

Accepted Manuscript

Cellulose Nanocrystal in Poly (Lactic acid)/Polyamide11 Blends: Preparation, Morphology and Co-continuity

Vahid Heshmati, Musa R. Kamal, Basil D. Favis

PII: S0014-3057(17)30993-X

DOI: <https://doi.org/10.1016/j.eurpolymj.2017.10.027>

Reference: EPJ 8126

To appear in: *European Polymer Journal*

Received Date: 1 June 2017

Revised Date: 17 October 2017

Accepted Date: 20 October 2017

Please cite this article as: Heshmati, V., Kamal, M.R., Favis, B.D., Cellulose Nanocrystal in Poly (Lactic acid)/Polyamide11 Blends: Preparation, Morphology and Co-continuity, *European Polymer Journal* (2017), doi: <https://doi.org/10.1016/j.eurpolymj.2017.10.027>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Cellulose Nanocrystal in Poly (Lactic acid)/Polyamide11 Blends: Preparation, Morphology and Co-continuity

Vahid Heshmati^a, Musa R. Kamal^b and Basil D. Favis^{a*}

a. CREPEC, Dept of Chemical Engineering, École Polytechnique de Montréal, Montreal, Canada

b. CREPEC, Dept of Chemical Engineering, McGill university, Montreal, Canada

*Corresponding author: basil.favis@polymtl.ca

Abstract

In this work, for the first time, cellulose nanocrystal (CNC) is incorporated into poly (lactic acid)/bio-polyamide11 (PA11) blends at different loadings through a combination of solvent dissolution, casting and melt mixing. Atomic force microscopy (AFM) and rheology analysis demonstrate an exceptional level of CNC dispersion using this technique. CNC is fed into the blends through prepared PLA/CNC or PA11/CNC mixtures via melt mixing in an internal mixer. In the PLA/PA11/CNC system, the CNC particles perfectly segregate into the PA11 phase at all compositions, after mixing, irrespective of whether the PLA/CNC or the PA11/CNC mixture is used. These findings are supported by thermodynamic predictions based on interfacial energy. There is virtually no influence of CNC content on the PLA/PA11 morphology when it is in a matrix/dispersed phase form. This is attributed to the already low level of coalescence resulting from the low interfacial tension between PLA and PA11. However, when coalescence phenomena are fully maximized through the preparation of a co-continuous system (PLA/PA11 50/50), then CNC addition dramatically diminishes coalescence even at values as low as 1 wt% CNC. It is suggested that the retarded relaxation of the CNC filled PA11 domains is the main mechanism governing this coalescence reduction.

Key Words: Poly (lactic acid), Polyamide11, Cellulose nanocrystal, Localization, Morphology

Download English Version:

<https://daneshyari.com/en/article/7803997>

Download Persian Version:

<https://daneshyari.com/article/7803997>

[Daneshyari.com](https://daneshyari.com)