

## Accepted Manuscript

Title: Recycling of Poly (Lactic Acid)/Silk based Bionanocomposites Films and its Influence on Thermal Stability, Crystallization Kinetics, Solution and Melt Rheology

Authors: Melakuu Tesfaye, Rahul Patwa, Arvind Gupta, Manash Jyoti Kashyap, Vimal Katiyar



PII: S0141-8130(17)30272-6  
DOI: <http://dx.doi.org/doi:10.1016/j.ijbiomac.2017.03.085>  
Reference: BIOMAC 7251

To appear in: *International Journal of Biological Macromolecules*

Received date: 19-1-2017  
Revised date: 14-3-2017  
Accepted date: 15-3-2017

Please cite this article as: Melakuu Tesfaye, Rahul Patwa, Arvind Gupta, Manash Jyoti Kashyap, Vimal Katiyar, Recycling of Poly (Lactic Acid)/Silk based Bionanocomposites Films and its Influence on Thermal Stability, Crystallization Kinetics, Solution and Melt Rheology, International Journal of Biological Macromolecules <http://dx.doi.org/10.1016/j.ijbiomac.2017.03.085>

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.

**Recycling of Poly (Lactic Acid)/Silk based Bionanocomposites Films and its Influence on Thermal Stability, Crystallization Kinetics, Solution and Melt Rheology**

Melakuu Tesfaye, Rahul Patwa, Arvind Gupta, Manash Jyoti Kashyap,  
Vimal Katiyar\*  
Department of Chemical Engineering, Indian Institute of Technology Guwahati,  
Guwahati 781039, Assam, India

\*Corresponding Author. E-mail: [vkatiyar@iitg.ernet.in](mailto:vkatiyar@iitg.ernet.in)

**Abstract:**

In this study, the effect of silk nanocrystals (SNCs) on the thermal and rheological properties of poly (lactic acid) (PLA) under repetitive extrusion process is investigated. The presence of SNCs facilitates the crystallization process and delaying the thermal degradation of PLA matrix. This leads to the reduction in cold crystallization peak temperature with lower crystallization half-time and higher growth rate. The substantial improvement in nucleation density observed through Polarized Optical Microscope (POM) proves the nucleating effect of SNC in all processing cycles. Moreover, the rheological investigation (complex viscosity, storage and loss modules values) revealed the stabilizing effect of SNC and the drastic degradation of neat PLA (NPLA) in third and fourth cycle is observed to be fortified by the presence of SNC. Cole-Cole plot and cross over frequencies have been correlated with the molar mass distribution of PLA and PLA-Silk composite during processing, which is further supported by the intrinsic viscosity measurement and acid value analysis. This investigation suggests that the melt viscosity and thermal properties of PLA can be stabilized by addition of silk nanocrystals.

Keywords: Reprocessing; Poly (lactic acid); Bionanocomposites

Download English Version:

<https://daneshyari.com/en/article/5511987>

Download Persian Version:

<https://daneshyari.com/article/5511987>

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