BIOCOMPATIBLE IONIC ELECTROCHEMICALLY ACTIVE POLYMER ACTUATORS

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Bioinspired technology with biocompatibility is of great interest in modern science. Potential materials to make aforementioned biomimetic devices are electrochemically active polymers (EAP). Good performance is not the only thing in this field to take into account. The structure itself has to be made out of biocompatible materials. An actuator made out of biocompatible materials has not been reached yet.

This project's objective is to produce a biofriendly moving actuator. This three layered material consists of conductive polymer electrodes with an ion permeable biopolymer membrane in between. The electrolyte in this structure is a non-toxic ionic liquid (IL) or an IL mixture. The conductive polymer for the actuator's electrodes was chosen to be polypyrrole (PPy). It's biofriendly, proven in experiments concerning doping it with a bioactive compounds to be released later, and cell growth [1]. The membrane separating the electrodes was chosen to be made out of gelatin.

Using ILs as electrolytes, actuators can be used in open air without worrying the electrolyte solution evaporating or having to use encapsulation to prevent it from happening [2]. Despite there being a large variety of ILs, only a few are used for ionic EAP materials, and all of them are toxic. In this study non-toxic ILs based on the choline cation were synthesised, some of them novel. In this presentation the fabrication, characterization, and performance of the ionic EAP actuators will be discussed. Potential applications include: wearable electronics, soft haptic devices, implantable or disposable biomedical devices, and smart prosthesis.

References

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