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Photovoltaic subretinal implants for blind patients

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Background

Retinal diseases are the most frequent causes of visual loss in the Western world. Two of the prominent diseases are age-related macular degeneration (AMD) and retinitis pigmentosa (RP). The pathophysiology of AMD and RP is unknown, but a central event leading to visual loss in these diseases is the degeneration of retinal photoreceptors. At present, there are no effective treatments of photoreceptor degeneration. A promising potential solution for partial restoration of sight is to implant a solar cell that translates incoming light into an electrical signal to be transmitted to the secondary neurons in the retina [1-4]. We propose a 1-diode subretinal prosthesis design utilizing 3D electrodes made from pyrolytic carbon (Figure 1). The final device would rely on via holes between isolated electrodes (pixels) enabling sufficient nutrient flow to the cells and charge transport from each local electrode to a common return electrode on the rear of the device. A sketch of the device is shown in Figure 1 (right).

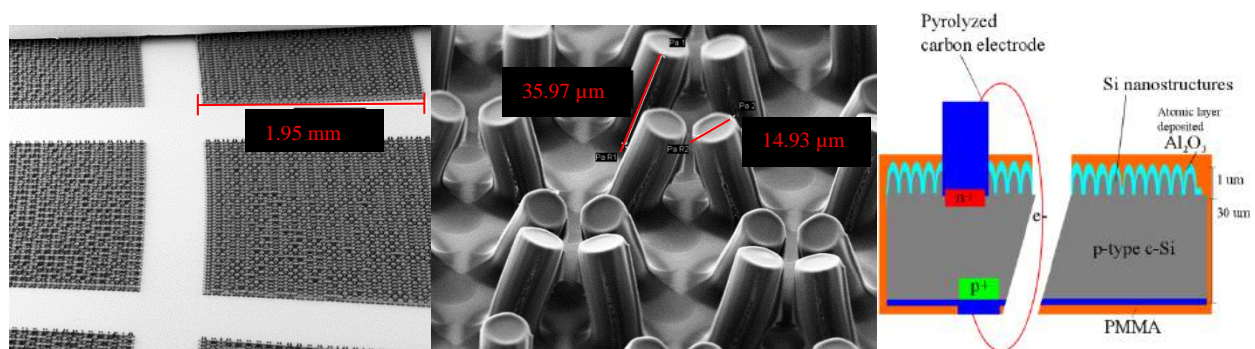


Figure 1: SEM-images of carbon electrodes at 72x(left) and 1700x(middle) and sketch of the device (right).

Fabrication of complete devices is currently ongoing and future work includes measuring potentials from porcine retinal tissue when the photovoltaic implant is placed in contact with tissue and illuminated with an appropriate light source in order to realize photovoltaic stimulation of neurons.

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