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Nano and submicrometric fibers of poly(lactic acid) obtained by Solution Blow Spinning

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Abstract – PLA nano and submicrometer fibers have been obtained by solution blow spinning and electrospinning. The morphology of the polymeric fibers shows dimensions ranging from a few nanometers to several microns (Fig. 1). The DRX shows the increase in the crystallinity of the material. The fibers obtained by electrospinning were more crystalline (Fig.2c) followed by fibers obtained by sb spinning (Fig. 2b). These results are consistent with the contact angles of these systems.

Recently a novel technique named Solution Blow Spinning (SB-Spinning) was produced from conceptual elements from electrospinning, solution and melt spinning to produce micro and nanofibers of polymers with diameters ranging from a few tenths of nanometers to several micrometers. This technique offers several advantages over electrospinning such as low cost and higher rate of fiber production [1]. Moreover, fibers produced by this technique are equivalent to electrospun ones and are at least one or two orders of magnitude smaller in diameter than those produced by conventional fiber production methods like solution and melt spinning [2-4].

In the solution blow spinning, polymer solution is forced through a nozzle at an appropriated rate, resulting in the formation of a drop of polymer solution at the tip of the nozzle wich is stretched by a high pressure stream of compressed air flowing through the outer nozzle causing the surface of the drop to distort into a cone the similar in shape to electrospinning. When a critical air pressure is exceeded, a jet of solution erupts from the apex of the cone and is accelerated toward the collection target. As this jet travels through the air, the solvent evaporates leaving behind polymer fibers which are collected basically on any target [1].

In this study, poly(lactic acid) (PLA) was first sb-spun and electrospun and then characterized by scanning electron microscopy (SEM), diffraction x ray (DRX) and contact angle. The hierarchical surface roughness inherent in the PLA spun mats stable highest hydrophobicity with a contact angle of 130°. Hydrophobicity was demonstrated to increase monotonically with a increase in cristallinity.

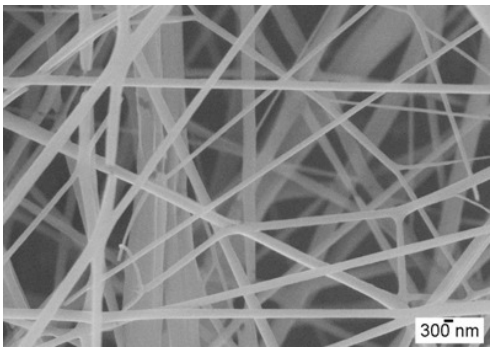

Figure 1: SEM image of a PLA nanofibers obtained at sb-spinning

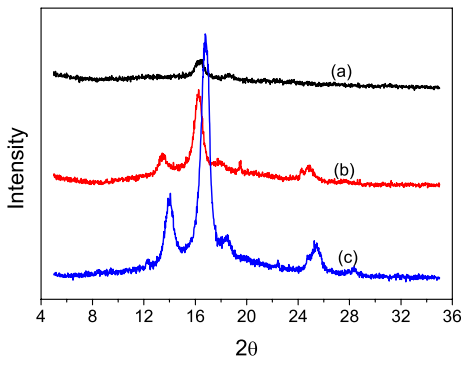

Figure 2: DRX **a**) PLA casting film **b)** PLA sb-spun nanofiber **c)** PLA electrospun nanofiber

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