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Magnetron sputtered electrodes deposited on piezoeletric polymers for sensors applications

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Electroactive polymers are the most interesting class of polymers used as smart materials in various applications, such as the development of sensors and actuators for biomedical applications in areas as smart prosthesis, implantable biosensors and biomechanical signal monitoring, among others. The aim of this work was the development of multifunctional coatings on a polymeric base substrate for biosensor applications. The coatings were deposited by magnetron sputtering on polymers based sensors and the different processing conditions allowed obtaining two different systems: Ti1-xAgx with different Ag/Ti atomic ratio and different Ag-TiNx samples with increasing N content. These electrodes were deposited at room temperature on poly(vinylidene fluoride), PVDF. The deposition conditions do not affect the piezoelectric response of the polymer which maintains its suitable characteristics for sensor applications. The mechanical and piezoresistive performance of the two systems was assessed by uniaxial stretch tests and electrical resistance variation measurements during mechanical stimulus, respectively. It was possible to conclude that all electrodes show piezoresistive properties, with an increase of the electrical resistance as the applied strain increases. The antimicrobial activity of samples from both series was assessed by agar diffusion method (Halo test). Only electrodes from the Ag-TiNx series presented antibacterial activity. Osteogenesis was also evaluated, in samples from both series, using MC3T3 osteoblastic cells. As a result a multifunctional electrode was achieved with antibacterial activity, which at an early stage does not promote animal cells adhesion and it still has proper electrical and mechanical properties.

Keywords
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