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Production of poly-3-hydroxybutyrate microfibers and gelatin nanofibers as scaffolding material using electrospinning process

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The poly-3-hydroxybutyrate (PHB) is a biodegradable and biocompatible polymer produced by microorganisms. It is suitable for biomedical applications; however, the biodegradation rate of PHB is low. On the other side, gelatin (GE) is an hydrolyzed of collagen highly used in tissue engineering due to its biocompatibility. Electrospinning is an electrodynamic technique that allows to produce scaffolds from different polymers, increasing the polymers biodegradation rate and improving their mechanical properties. The objective proposed in this study was to produce and to combine PHB-microfibers and gelatin-nanofibers by electrospinning, controlling some process variables. For obtaining PHB-microfibers and gelatin-nanofibers, electrospinning conditions such as polymer concentration, voltage and flow rate, were tested at three different levels. Diameter and morphology of the micro and nanofibers were analysed by scanning electron microscopy and their thermogravimetric properties and FTIR spectrum were investigated the process variables evaluated showed to have a significant effect over fiber diameter. Continuous and smooth PHB-microfibers were obtained at 8%w/v, 25kV and 0.5mL*h⁻¹ with a diameter of 1.252±0.174 µm and a morphology index of 0.950. On the other hand, ultrafine GE-nanofiber were obtained at 30%w/v, 25kV and 0.5mL*h⁻¹ with a diameter of 0.222±0.047 µm and a morphology index of 1.000. The FT-IR and TGA-DSC spectrum of GE-nanofibers showed the formation of secondary structures by the electrospinning process, for PHB was possible to observe a decrease on PHB crystallinity. It was possible to obtain good quality PHB-microfibers and GE-nanofibers under similar process conditions reaching a high morphology index. The combination of PHB-microfibers and GE-nanofibers was successfully done.

Biography

Claudia Sanhueza is Biochemist from the University of La Frontera. Now days, she is a PhD student from the doctoral program in Sciences of Natural Resources. Her doctoral thesis is entitled "Development of a skin scaffold of PHB from *B. xenovorans* LB 400 and gelatin for dermal tissue regeneration". This study was partially supported by Direction of Investigation, University of La Frontera, Conicyt Scholarship N° 21160515 and Proyecto Anillo Conicyt N° ACT1721288.

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