacki

Department of Mechanical Engineering
University of Colorado Denver

Liquid-crystalline elastomers (LCEs) are a class of stimuli-responsive and active materials known for their unique mechanical and optical properties. These materials can demonstrate a large magnitude (~700%) of thermally-reversible shape change and actuation due to the coupling of liquid-crystalline order and network elasticity. As a result, LCEs have been proposed for a myriad of sensor and actuator applications, such as artificial muscles, tunable iris lenses, and soft robots. While promising materials, the practical application, scalability, and accessibility of main-chain LCEs remain a limiting barrier in the widespread use of LCEs. This presentation will present a novel two-stage thiol-acrylate Michael addition-photopolymerization reaction for scalable synthesis of main-chain LCEs and a programmable single-liquid crystal monodomain. The structure-property-performance relationships of this system are presented in the light of creating tailorable materials. Studies showing control over the actuation temperature, dissipation profile, and liquid-crystalline order are presented. This chemistry and method can be combined with 3D-printed structures to create soft robots as well as directly printed to create anisotropic structures. Lastly, this presentation will cover how the spatio-temporal control of this reaction can be used to create highly mechanically anisotropic, shape-changing, and shock absorbing materials for previously unexplored biomedical applications.

Wednesday, November 1st at 1:30 p.m. in Duane Physics G126

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Department of Physics, University of Colorado.

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