HASEL (Hydraulically Amplified Self-healing Electrostatic) actuators are a new class of muscle-like actuators that comprise liquid-filled deformable pouches that are coated with electrodes (Fig. 1). When a high voltage is applied between the electrodes, the electrostatic attraction causes the walls of the shell to zip together and the actuator to deform. To date, the interplay between electric forces and the mechanics of the film near the zipping front (Fig. 2) is not understood. Developing this understanding is important to explain experimental observations such as hysteresis during actuation and for future numerical models for the behavior of HASEL actuators.

This project will investigate the mechanics of electrostatic zipping with the help of a simplified model system. You are asked to design an experimental setup for the characterization of this system. Then you will use the setup to investigate how materials properties and other parameters, such as applied force and voltage, influence the zipping behavior. Finally, you are asked to derive a simple electromechanical model for electrostatic zipping based on these results.

The project will be carried out at the Robotic Materials Department of the Max Planck Institute for Intelligent Systems in Stuttgart. For questions about the project, feel free to contact Dr. Philipp Rothemund.


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