PLLA PRODUCED VIA DIRECT POLYCONDENSATION – AN INVESTIGATION ABOUT ITS PROCESSABILITY WITH ELECTROSPINNING

Juliana Otavia Bahú [1]
Samuel Diógenes Azevedo de Souza [2]
Sara Crivellin [3]
André Luiz Jardini Munhoz [4]
Maria Ingrid Rocha Barbosa Schiavon [5]
Viktor Oswaldo Cárdenas Concha [6]
Rubens Maciel Filho [7]

ABSTRACT

Currently, biomaterials are developed and processed for specific applications in the medical field. They can be applied in patients to collaborate with the regeneration or even the replacement of organs and tissues, promoting greater longevity and quality of life. For this reason, the influence of biomaterials in the market is expressive, presenting a global market forecast that exceeds US$ 100 billion (2019). Biomaterials used in tissue engineering must attend to some requirements, such as biocompatibility, high porosity, biodegradability, large surface area to volume ratio that facilitates cells adhesion and promote their proliferation. Among the biomaterials studied, poly(lactic acid) (PLA) has stood out as a biocompatible polymer with great biofunctionality, and excellent mechanical properties (stiffness and strength). The fact that its degradation process generates non-toxic products (CO_2 and H_2O), compounds produced from metabolic processes related to the Krebs cycle, confers its biocompatible characteristic. PLA is an aliphatic polyester (poly(hydroxy acids)) commonly obtained by the routes of direct polycondensation or by the opening of the lactide (cyclic dimer of lactic acid). In addition, PLA is an isomer that can be found in three forms: poly-d-lactic acid (PDLA)

[1] PhD Canditate in Chemical Engineering from UNICAMP - SP, juliana.bahu@gmail.com;
[2] Master's Student of Chemical Enginering from UNICAMP - SP, samuel.diogenes.pgfeq@gmail.com;
[3] PhD Candidate in Chemical Engineering from UNICAMP - SP, saracrivellin19@gmail.com;
[4] Senior Researcher from INCT-BIOFABRIS, PhD in Mechanical Engineering from UNICAMP - SP, andre.jardini@gmail.com;
[5] PhD in Chemical Engineering from UNICAMP - SP, ingridrb@unicamp.br;
[6] Co-Advisor: Associate Professor of Chemical Engineering from UNIFESP - SP, viktor.cardenas.c@gmail.com;
[7] Advisor: Full Professor of Chemical Engineering from UNICAMP - SP, rmaciel@unicamp.br.

(right-handed), poly-l-lactic acid (PLLA) (left-handed), and poly-d,l-lactic acid (PDLLA) (meso). The PLLA is largely studied, its more relevance is due to the molecules of l-lactic acid that produce polymers with better mechanical properties. Given the quality of its physicochemical and mechanical properties, PLLA can be processed and adjusted to different configurations that extend its applications, such as in electrospinning. From the voltage generated between a high voltage source, with its poles (positive and negative) respectively connected to the needle of a syringe containing the polymer solution and a grounded collector, we can produce a film with filaments that can vary from micro to nanometric scale. Given this scenario, the present work aims to evaluate the electrospinning process of a PLLA obtained by a direct polycondensation route. This polymer was characterized by X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) techniques. The scanning electron microscopy (SEM) micrograph of the polymeric membrane obtained presented a film with some beads and filaments bonded. It can be related to the solvent, because it did not reach a sufficient time to evaporate, however, it can be improved in the future by increasing the distance between the needle and the collector.