

UNIVERSITI TEKNOLOGI MARA

**STRUCTURAL AND MECHANICAL
PROPERTIES STUDY OF
THERMOPLASTIC STARCH FILM
REINFORCED WITH RICE HUSK
BIOCHAR**

FARAH AYUNIE BINTI MOHD ZAMZURI

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ABSTRACT

The morphological and mechanical properties study of thermoplastic starch (TPS) film from *Tacca leontopetaloides* reinforced with rice husk biochar (RHB) was investigated in this study. *T. leontopetaloides* was chosen as a good source of starch since it is cheap, readily available, abundance in nature and it is not a staple food in Malaysia. Using *T. leontopetaloides* starch as the main ingredient for TPS is a new idea to produce biodegradable compound in order to control environmental problem by reducing the agricultural waste disposal problem. The TPS/RHB biocomposites were developed from casting method. RHB infiltration into TPS was performed by rolling them with roll mill. The improvement of the properties of TPS with biochar has significantly increased the tensile strength and elongation at break properties of TPS. X-Ray Diffraction analysis showed that the TPS/RHB blends displayed crystallinity characteristics at peak of 22°. For Tensile strength, the TPS/RHB blend at 7% of RHB showed the highest value at 25 MPa. The inverse trend was observed for elongation at break in which the unfilled TPS showed the highest percentage at 21%. Based on the results portrayed by the analyses, it was clearly proven that the incorporation of RHB into TPS has brought a great improvement of mechanical properties of TPS.

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CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

In current years, the environmental problems due to the usage of polymers have increased and become serious especially involving the consumption of packaging materials and off-set plastic bags and cups. Disposal of large volume of plastic as well as the depletion of non-renewable petroleum source have prompted to an increasing interest on design of new environmental-friendly polymer. This problem has given self-awareness and grow the passion to the scientist to begin a research on the development of plastics that degrade more rapidly in the environment, leading to a complete mineralization or bio-assimilation of plastics (Aminabhavi, 1990). It is an urgent need to create and develop new biopolymer which is biodegradable materials that have comparable properties with today's polymeric materials at equivalent cost. The existed biopolymer are derived from both synthetic and natural resources but at high cost. Thus, an alternative way to overcome this problem is by using agricultural products in plastic applications in order to reduce surplus farms products and to develop nonfood applications (L. Averous, 1999).

Thermoplastic starch (TPS) is a new material in the application of biodegradable plastic and one of the most studied polymer in this field. Starch is not a true thermoplastic