# Soft, Biologically Active, and Low Impedance Polymer Coatings for Interfacing Microfabricated Electronic Devices with Neurons

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There is considerable interest in interfacing microfabricated electronic devices with neurons in various regions of the body including the cerebral cortex, the eye, and the ear. These devices are intended to restore some measure of function to blind or deaf patients, or to provide an interface for the motor control of external prosthetics. However the electrode surfaces are typically inorganic, hard, flat, and biologically inert, whereas neural tissue is organic, soft, intricate, and biologically active. We have been investigating the use of conducting polymers such as poly(diethoxythiophene) (PEDOT) that can be tailored into precisely controlled geometries over several length scales using electrochemical deposition and various templating methods. These polymer materials create a mechanically compliant, low impedance, and biologically active surface that is better able to integrate with the living tissue. Control over the response of the tissue can be mediated by the incorporation of neurotrophic agents such Nerve Growth Factor (NGF) and anti-inflammatory molecules such as dexamethasone. Our most recent developments in materials design, synthesis, processing, and characterization will be described, as well as results from in-vitro and in-vivo testing.