

**PHYSICOCHEMICAL STUDIES
OF
DIALDEHYDE STARCH
BLENDED POLYVINYL ALCOHOL FILMS**

Ph .D. DISSERTATION

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Blended Polyvinyl Alcohol Films

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Abstract

Blended polyvinyl alcohol - prepared dialdehyde starch (DAS) films possessing significant mechanical properties and biodegradability characteristics have been prepared and characterized. Blended films were prepared by mixing dialdehyde starch and 20% (w/w) polyvinyl alcohol, for 20 minutes heating at 121°C and were compressed under a pressure of 0.1 MPa by using an autoclave. The 20% (w/w) PVA film was found to be the most appropriate weight ratio to prepare the blended films. The criteria ratio was based on the performance mechanical properties such as tensile strength, elongation at break (%) and tear strength, and from the results of FTIR and thermal analyses (TG/DTA) characteristics.

Regarding with respect to the concentration of DAS blended in the PVA films, the 5% and 10% were found to show significant parameter changes corresponding to the measured mechanical properties; tensile strength, elongation at break (%) and tear strength. At these respective concentrations, the performance mechanical properties acutely skewed downwards with increase in the percentage of DAS. This is an indication of the loss in

viscoelasticity, shear stress as well as loss in plasticity of the films as compared to the original 20% (w/w) PVA film of which the mechanical properties are opposite to those of the blended films, particularly in viscoelasticity. The incorporated hydrophilic starch globules may have contributed to the brittleness and low elastic nature. However, these intermediate mechanical properties in one way enhanced the biodegradability of the blended films as well as without losing the thermal plastic nature of the film as exemplified from thermal analyses data.

The physicochemical properties of the solutions for the preparation of blended films such as pH, refractive index, specific gravity and viscosity were determined. Characterization of blended films includes FTIR and TG/ DTA analyses. The blended films showed high degree of swelling (%) and high water holding capacity (%). The higher the DAS content in the blended film, high percents of these two factors are observed. But the higher the DAS content in the blended films, the lower the mechanical parameter; possessing intermediate mechanical properties. Also the 5% and 10% DAS blended films were found to show high response to biodegradability which was determined by its response to bacteria activity of the selective bacteria by using the petri dish method. Based on the mechanical properties as well as on the degree of swelling, water holding capacity (%), and on the context of biodegradability, it can be considered that the 5% and 10% DAS-PVA blended films can be used as package films, possibly in horticulture.

Key words : PVA - DAS blended film, mechanical properties, degree of swelling, water holding capacity, biodegradability