

Soft Optoelectronics for Bio-Medical Application

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Optogenetics is a new neuroscience technology, consisting of biological technology that activates a nerve by light and engineering technology that transmits light to the nerve. In order to transmit light to the target nerve, fiber optics or light-emitting devices have been inserted into the living body, while the motions or emotions of freely moving animals can be controlled using a wirelessly operated optoelectronic device. Here, we developed thin, mechanically soft neural interfaces with fully implantable, stretchable wireless radio power and control systems. This is demonstrated with two form factors: stretchable film appliques that interface directly with peripheral nerves, and flexible filaments that insert into the narrow confines of the spinal epidural space. These soft, thin devices are minimally invasive, and histological tests suggest they can be used in chronic studies. We demonstrate the power of this technology by modulating peripheral and spinal pain circuitry, providing evidence for the potential widespread use of these devices in research and future clinical applications of optogenetics outside the brain.