ME Seminar

A Ribbon Model for Nematic Polymer Networks

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ABSTRACT

Nematic polymer networks (NPNs) are rubber like materials that can be deformed by external stimuli of heat and light. This property of NPNs arises due to liquid crystal mesogens embedded in their polymer networks. In this talk, I will present a theory of deformation of ribbons cut out from a thin NPN sheet. The theory describes the natural and deformed congurations of an NPN ribbon as ruled surfaces, connected by a deformation map that allows for stretching of the material along the imprinted nematic directors. The main result of the theory is an energy density for ribbons, obtained by a dimension reduction of a surface energy density of a thin NPN sheet. I will also present an illustrative example of a rectangular NPN ribbon that undergoes in-plane serpentine deformations upon activation.

ABOUT THE SPEAKER

Harmeet obtained his bachelor's degree in Civil Engineering in 2010 from G.B. Pant University of Agriculture and Technology, and master's in Structural Engineering from IIT Kharagpur in 2012. Thereafter, he worked as a structural engineer at Airbus Industries Pvt. Ltd. for a period of two years. He obtained his PhD in Engineering Mechanics in 2018 from Virginia Tech, where he worked on the mechanics of partially constrained strings and rods. He is currently a postdoc at the Institute of Mathematics at EPFL, working on the mechanics of knots and clasps, along with the mechanics of nematic polymer networks.

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