N Lis Garcia et al., J Chem Eng Process Technol 2018, Volume 9
DOI: 10.4172/2157-7048-C1-012

Chemical modification of cellulose nanofibers from argentine cane tacuara (guadua angustifolia kunth)

N Lis Garcia[1*] , **C.A. Rodríguez Ramírez**[1] and **N.B. D´Accorso**[1, 2]
[1]CONICET-Universidad de Buenos Aires, Argentina
[2]Universidad de Buenos Aires, Argentina

The growing demand for practice environmental sustainability has encouraged research into biodegradable polymers to minimize the environmental impact of conventional polymers. In this context, plant fibers, is an attractive material they constitute rich sources of cellulose[1]. Because cellulose is natural and renewable and its features resemble those of synthetic polymers, it could potentially replace its synthetic counterpart[2]. The cellulose nanofibers (NFC) based nanocomposites in the last decades there has been a growing interest, because its incorporation in the biomaterials generates an improvement in dynamic mechanical thermal properties, as well as tensile strength, toughness and elongation to break[3,4]. Nevertheless, the biggest problem of nanocelluloses in real applications is their hydrophilic nature. Nanocellulose cannot be uniformly dispersed in most nonpolar polymer media, its suspension is a gel-like structure at very low concentration, and it forms films or aggregates once dried. Consequently, nanocellulose modification is of interest in order to limit this phenomena and open-up new applications[5]. In this context, a new bio-material obtained from the chemical modification of a national low molecular weight polylactic acid (LMWPLA) synthesized in our laboratory with cellulose nanofibers is presented, using a synthetic route that consists of three reaction stages. The first one is the protection of the hydroxyl groups of the LMWPLA through a benzoylation reaction (PLABz), the second step involves the activation of carboxyl groups with thionyl chloride, and these latter groups react with the cellulose nanofibers (LMW-PLACEL) in the third stage. This new polymer will serve to be compatible with a hydrophobic PLA of high molecular weight (HMWPLA) to be use in the packaging manufacturing.

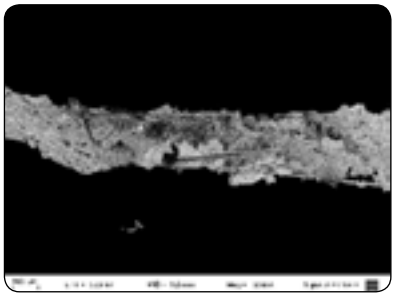

Figure 1: NCF Cane Tacuara (Guadua angustifolia)

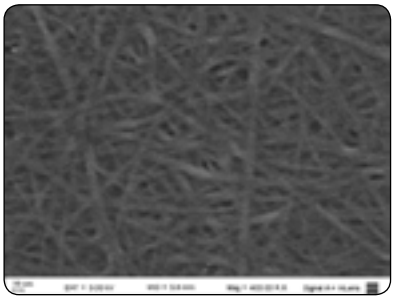

Figure 2: Cross section Film CNF-PLA

Recent Publications:

1. Lavoine, N., Desloges, I., Dufresne, A., & Bras, J. (2012). Microfibrillated celluloseIts barrier properties and applications in cellulosic materials: a review. Carbohydrate Polymers, 90, 735-764.
2. Siqueira, G., Bras, J., & Dufresne, A. (2009). Cellulose whiskers versus microfibrils: influence of the nature of the nanoparticle and its surface functionalization on the thermal and mechanical properties of nanocomposites. Biomacromolecules, 10, 425-432.
3. Jonoobi, M., Harun, J., Mathew, A., Oksman, K. (2010). Mechanical properties of cellulose nanofiber (CNF) reinforced polylactic acid (PLA) prepared by twin screw extrusion. Composites Science and Technology. 70, 1742-1747.
4. Llanos, J., Tadini, C. (2018). Preparation and characterization of bio-nanocomposite films based on cassava starch or chitosan, reinforced with montmorillonite or bamboo nanofibers. International Journal of Biological Macromolecules. 107, 371-382.

5. Afrain, S. Karim, Z. (2016). Isolation and Surface Modification of Nanocellulose: Necessity of Enzymes over Chemicals. Review. ChemBioEng.4, 1-16.

Biography

Dr. García currently belongs to the CIHIDECAR-CONICET Carbon Hydrates Research Center, where she has worked extensively in the development of new composite materials, Initially starch films and starch nanocrystals for packaging, then making interesting odifications that can be used as reinforcements in different polymer matrices. At this moment, she is developing new materials incorporating nanocapsules that allow the controlled release of different active compounds that make it attractive for its application in different matrices.

nancylis@qo.fcen.uba.ar; nancylis@gmail.com

Notes: