EuroSciCon

3rd Edition of International Conference and Exhibition on

Polymer Chemistry

March 26-28, 2018
Vienna, Austria

Mojca Božič et al., Polym Sci, Volume 4
DOI: 10.4172/2471-9935-C1-008

3D PRINTING OF BIOCOMPOSITE OF POLYLACTIC ACID AND LIGNIN MODIFIED CELLULOSE NANOFIBRILS

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The incorporation of lignocellulosic materials as a reinforcing component in polymer composites has received increased attention, primarily as industry attempts to lessen the dependence on the unrenewable petroleum supplies and to follow the concept of a circular economy. Nanofibrillated cellulose (NFC), derived from cellulose, the most abundant biopolymer, is one of the most promising materials. One of the key issues that have been largely investigated is the compatibility of the NFC with polymers. The main challenge is the poor adhesion and dispersibility of the NFC in the synthetic or biobased hydrophobic polymer matrices due to the dissimilar nature of the components. In this work we applied Kraf lignin as by product from pulp production for surface modification of commercial NFC to increase the compatibility with polylactic acid (PLA), a biodegradable and bioactive thermoplastic aliphatic polyester. The lignin surface coverage and morphology was determined by scanning electron microscope and potentiometric titration. The hydrophilicity/hydrophobicity effect of adsorbed and polymerized lignin on the 3D printed composite mechanical properties was also studied. The results indicated increased hydrophobic character of NFC upon lignin surface adsorption and enzymatic polymerization that led to an improved interfacial adhesion with PLA resulting in increased composite mechanical properties (tensile modulus and strength at yield).

Biography

Mojca Božič is an Assistant Professor of Materials in University of Maribor at Faculty of Mechanical Engineering in Slovenia. She has more than 13 years of experience in the field of Material Chemistry (expertise in enzymatic synthesis and bio-catalysis, development of multifunctional biodegradable materials etc.) as well Nanotechnology (expertise in nano-particles synthesis), and surface characterization, modification and their application. She is working on biochemical functionalization and cross-linking of polysaccharide with focus on chitosan and nanocellulose, and biobased-based polymers.

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