The Cluster of Excellence livMatS develops completely novel, bioinspired materials systems that adapt autonomously to various environments and harvest clean energy from their surroundings. The intention of these purely technical – yet in a behavioral sense quasi-living – materials systems is to meet the demands of humans with regard to pioneering environmental and energy technologies. The societal relevance of autonomous systems and their sustainability will thus play an important role in their development. The research program of livMatS is characterized by highly interdisciplinary collaboration between researchers from a broad range of fields including engineering, chemistry, physics, biology, psychology, the humanities, and sustainability sciences.

The livMats Cluster of Excellence is offering the following position:
PhD position for the project Volumetrically-programmable four-dimensional actuators
Envisaged start date: as soon as possible in 2023

Project description
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, 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.

Candidate profile
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.

Please hand in:
- Letter of intent detailing why you are interested in this specific project and how your previous research qualifies you for the project (up to 1,500 words)
- Curriculum Vitae with list of publications (if applicable)
- Certified copies of your university degree(s) with grades (BA and MA certificate / Diploma certificate and transcript)
- Short summary of your master’s thesis (up to 1,000 words)
• Work sample (chapter from recent thesis or journal article, up to 5,000 words)
• Suggestion of two referees with contact details

Your documents will not be returned after the application process. For this reason, please submit copies only. Funding for the position is guaranteed until 31 December 2025. The salary will be determined in accordance with TV-L E13. We are particularly pleased to receive applications from women for the position advertised here.

Please send your application in English including supporting documents mentioned above citing the reference number 00002644. Application deadline is 08.01.2023.

Application is to be emailed as one MERGED PDF file to positions@livmats.uni-freiburg.de.

Direct questions about the project to Prof. Hans Zappe at zappe@imtek.uni-freiburg.de.