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Mechanics-guided Design of Intelligent Material Systems

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ABSTRACT:

Intelligent materials are artificially designed materials that can respond to external stimuli such as temperature, stress, pH, electric or magnetic fields, and change their shapes, properties, and functions in programmed manners. Recently, designs and fabrications of soft intelligent materials have attracted great interests in the research communities due to the increasing demand of smart, programmable materials that can be easily controlled to achieve complex functionalities in the fields of flexible electronics, soft robotics, soft electronics, and biomedicine. However, it is still a great challenge to design and fabricate high performance multifunctional intelligent materials for advanced engineering applications, due to the lack of design guidance on the level of material, structure, and stimulation. In this talk, a mechanics-guided methodology will be introduced, combining fundamental mechanics, advanced fabrication such as 3D printing, and design concept of intelligence materials, aiming to achieve the efficient design of functional material systems for the aforementioned applications. This mechanics-guided methodology will be demonstrated through specific material systems, and topics on "Printing ferromagnetic domains for untethered fast-transforming soft materials" and "Folding artificial mucosa with cell-laden hydrogels" will be introduced in this talk.

BIOGRAPHY:

Ruike Zhao received her PhD degree in solid mechanics from Brown University in 2016, under the guidance of Prof. Kyung-Suk Kim and Prof. Huajian Gao. She was a postdoc associate at MIT during 2016-2018. She joined The Ohio State University as Assistant Professor in August 2018. Her research is focused on mechanics-guided intelligent soft material design for applications in soft robotics and bioengineering. A particular interest is to develop mechanics-guided methodology to help the design of i) functional soft material composite, ii) optimized structure, and ii) high energy density material stimulation.