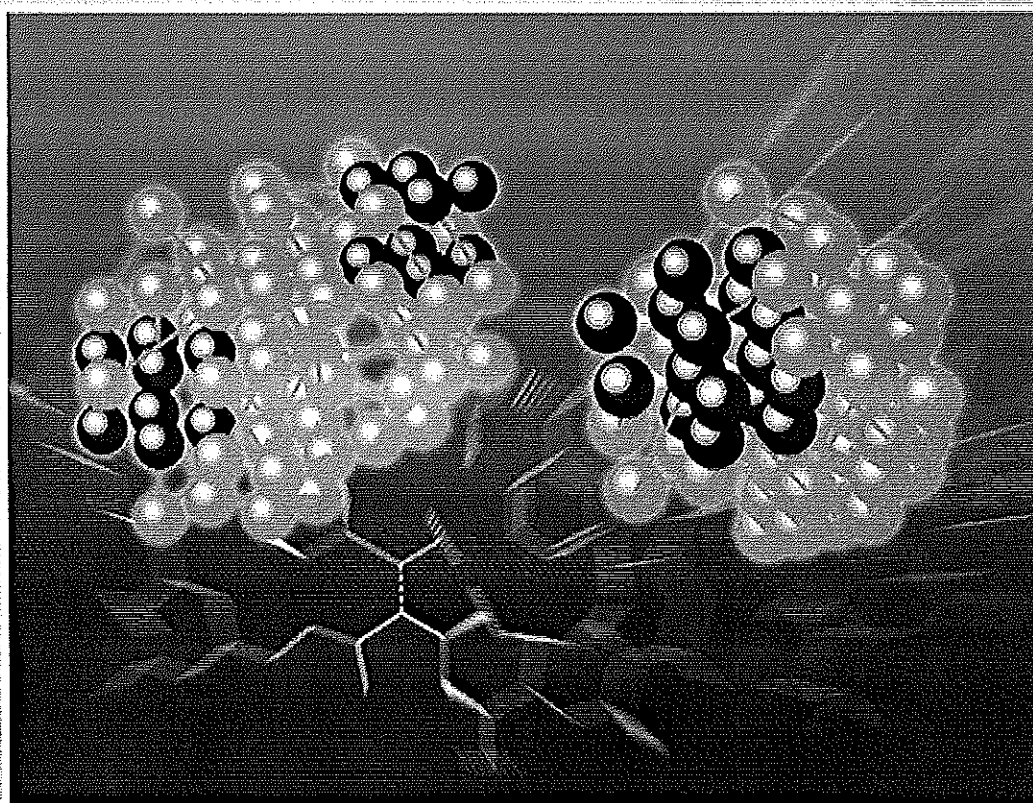


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Biopolymer Films Based on Chitosan and Polyethylene Glycol with Pineapple Leaf Fiber for Food Packaging Applications

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Summary: Pineapple is a tropical plant native to South East Asia. Pineapple leaf fiber is rich in cellulose, relatively inexpensive and abundantly available. Furthermore, it has the potential for polymer reinforcement, and is more environmentally friendly than films that are reinforced with the artificial additives. The objectives of the present work were to compare the mechanical and water vapor barrier properties of biopolymer films, chitosan and polyethylene glycol 6000 (PEG 6000), with and without incorporating pineapple leaf fibers which had been chemically treated in an alkaline solution. The water vapor permeability (WVP), % soluble matter (SM), moisture index, tensile strength (TS) and % elongation (E) were investigated in these films. The composite yellow film exhibited an excellent water vapor permeability of $5.14 \pm 1.87 \text{ g mm m}^{-2} \text{ day}^{-1} \text{ kPa}^{-1}$. The solubility was $65.00 \pm 0.97\%$ while the moisture index was in the range of 10.50–31.20%. The results suggested that biodegradable films could be advantageously used to replace polymer films in the packaging of freshly processed vegetables and thereby reduce the negative environmental impact of polymeric films.

Keywords: biopolymer; chitosan; mechanical properties; pineapple leaf fiber; reinforcement

Introduction

As a result of severe environmental pollution in the form of global warming, caused by the petroleum based polymer contained in plastic food packaging, there has been considerable interest in biodegradable films made from natural polymer.^[1] One possible solution to the problem is by finding an alternative material from which to make this packaging.^[2–3] Currently gaining interest and further research is active packaging due to its potential for providing protection against the permeation of gas, moisture and microbes, maintaining high food quality. Research into biodegradable packaging has focused on the use of natural fiber packaging material due to its ability to address the

consumer concerns over food-related health risks and environmental impact.^[4–6]

One of the most interesting of these biopolymers is Chitosan which is obtained from the shells of crab, shrimp and other shell fish.^[7] It is found to be nontoxic, biodegradable and containing antioxidant characteristics as it is a linear polysaccharide produced by the deacetylation of chitin. This leads it to be considered as an environmentally friendly packaging material.^[8] A major component of bio-based film is the plasticizer, polyethylene glycol 6000 (PEG 6000), the film forming polymer. The water vapor transmission rate (WVTR) can be reduced slightly by adding a plasticizer.^[9] Moreover, the various natural fibers such as rice husks, kenaf, pineapple leaf and sugarcane act as reinforcements for the polymer composites.^[10] Also these bio-based, natural fibers have not caused allergic reactions in the human body.^[11] Pineapple leaf fibers (PALF) can be easily and inexpensively obtained for industrial purposes as they are at present a waste product of

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