EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Molecular Patterning Directs Morphing and Motility in Liquid Crystalline Polymers

ABSTRACT - Blueprinting orientational order at the molecular level in liquid crystalline polymers (LCP) is a potent route for directing the work content in an exciting class of soft artificial muscles. Light powered LCP that are functionalized with photochromic molecules are particularly interesting. Ambient or directed energy can drive molecular switching that is upconverted into actuation. The ability to remotely power and control mechanical systems without onboard electronics can offer new opportunities in microrobotics. In addition to shape change and motility, it is also possible to imagine a light-driven analogue of a heat engine.

Composing 3D structures from molecularly patterned LCP unlocks non-linear actuation. These include mechanical instabilities like snap-through, creasing and super-coiling that magnify the power/torque-density. 3D printing of LCP with spatially resolved molecular patterning presents a pathway to realize freeform actuators. Designs capable of multi-stimuli responsiveness in prototypical microrobots and passive flyers become feasible.

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SPEAKER BIO – Dr. Shankar is currently a Swanson Professor in the Department of Industrial Engineering at the University of Pittsburgh. He obtained his Ph.D. in 2006 from Purdue University in Industrial Engineering. His research has focused on problems in mechanics, materials design, and manufacturing. He was a winner of the Society of Manufacturing Engineers' 2010 Outstanding Young Manufacturing Engineer Award, 2014 Institute of Industrial Engineer's Outstanding Early Career IE in Academia Award and previously held a Whiteford Faculty Fellowship at the University of Pittsburgh.

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