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Novel Biodegradable and Antibacterial Edible Films Based on Alginate and Chitosan Biguanidine Hydrochloride

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Abstract

Novel bioactive edible films synthesized from sodium alginate (A) and chitosan biguanidine hydrochloride (CG) with different weight percents were successfully prepared. ^{13}C-NMR and ^{1}H-NMR confirmed the successful guanidylation of chitosan. Fourier transform infrared confirmed the successful reaction between CG and A. The interaction between CG and A was confirmed through the reduction of the crystalline peaks using wide-angle X-ray diffraction of both CG and A. Thermogravimetric analysis confirmed that CG enhanced the thermal stability of films as detected from the calculated Integral Procedure Decomposition Temperature (IPDT) values. CG incorporation improved the mechanical properties of dry and wet samples. A/CG films exhibited a reduced water vapor permeability and good color properties. The antibacterial study proved that the prepared films showed a remarkable antibacterial killing ability. These results revealed that A/CG films could be an alternative candidate to be used as antibacterial edible films in food industries.

Keywords: Sodium alginate; Chitosan; Edible films

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1. Introduction

Biopolymers, as green and renewable alternatives, are recently used to produce edible films (EFs) which are applied in food industries [1]. EFs can extent the shelf life of the food and control the passage of many components between the food and its environment as water, oxygen, flavors, etc [2]. Biodegradable biopolymers as polysaccharides, lipids, and proteins are recently