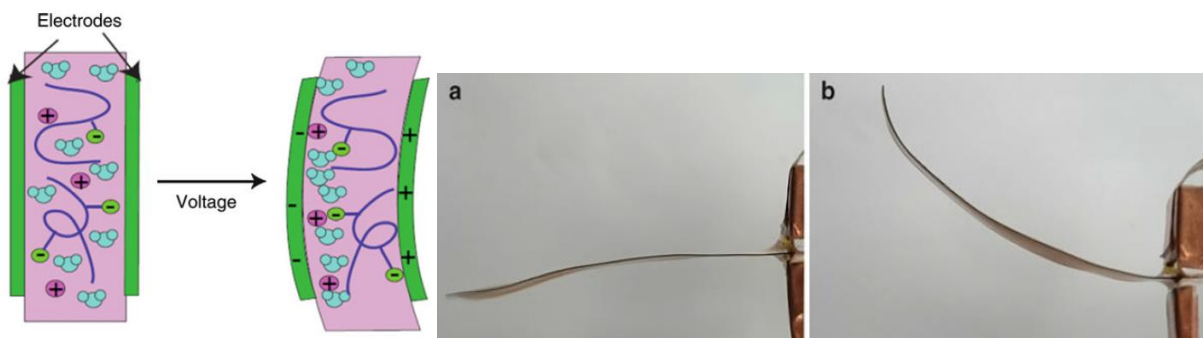


Study-/Diploma-/Master-Thesis

Topic: Low voltage actuator for soft robotics

Overview: Soft polymeric robots can be applied for artificial muscles, valves and even touch displays. To operate these robots electrically flexible electrodes are needed. By setting up a capacitor like stack of electrode, elastomer and electrode, an electronic electroactive polymer actuator is generated which is able to deform by charging the electrodes and can be utilized for robotic applications. However, electronic EAPs suffer from high operation voltages up to 10kV. By substituting the elastomer layer by an ion containing polymer gel, ionic EAPs can be formed and can operate with a few volts. Ionic EAPs are capable of large bending while pumping ions and water or ionic liquids between the electrodes that results in a pressure gradient which deforms the EAP layer. This actuator technology can be applied for voltage sensitive application to prevent e.g. human injury.



Asaka K., Kim K., Oguro K., Shahinpoor M. (2016) IPMCs as EAPs: Fundamentals. In: Carpi F. (eds) Electromechanically Active Polymers. Polymers and Polymeric Composites: A Reference Series. Springer, Cham

Objectives: Fabrication and characterization of an ionic EAP with perfluorosulfonic acid membrane (Nafion) and plated platinum electrodes for soft robotics.

Sub-tasks:

- Literature research of ionic EAPs (set up, characterization).
- Fabrication procedure to generate the layer stack
- Investigating and optimizing swelling parameters, concentration of ions and platinum complex.
- Generation of electrode layers to investigate their morphology, surface pattern, conductivity, thickness and stability.
- Setting up and characterization of an actuator configuration (soft robot).

Beneficial skills in:

- Microsystems and Materials Engineering
- Dealing with chemicals

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