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Nano-Magnesium Oxide Reinforced Polylactic Acid Biofilms for Food Packaging Applications

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Abstract

This study is aimed at producing biofilms by reinforcement of Magnesium Oxide (MgO) nanoparticles in polylactic acid (PLA) biopolymer using the solvent casting method. In this study MgO nanoparticles (up to 4 wt%) were reinforced in PLA biopolymer and their key mechanical, barrier, thermal and antibacterial properties were investigated for food packaging applications. Among the prepared biocomposite films, the 2 wt% reinforced PLA films showed the maximum improvement in tensile strength and oxygen barrier properties (up to 29% and 25% respectively) in comparison to pristine PLA films. However, the water vapour barrier properties decreased by nearly 25% due to interfacial behaviour and presence of free volumes near MgO nanoparticles. PLA/MgO films also exhibited superior antibacterial efficacy. The 2 wt% biofilms caused progressive damage and death of nearly 46% of E. Coli bacterial culture after 12 h treatment. The produced films are transparent, capable of screening UV radiations and exhibit superior antibacterial efficacy making them an excellent food packaging material.

Keywords

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