EuroSciCon

World Congress on
Ophthalmology & Eye Surgery

August 16-17, 2018
Paris, France

Manuela Ciocca et al., J Eye Cataract Surg 2018, Volume: 4
DOI: 10.21767/2471-8300-C2-005

SIGHT RESTORATION VIA ORGANIC AND HYBRID THIN FILMS (SIROH)

Manuela Ciocca[1, 2], K Snashall[2], P Giannakou[2], L Cina[3], A Camaioni[1], M Shkunov[2] and T M Brown[1]

[1] University of Rome Tor Vergata, Italy
[2]University of Surrey, UK
[3]Cicci Research s r l, Italy

According to the World Health Organization there are 285 million people visually impaired worldwide. Medical treatments are improving rapidly with the development of biomedical engineering and bionics. Biomedical-electronic engineering can play a vital role in developing innovative prosthetics, in particular in sight restoration via artificial vision. Interfacing living systems with organic electronics is the forefront of bioengineering, while never without risks, technological breakthroughs promise innovative solutions. In our research-work we propose a novel printed and photolithographically defined Retina-System based on organic semiconducting polymers. SIROH project focuses on the development of a bio-hybrid-photosensitive device for retinal photostimulation. It consists of a biocompatible polymeric thin film, a retinal tissue and biological electrolyte, all sandwiched between two parallel transparent electrodes. The device will evoke electrical photoresponses in (healthy and/or degenerated) retinas which could be analysed in a novel approach. The results stemming from SIROH-device will find medical applications in treatments for eye diseases, i.e. Age Related Macular Degeneration (AMD) and Retinitis Pigmentosa (RP). Furthermore, it will introduce a new platform to unravel the visual system networking replacing and/or supporting the standard electrophysiological instrumentation (patch-clamp amplifier or multi-electrodes array). The first step of our research is to develop a device system to interface with retinal tissue. The printed device-system is presented in the form of an array of thin-film round 'pixels' composed of semiconducting polymer-P3HT of around 70µm diameter, and also, a continuous, 0.8x0.8 cm^2 spin coated, 80 nm thick P3HT film. The device aims to mimic retinal photoreceptors activities in order to substitute the deteriorated photoreceptors. The first realized prototype shows high sensitivity to light, an absorbance spectra similar to the retinal green cones (λ_{max}=520 nm), and elicited photocurrent values (~ nA) suitable for photoreceptors stimulation. This cross-cutting research project brings together engineering, biomedicine and neuroscience to introduce a revolutionizing approach in the field of visual prostheses

Biography

Manuela Ciocca has graduated in Medical Engineering from University of Rome Tor Vergata in October 2016 defending a Master thesis about developing and testing organic semiconducting polymers or hybrid thin films and their possible interfacing with retinal system to develop Artificial Retinas. In 2016, she started her PhD in Electronic Engineering on development of Artificial Retinas for sight restoration using organic polymeric thin films. She won the ITWIIN (Italian Women Inventor & Innovator) Awards-Special Mention Material Conne Xion-Best Innovative woman 2016, and the EIWIIN (European International Women Inventors & Innovators), Special Recognition Award 2017 for ingenious and innovative achievements. In the past she has worked for ISATEL SRL on the design and development of a multi-functional medical device for physiotherapy and post-traumatic rehabilitation. Currently she is based at the University of Surrey (UK) for her 2nd PhD year, working on the development of an ink-jet printed polymeric Artificial Retina (project funded by Lazio Region-TORNOSUBITO programme).

m.ciocca@surrey.ac.uk;
manuela.ciocca@uniroma2.it