Nano Materials for Retinal Recording and Stimulation

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A lingering technological bottleneck in the field of neuro-prosthetic devices is the realization of soft, micron sized electrodes capable of injecting enough charge to evoke localized neuronal activity without causing neither electrode degradation nor tissue damage. In recent years we have developed a new flexible neuronal micro electrode device, based entirely on carbon nanotube technology, where both the conducting traces and the stimulating electrodes consist of conducting carbon nanotube films embedded in a polymeric support. The use of carbon nanotubes bestows the electrodes flexibility, and excellent electro-chemical properties. As opposed to contemporary flexible neuronal electrodes, this technology is both robust and the resulting stimulating electrodes are nearly purely capacitive. Recording and stimulation tests with chick retinas were used to validate the advantageous properties of the electrodes and demonstrate their suitability for high-efficacy neuronal stimulation applications. These electrodes can be further modified with quantum dots converting them to bio-mimetic, photo-sensitive pixels. Such photo-sensitive pixels are ideal for artificial retina applications.