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Biocompatible Silk-Poly(Pyrrole) Composite Trilayer Electromechanical Actuators CARLY KLEMKE, NATHAN BRADSHAW, JESSE LARSON, SEAN SEVERT, NICHOLAS OSTROVSKY-SNIDER, AMANDA MURPHY, JANELLE LEGER, Western Washington University — Biocompatible materials capable of controlled actuation are in high demand for use in biomedical applications such as dynamic tissue scaffolding, valves, and steerable surgical tools. Conducting polymers (CPs) have some desirable traits for use as an actuator, such as the ability to operate in biologically relevant fluids and responsiveness to low voltages. However CPs alone are limited due to their brittle nature and poor solubility. Recently we have shown that a composite material of silk and the CP poly(pyrrole) (PPy) shows promising characteristics as an actuator; it is mechanically robust as well as fully biocompatible. Initial proof-of-concept experiments demonstrated that these composites bend under an applied voltage (or current) using a simple bilayer device. Here we present the development of a trilayer device, composed of two conductive layers separated by an insulating silk layer. This configuration has twice the active surface area as a bilayer, potentially increasing the amount of mechanical motion per volt applied. We will discuss the fabrication and characterization of these devices, as well as their performance and future applications of this technology.

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