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2nd International Conference on

Food & Beverage Packaging

June 13-14, 2016 Rome, Italy

Cellulose nanocrystals from coffee silverskin in polylactic acid-based nanocomposite films through extrusion process

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B io-nanocomposite films based on polylactic acid (PLA) matrix reinforced with cellulose nanocrystals (CNC) were developed using a twin-screw extruder. The CNCs were extracted from coffee silverskin which is the by-product in coffee roasting process, by alkali treament followed by sulfuric acid hydrolysis. Those were used as surface-modified CNCs by adsorption of polyethylene glycol (PEG) onto CNC to obtain PLA/CNC-PEG nanocomposite films by adding at different concentrations (1, 2 and 5% CNC-PEG, w/w). PEG was used not only as plasticizer but as compatibilizer to improve CNC dispersion within PLA matrix. Morphological properties, tensile properties and water vapor permeability (WVP) of the bio-nanocomposite films were analyzed. Thermal analysis was also investigated for the change of thermal properties during melting and crystallization process. The tensile strength and elongation-atbreak increased in both 1% and 2% of CNC-PEG and the WVP decreased gradually with increasing the addition of CNC-PEG up to 2%. These results suggest that CNCs from coffee silverskin can surely improve physical properties of PLA-based biopolymer film. The developed PLA/CNC-PEG bio-nanocomposite films can potentially be used for food packaging materials with improved barrier and mechanical properties.

Biography

Soo Hyun Sung has her academic background in Food Biosciences and Technology. She is a Master's student with Professor Jaejoon Han at Korea University. Her research focuses on the development of biomass-based bioplastic materials for food packaging.

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