ISBN 978-85-63274-02-4

International Conference on Food and Agriculture Applications of Nanotechnologies

Editors:
Caue Ribeiro
Odílio Benedito Garrido de Assis
Luiz Henrique Capparelli Mattoso
Sergio Mascarenhas

São Pedro, SP
2010

1st Edition
1st print: 500 copies

Anais da 1. International Conference of Food and Agriculture Applications of Nanotechnologies – São Pedro: Aptor Software, 2010.
284 p.

ISBN 978-85-63273-02-4

1. Nanotechnologies – Events. 2. Ribeiro, Caue. 3. Assis, Odílio Benedito Garrido de. 4. Mattoso, Luiz Henrique Capparelli. 5. Mascarenhas, Sergio

Fibers of biodegradable blend polymer obtained by Solution Blow Spinning

E. A. Moraes(1), J. E. Oliveira(1,2)*, E. S. Medeiros(3) and L. H. C. Mattoso(1)

(1) LNNA, CNPDIA, Embrapa, São Carlos, SP, Brazil
(2) PPGEM, Departamento de Materiais, UFSCar, e-mail: juliano@cnpdia.embrapa.br
(3) Centro de Tecnologia, Deparmento de Materiais, UFPB
* Corresponding author.

Abstract –Poly(lactic acid)/Poly(ethylene oxide) (PLA/PEO) nano and submicrometer fibers have been obtained by solution blow spinning and electrospinning. The PEO addiction in biodegradable blends shows an decrease in contact angle (Fig.1). morphology of the polymeric fibers shows dimensions ranging from a few nanometers to several microns (Fig. 1). The thermogravimetric analysis of (PLA/PEO) blends indicate an decrease in the thermal stability of PLA (fig.2). These results can be related the interactions between PLA and PEO.

A variety of degradable polymers have been used as implantable biomaterials and drug-delivery devices. The main advantage of these polymers is that no retrieval of the device is needed after usage. In particular, poly(L-lactic acid) (PLA) has been widely utilized, since its degradation product, lactic acid, is metabolized in the body. The degradation time of a polymeric device and release period of a particular drug can be varied from months to years, depending on the degradation rate of PLA. This can be controlled by blend composition with another polymers. Amorphous/crystalline and hydrophilic/hydrophobic properties also determine the degradation time [1-4].

Research on the polymeric nanofibers has increased in recent years because of the number of potential applications in different areas, ranging from technical textiles (e.g., filters, composite reinforcements, and protective fabrics) to biomedical commodities and devices such as bandages, membranes, bioactive surfaces, and porous substrates for tissue engineering, for which biocompatible polymers play an essential role [2,3].

In this work, wool poly(lactic acid)/poly(ethylene oxide) nanofibers were sb-spun from chloroform:acetone solutions of polymer blends under different operating conditions. The non-woven mats were characterized with scanning electron microscopy (SEM), Fourier transform infrared (FTIR), and thermogravimetric analysis (TGA) analyses and compared with films of the same materials produced via casting with the aim of investigating structural changes due to the sb-spinning process.

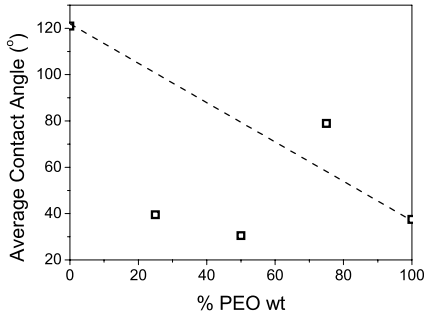

Figure 1: PEO effect in average contact angle of blend nanofibers

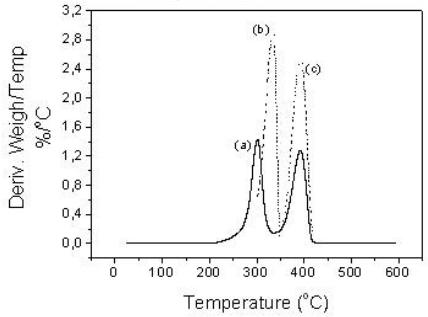

Figure 2: DTG of **a**) $(PLA/PEO)_{50/50}$ nanofibers **b)** PLA nanofibers and **(c)** PEO nanofibers

[1] Medeiros, E.S., et al., *Solution Blow Spinning: A New Method to Produce Micro- and Nanofibers from Polymer Solutions.* Journal of Applied Polymer Science, 2009. **113**(4): p. 2322-2330.

[2] Eling, B., S. Gogolewski, and A.J. Pennings, *BIODEGRADABLE MATERIALS OF POLY(L-LACTIC ACID) .1. MELT-SPUN AND SOLUTION-SPUN FIBERS.* Polymer, 1982. **23**(11): p. 1587-1593.

[3] Fisher, R.J. and M.M. Denn, *THEORY OF ISOTHERMAL MELT SPINNING AND DRAW RESONANCE.* Aiche Journal, 1976. **22**(2): p. 236-246.

[4] Jin, H.J. and D.L. Kaplan, *Mechanism of silk processing in insects and spiders.* Nature, 2003. **424**(6952): p. 1057-1061.