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Physicochemical Properties of Films from Semirefined Carrageenan/TiO2 Integrated with Cinnamaldehyde Pickering Emulsion for Active Food Packaging

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Abstract

Plastic waste has become a significant global environmental issue, particularly in the context of food packaging. In the present study, active packaging films were fabricated by integrating chitosan-stabilized cinnamaldehyde Pickering emulsion (PE) and titanium dioxide particles (TNPs) into the semirefined carrageenan (SRC) matrix. The impact of cinnamaldehyde PE and TNPs on the physical and mechanical attributes of the SRC films was explored. The integration of TNPs (3%, w/v) and 0.5% cinnamaldehyde PE revealed promising mechanical properties, with 21.86 MPa tensile strength and 34.21% of elongation at break value. The inclusion of TNPs and cinnamaldehyde PE led to enhancements in the moisture content and water solubility of the SRC films. The thermal stability of the fil m was marginally increased with 0.5% cinnamaldehyde PE. Scanning electron microscopy (SEM) revealed a uniform distribution of active compounds in the SRC matrix. The study findings highlight the potential of cinnamaldehyde PE and TNPs in active food packaging films as eco-friendly alternatives to conventional petrochemical-derived plastics in food packaging.

Author Keywords

Active food packaging; cinnamaldehyde; nanoparticle; pickering emulsion; plastics waste; titanium dioxide

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