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High-Performance Organic Bioelectronic Actuators with Tunable Dynamics Operate in Liquid and Gel Electrolytes

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Abstract

Organic actuators that transform electrical energy to mechanical energy through an electrochemical process have numerous applications ranging from soft robotics to biomedical devices. Development of high performance actuators operating in biological environments is of major importance in the growing field of bioelectronics and biorobotics, in particular artificial muscles and cell manipulators. Bioactuators should ideally be soft, biocompatible, minimally invasive, highly durable during numerous actuation cycles, and capable of generating precise and reversible motion with tunable dynamics. However, soft actuators have their own limitations such as low load-bearing capacity and limited number of actuations that they can withstand. This work presents a highly durable and flexible bioactuator based on conducting polymer nanofibers that is dynamically adjustable, rapidly responsive, and capable of efficiently operating in hydrogel and aqueous electrolytes over a great number of actuations.

Biosketch

Mohammadjavad Eslamian is a Ph.D. candidate in Dr. Abidian's Lab in the UH Department of Biomedical Engineering. He previously earned an M.S. in Materials Engineering from Sharif University of Technology in Iran. His research at the University of Houston focuses on development of micro/nano-scale technologies for controlled drug delivery and bioelectronics.