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Virtual SEMINAR SERIES

Wednesday February 9th, 2022
Seminar Presentation: 11:00am – 12:00pm PDT

"Liquid Crystal Elastomer and Networks for Multi-scale Soft Robotic Applications"

Dr. Hamed Shahsavan, PhD
Assistant Professor
Department of Chemical Engineering and Waterloo Institute for Nanotechnology

Abstract: Soft robotics is a multidisciplinary field that links different fields of research, such as chemistry, materials science, mechanical engineering, instrumentation and control, and artificial intelligence. During the last decade, the development of novel materials and fabrication techniques have been two of the major challenges for further progress in this field. The synthesis and application of structural materials that a) have integrated sensing and actuating capabilities, b) can be programmed, and c) can be scaled down (or up) by various fabrication techniques are highly desirable for the fabrication of soft robots with a reduced number, size, and weight of components. In this seminar, I will talk about the importance of liquid crystal networks (LCNs) in the design and fabrication of soft robotic components. I will present our recent progress in the development of artificial muscles and robotic constructs from LCNs that can be remotely stimulated by a variety of cues, such as heat, light, electrical fields at different scales and media. I will also present opportunities to create novel solutions or augment the existing capabilities of microscale robotic systems with an emphasis on their future biomedical applications.

Biosketch: Dr. Hamed Shahsavan is an assistant professor in the Department of Chemical Engineering at the University of Waterloo. He obtained his PhD in chemical engineering and nanotechnology from the University of Waterloo in 2017. During his PhD studies, Dr. Shahsavan was a visiting scholar in the Advanced Materials and Liquid Crystal Institute at Kent State University, OH, USA. After his graduate studies, Dr. Shahsavan moved to Stuttgart in Germany, to embark on his postdoctoral research as an NSERC postdoctoral fellow at Max Planck Institute for Intelligent Systems. He was also a visiting scientist in the Smart Photonic Materials (SPM) research group at the University of Tampere in Finland. In this period, he mainly focused on the synthesis of different types of liquid crystalline elastomers, networks and gels to deploy them as shape-change programmable materials in soft robots and devices at millimeter to micrometer scale. His current research interests revolve around the development of a variety of soft, stimuli-responsive, and programmable materials, and different fabrication methods for the manufacturing of small-scale mobile robots and devices. Dr. Shahsavan is the recipient of several awards and recognitions, such as the 2021 Cozzarelli Finalist Award from the Proceeding of National Academy of Sciences, Early Stage Career Award from 2015 International Liquid Crystal Elastomer Conference, Max Planck, and NSERC postdoctoral fellowship.