Volumetrically-programmable four-dimensional actuators

PhD project
at the
Gisela and Erwin Sick Laboratory of Micro-optics

Liquid crystal elastomers (LCEs) represent an interesting class of materials, as they can undergo significant dimensional changes when properly stimulated, in directions that can be programmed during fabrication, and are thus suitable for the realization of artificial structures with programmable mechanical response.

We have developed a technology which allows a pixel-by-pixel definition of the alignment (and thus actuation direction) of these films, with a resolution of about 20 micrometers. This unique structuring capability gives us unparalleled flexibility in defining the two-dimensional actuation behavior of an LCE film.

In this new project, part of the livMats Cluster of Excellence (www.livmats.uni-freiburg.de), we now propose to extend this concept into three dimensions, enabling the realization of bulk actuators which can modulate between multiple pre-determined shapes, with complete flexibility in defining the actuation direction in the bulk of the "crystal". With high-resolution definition of the mechanical response of the bulk, we expect to be able to realize wide-ranging adaptive mechanical behavior in materials, all of which can be defined in the material design.

To address the research challenge defined by this project, we are looking for a highly-motivated scientist or engineer with a strong background in one or more areas including mechanical engineering; chemical engineering; microsystems engineering; or process engineering. Experience in numerical modelling of mechanical systems; chemical synthesis; and/or microfabrication is a plus. The candidate should have completed her or his MSc degree in a relevant field; be fluent in English and capable in German; and have demonstrated ability to work both independently and as part of an interdisciplinary team.

Intrigued? Send email to zappe@imtek.uni-freiburg.de.

Interested in applying? Please see `www.livmats.uni-freiburg.de/en/career`