

NANOCELLULOSE-BASED NANOCOMPOSITES FOR PACKAGING  
APPLICATIONS

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Food packaging materials, predominantly derived from petrochemical sources, have raised environmental concerns due to their impact on limited fossil fuel resources. To address this issue, researchers have explored the potential of bio-based polymers, but these materials often lack the required mechanical and gas barrier properties. This thesis work contributes to the development of sustainable bio-based nanocomposites for food packaging materials, with cellulose nanocrystals (CNCs) as a nano-filler. The findings emphasize the potential for improving the mechanical and gas barrier properties of bio-based food packaging materials through surface modifications of CNCs. Bio-sourced polymers, poly(ester-amide)s and hydroxypropyl cellulose, serve as the polymer matrix with each nanocomposite utilizing unique solvent casting methods to generate films. In addition, the introduction of diblock polymer-grafted CNCs consisting of the hydrophobic polymers, poly(methacrylate) and poly(methyl methacrylate), presents a novel system with unique mechanical properties, offering insights into the tracking of polymer growth without the need for polymer cleavage. Monitoring polymer-grafted CNCs growth can lead to higher CNC concentrations in bio-based polymers, such as poly(capro-lactone) and poly(lactic acid), for food packaging applications. This research contributes to the ongoing efforts to create more eco-friendly and high-performance materials for the food packaging industry.

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