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Electroactive materials such as mixed-valence oxides or conducting polymers and their hybrids are ideal for electrodes in systems that go from energy, to catalysis or biomedicine. The existence of mixed valence or charge carriers allows modulation of surface potentials during preparation or in situ while acting in devices such as batteries, sensors, electrostimulators, or electrocatalytic reactions. The nanostructure that may be imposed modifies substantially the response in terms of speed and power in energy devices, and also the response of biological systems in case of use of electrodes for functional nervous stimulation. Other applications in neural directional growth, adhesion and cell survival will be shown. Mixed conducting systems such as some mixed valence oxides, conducting polymers etc, allow modulation of surface potential through electrochemical methods. Such processes come usually together with intercalation and deintercalation of ions that allow charge neutrality upon application of the electrochemical field during the electrochemistry. This type of intercalation chemistry is the center of energy storage in lithium batteries [1] and also in the oxygen doping that allows to transform semiconducting \( \text{La}_2\text{CuO}_4 \) into superconducting \( \text{La}_2\text{CuO}_4+d \), [2] or huge magnetic changes in its Mn analogues [3]. Electrochromism and other properties are also some of the cases. Other fields of application are the solid state transformation that may occur from \( \text{Ag}_2\text{Cu}_2\text{O}_3 \) to \( \text{Ag}_2\text{Cu}_2\text{O}_4 \), or from Cu and Ag metals to \( \text{Ag}_2\text{Cu}_2\text{O}_4 \), the first known silver copper mixed oxides known. [4]Electrochemistry is a surface phenomenon where diffusion and interfacial properties are prime factors, and therefore the nanoscale of the material surface is an essential factor. The above mentioned chemical transformations also change from micro to nanoscale, in terms of processes occurring from months to days, hours or minutes. A significant and new application for this type of materials has been developed in our lab, as well as the previous ones described. It involves the use of electroactive materials as electrodes in the nervous system, either for functional stimulation or neural growth [5]. The use of electroactive materials instead of noble metals in this application prevents the formation of radicals that may damage the biological tissue. Instead, a parallel reaction occurs at the electrode itself, without modification of the medium and without change in its capacity to act as electrode. IrOx , Iridium oxide is among the best materials known for electrostimulation, and other electroactive materials are being tested in the same sense. Additionally, they can function as support for cell growth in controlled potential conditions, a fact that is being investigated.

Figure 1. Conducting polymer transparent coatings (on Pt coated glass) used as electrodes and Neural growth on nanostructured transparent IrOx(OH)y electrodes

REFERENCES