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Electrochemical synthesis and evaluation of platinum-iridium-oxide thin film for biomedical applications

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Neurostimulating/recording devices have been extensively used for effective treatment of neurological diseases. Implantable medical devices communicate with nerve cells of the body via the electrode/tissue interface, where the microelectronics transfer electrical signals to the neurons through microelectrodes. The properties of the interface material are one of the most important parameters to be considered during the design of the device. In this study, a novel and efficient platinum-iridium thin film electroplating method for modification of implantable microelectrodes was developed. A wide range of investigations on the electrochemical and morphological properties of the microelectrodes were conducted. The impedance of the coated and uncoated electrodes was measured *in-vitro* using electrochemical impedance spectroscopy (EIS) in phosphate buffered saline (PBS). Square wave biphasic current pulses were applied to the electrodes and corresponding voltage transients were measured. Surface potential of the coated electrodes were drastically reduced due to increased surface area caused by the platinum-iridium rough film. Scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS) were used to study the morphology and the chemical composition on the surface and bulk of the coatings, respectively. EDS results demonstrated nearly 60:40 % platinum:iridium in the chemical composition of the coatings. X-ray photoelectron spectroscopy (XPS) experiments were run to investigate the elemental changes in the coatings down to 60 nm from the surface of the electrodes. XPS results showed Pt-IrO2 on the surface transitioning to Pt-Ir below 10 nm thickness of the coating.

Biography

Artin Petrossians obtained his Ph.D. in 2012 from the Mork Family Department of Chemical Engineering and Materials Science, University of Southern California. He joined the Department of Ophthalmology at University of Southern California in 2012 as a postdoctoral fellow. His research field has been focused on the optimization of brain/machine interfaces. His current research is directed to electrochemical approaches for surface modification and materials characterization of implantable microelectrode biomaterials used in neural implants.

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