THE EFFECT OF PINEAPPLE LEAF FIBRE ADDTION ON MECHANICAL AND PHYSICAL PROPERTIES OF THERMOPLASTIC CASSAVA STARCH BIOCOMPOSITES

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AUGUST 2024

Fakulti Sains Gunaan

SUBMISSION FOR EVALUATION
FINAL YEAR PROJECT 2 - RESEARCH PROJECT

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Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Applied Chemistry
In The Faculty of Applied Sciences
Universiti Teknologi MARA

AUGUST 2024

ABSTRACT

THE EFFECT OF PINEAPPLE LEAF FIBRE ADDITION ON MECHANICAL AND PHYSICAL PROPERTIES OF THERMOPLASTIC CASSAVA STARCH BIOCOMPOSITES

The growing utilization of synthetic products poses significant environmental risk, necessitating the adoption of natural, renewable, and biodegradable materials. This study investigates the obstacles hindering the extensive use of biodegradable polymers, with a specific emphasis on thermoplastic starch. Despite its environmental benefits, thermoplastic starch suffers from inadequate mechanical strength and moisture absorption. To address these challenges, pineapple leaf fibre (PALF), known for its high cellulose content, is employed as a reinforcement to enhance the properties of thermoplastic cassava starch. The primary aim of this study is to investigate how the addition of untreated and treated fibre affects the mechanical and physical properties of thermoplastic cassava starch. On the other hand, the effect of untreated and treated pineapple leaf fibre on the morphological and structural characteristics of thermoplastic cassava starch were also investigated. PALF with varying fibre loading (0-8 wt.%) and cassava starch were fabricated using a solution casting method with glycerol as a plasticizer. This investigation involved treating the surface of PALF with a 5% sodium hydroxide solution. The mechanical analysis demonstrated that TPCS/PALF 8% composite treated with alkali exhibited the highest tensile stress (3.37 MPa) and modulus (134.55 MPa) compared to other biocomposites. However, untreated TPCS/PALF 6% had the largest tensile strain (29.37%). Optical microscopy showed improved matrix-reinforcement compatibility in treated TPCS/PALF composites. Fourier transform infrared spectroscopy (FTIR) analysis revealed significant physico-chemical alterations in treated TPCS/PALF compared to untreated TPCS/PALF composites. The physical test revealed that both untreated and treated TPCS/PALF composites saw a notable reduction in density and moisture content, accompanied by a rise in water absorption as the fibre loading increased.

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