

Liquid Crystal Fibers

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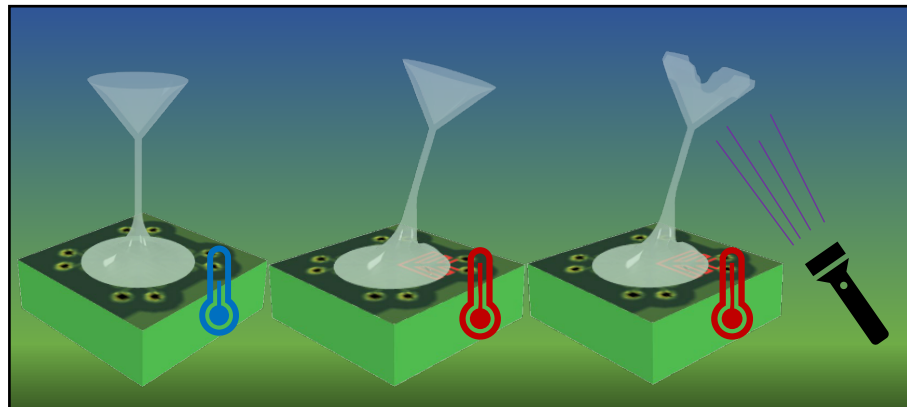


Introduction

Soft robots are interesting since they can perform mechanical tasks without the need for joints. Instead, actuation is enabled by material properties. One class of materials for soft robots are liquid crystal elastomers, which can reversibly deform when their molecular alignment (as induced during fabrication) is disturbed. This disturbance is usually achieved by locally applying heat or light.

Project summary

Previously, we have made liquid crystal fibers that can bend when locally heated. Recently, a new method has allowed for the creation of liquid crystal fibers with conical heads. When heated, these cones deform in a complex way, which allows for their use as switchable suction cups



While the fibers can be controllably bent via computer-controlled contact heating, an elegant way to deform the cones does not yet exist. One option is to include a dye in the fiber to allow for photothermal actuation, while another option is to change the liquid crystals used to allow for photomechanical actuation. Finally, it will be necessary to integrate the light source and -control with the fibers to create a functional device.

Project goals

- Learn to fabricate liquid crystal fibers.
- Develop fibers from new material for combined heat- and light-based actuation.
- Develop a device for controlled actuation of the fibers using both stimuli.
- Use the fibers to perform some useful task.

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