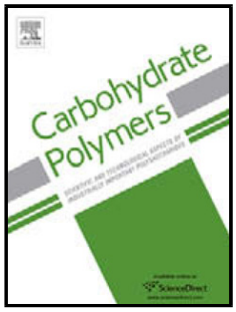

Title: Improved Mechanical Properties of Polylactide Nanocomposites-Reinforced with Cellulose Nanofibrils through Interfacial Engineering via Amine-Functionalization

Author: Yuan Lu Mario Calderón Cueva Edgar Lara-Curzio Soydan Ozcan

PII: S0144-8617(15)00453-1
DOI: http://dx.doi.org/doi:10.1016/j.carbpol.2015.05.047
Reference: CARP 9951

To appear in:

Received date: 22-1-2015
Revised date: 20-5-2015
Accepted date: 21-5-2015

Please cite this article as: Lu, Y., Cueva, M. C., Lara-Curzio, E., and Ozcan, S.,Improved Mechanical Properties of Polylactide Nanocomposites-Reinforced with Cellulose Nanofibrils through Interfacial Engineering via Amine-Functionalization, *Carbohydrate Polymers* (2015), http://dx.doi.org/10.1016/j.carbpol.2015.05.047

Improved Mechanical Properties of Polylactide Nanocomposites-Reinforced with Cellulose Nanofibrils through Interfacial Engineering via Amine-Functionalization

Yuan Lu[1], Mario Calderón Cueva[2], Edgar Lara-Curzio[1], Soydan Ozcan[1*]

[1]Materials Science and Technology Division, Oak Ridge National Laboratory, 1 Bethel Valley Road, Oak Ridge, Knoxville, TN. 37831
[2]Universidad San Fransicso de Quito, Quito, Ecuador.

*Address correspondence to Dr. Soydan Ozcan

Email: ozcans@ornl.gov.

ABSTRACT

One of the main factors responsible for the mechanical and physical properties of nanocomposites is the effectiveness of the interfacial region to transfer loads and mechanical vibrations between the nano-reinforcements and the matrix. Surface functionalization has been the preferred approach to engineer the interfaces in polymer nanocomposites in order to maximize their potential in structural and functional applications. In this study, amine-functionalized cellulose nanofibrils (mCNF-G1) were synthesized via silylation of the hydroxyl groups on the CNF surface using 3-aminopropyltrimethoxysilane (APTMS). To further increase the amine density (mCNF-G2), dendritic polyamidoamine (PAMAM) was grafted onto mCNF-G1 by the Michael addition of methacrylate onto mCNF-G1, followed by the transamidation of the ester groups of methacrylate using ethylenediamine. Compared to native CNF-reinforced, poly(L-lactide) (PLLA) nanocomposites, amine-functionalized CNF exhibited significantly