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Ex-Situ Development and Characterization of Composite Film Based on Bacterial Cellulose Derived from Oil Palm Frond Juice and Chitosan as Food Packaging

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Abstract

The development of alternative food packaging films using bio-based residues is in great demand for replacing petroleum-based packaging materials. However, large-scale application is severely limited by costly production and poor performance. This study investigates the ex-situ modification of bacterial cellulose (BC) produced by Acetobacter xylinum in oil palm fronds juice to obtain BC-Chitosan (BCC) films. FTIR revealed the structure of amide I and II bands, confirming the presence of chitosan in BCC films. The FE-SEM images of BCC films showed the formation of a thick chitosan layer with increasing chitosan incorporated into the BC surface structure. The coated chitosan layer observed improved mechanical properties in BCC films due to the disappearance of empty pores between BC fibers.

Increments in chitosan concentration slightly decreased the thermal behavior of BCC. The antimicrobial effects of BCC films were effective against Gram-positive bacteria (Staphylococcus aureus) when the concentration of chitosan incorporated was above 0.6 %w/v. This study reveals the potential of extending the application of BC derived from oil palm frond juice (OPFJ) for developing food packaging materials. © Universiti Putra Malaysia Press.

Author keywords

Bacterial cellulose; chitosan; ex-situ method; film composite; oil palm frond juice

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