UV-Assisted Surface Modification of PBAT films prepared by Casting and Electrospinning for biomedical applications

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Palavra chave: PBAT, Ultraviolet (UV), scaffold, electrospinning, XPS, NEXAFS

Resumo:
Cellular adhesion and proliferation represent a major challenge in tissue engineering. The surface chemistry in three-dimensional synthetic scaffolds has been recently a focus of research to obtain, for example, electrospun nanofibers chemically functionalized. Recently, we have used with relative high success Ultraviolet (UV) treatment in the presence of oxidative atmospheres to modify the polymer surfaces and graft polar groups on their surfaces. In this work, the PBAT, a synthetic biodegradable polymer, was used as scaffold. It has non-toxicity, good mechanical and thermal properties. However its excellent properties, there are a few studies using PBAT as biomaterial and further investigations are necessary to understand its behavior in the body. The PBAT scaffolds were prepared by casting and electrospinning technique. The prepared scaffolds were irradiated during fix periods of times and under a constant flux of oxidative atmosphere. The surface wettability was measured by WCA and the morphology was determined by SEM and optical profilometry. Surface chemical information was obtained by FTIR-ATR, XPS and NEXAFS. Additionally, theoretical calculations were carried out to try to understand the changes produced by the treatments. In particular the NEXAFS results were simulated using the computational package FEFF9. Changes in structure and excited states were studied using the free packages WinMostar and ArgusLab for UV-vis calculation in vacuum and solvated state. The results showed electrospun fibers with diameters between 340,5 nm and 2,7 µm. The increase in the irradiation time increase the hydrophilicity of the surfaces and in the case of the electrospun fibers capillary effects were observed in PBAT’s fibers. XPS and FTIR-ATR data showed that the wettability increase was due to the increase of polar groups (C=O and C-OH) grafted on the polymer’s surface. Cytotoxicity tests and theoretical calculations are under way.