Proceedings of the 2019 Society of Wood Science and Technology International Convention

Convention Theme: Renewable Materials and the Wood-based Bioeconomy

Edited by Susan LeVan-Green

Overall General Chair*: *Eve Haviarova, Purdue University, USA

October 20-25, 2019
Tenaya Lodge
Yosemite National Park, California, USA

Table of Content

Impact of Forest Disturbances on Wood Quality
Monday, October 21, 2019

International Innovation, Trends and Education in Wood Science
Monday, October 21, 2019

Biodegradation and Preservation
Tuesday, October 22, 2019

Composites and Adhesives 1
Tuesday, October 22, 2019

Wood Chemistry
Tuesday, October 22, 2019

Student Posters
Tuesday, October 22, 2019

Regular Posters
Tuesday, October 22, 2019

Composites and Adhesives 2
Thursday, October 24, 2019

Business, Marketing and Regulations
Thursday, October 24, 2019

Wood Physics and Mechanics
Thursday, October 24, 2019

Timber Engineering and Mass Timber
Friday, October 25, 2019

Proceedings of the 62nd International Convention of
Society of Wood Science and Technology
October 20-25, 2019 – Tenaya Lodge, Yosemite, California USA

Development of Nano-cellulose Based Thermal Insulating and Encapsulated Phase Change Materials for Energy Efficient Buildings

David DeVallance
InnoRenew CoE and University of Primorska, Slovenia

Abstract

Nanocellulose has been gaining more attention for use as a light-weight, bio-based, highly insulative material. Specifically, researchers and industry are looking to use waste materials, such as wood fibers, waste textiles, and under-utilized cellulosic sources for producing innovative building materials with enhanced insulative properties. In addition to insulating materials, building efficiency can be achieved through the use of phase change materials (PCMs). Organic phase change materials such as paraffin wax, polyethylene glycol, fatty acids, polyalcohol, and polyethylene have shown potential as sufficient PCMs. PCMs, especially organic based types, are generally hindered with low heat transfer rate that results in incomplete melting/freezing and losses in extraction of stored energy. Some approaches to overcome these hindrances include macro and micro encapsulating the PCMs, incorporating porous materials into PCMs, filling PCMs with highly conductive particles and fibrous materials. The overall goal of this research is to develop high performance nano-cellulose based thermal insulation material and a new generation of encapsulated PCMs with thermal conductivity-enhancing cellulose-based shells. Specifically, this presentation covers the laboratory design and development of new enhanced cellulose-based shells and the development of the encapsulation process for PCM. To evaluate the emulsification process of PCMs, heated homogenous mixtures of palmitic acid (PA) and cellulose triacetate (CTA) were prepared at 80 degrees Celsius in dimethyl sulfoxide (DMSO). To evaluate improvement in thermal conductivity, highly conductive particles of carbon black and from carbonized wood were incorporated into shells of PCM capsules. The presentation will cover the results from the emulsification studies and improvements in thermal performance of the PCMs containing conductive carbon materials.

ISBN 978-0-9817876-9-5