



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

INVESTIGATION ON THE CHARACTERISTIC OF THERMOPLASTIC CORNSTARCH COMPOSITE REINFORCED SHORT PINEAPPLE LEAF FIBRE (PALF) BY USING DIFFERENT METHOD OF PREPARATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Manufacturing Automotive (BMMA) with Honours.

by

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Tajuk: Investigation on the characteristic of thermoplastic cornstarch composite reinforced short pineapple leaf fiber (PALF) by using different method of preparation

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Manufacturing Automotive (BMMA) with Honours. The member of the supervisory is as follow:

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ABSTRACT

This research intends investigation on the characteristic of thermoplastic corn starch composite reinforced short pineapple leaf fibre PALF by using different methods of preparation the different composition will be given a different result by using a testing method such as tensile test, impact test, flexural test, and moisture content and density measurement. Pineapple leaf fibre PALF with short length 2mm will be parameter for all composition percentage for PALF/TPCS is 20/80, 30/70, 40/60, 50/50 and 60/40. **The all specimens were validated by comparing the experimental results and the numerical results.** In this project, TPCS/PALF composite will show a different result during a mechanical test, physical test and environment test by the using a different percentage combination of PALF and TPCS. The main objectives of this experiment are to investigate on the characteristic of thermoplastic corn starch TPCS composite reinforced short pineapple leaf fibre PALF by using different methods of preparation mixture (blended) and layer (lamina sandwich). The PALF use as reinforcement and TPCS matrix show positive result with all experimental it almost show that biodegradable composite has potential as replacement fibre synthetic but need more research to make it better in future. From the results, it can be concluded that the mechanical properties can be different result for every different specimen had been tested by mechanical testing in the laboratory.

ABSTRAK

Penyelidikan ini mensasarkan penyiasatan ciri-ciri termoplastik tepung jagung berasaskan komposit serat daun nenas (PALF) dengan menggunakan kaedah penyediaan yang berbeza dan komposisi yang berlainan akan memberikan hasil yang berbeza dengan menggunakan kaedah ujian seperti ujian tegangan, ujian, ujian lenturan, dan kelembapan pengukuran kandungan dan ketumpatan. PALF dengan panjang 2mm akan digunakan didalam semua komposisi untuk PALF / TPCS iaitu 20/80, 30/70, 40/60, 50/50 dan 60/40. Semua sample telah disahkan dengan membandingkan hasil eksperimen dan hasil berangka. Dalam penyelidikan ini, sample TPCS yang dicampur dengan PALF mempamerkan hasil yang berbeza semasa ujian mekanikal, ujian fizikal dan ujian persekitaran dengan menggunakan kombinasi peratusan yang berbeza dari PALF dan TPCS. Objektif utama eksperimen ini adalah untuk mengkaji ciri-ciri TPCS dan PALF dengan ukuran panjang yang ditetapkan dengan menggunakan kaedah campuran (campuran) dan lapisan (sandwich lamina) yang berlainan. Penggunaan PALF sebagai bahan semula jadi dan matriks TPCS diharapkan menunjukkan hasil yang positif dengan semua eksperimen yang dilakukan akan menunjukkan bahawa komposit dari sumber semula jadi mempunyai potensi sebagai serat penggantian semula jadi. Dapat disimpulkan disini bahawa sifat-sifat campuran PALF dan TPCS dapat menghasilkan hasil yang berbeza untuk setiap spesimen yang berbeza telah diuji di makmal uji kaji.

DEDICATION

This report is dedicated to my beloved parents, my family members and my friends who always give me full support and encourages completing my final year project. In addition, my final year group mates who giving me guidance and assists during the project.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
l	-	Length
m	-	Mass
P	-	Pressure
z	-	Height
mm	-	Millimetre

CHAPTER 1

INTRODUCTION

1.1 Introduction

Plastic or chemical material that is made from petroleum based material polymer have caused negative impact to environmental that cause due the accumulation of non-biodegradable waste. Many plastic products among world, mostly used for many applications are coming from petroleum-based polymeric materials. Their use is size ready in massive scale availableness, low cost, light weight, extremely demand uses and sensible mechanical properties. However, these materials have some disadvantaged as a result, they were synthesized from a non-renewable supply, creating them have some materials not suitable for biodegradable. This characteristic results in some supply of generation associate degree accumulation of non-degradable residues that build petroleum-based polymer as an environmental harmful waste.

Lately the world talking about environmental awareness and community interest, the recent environmental regulations and unsustainable consumption of chemical like petroleum, direct to thinking about the use of environmentally eco-green materials. Polymer composites are considered one among the environmentally eco green materials that sensible properties compared to synthetic fibre.

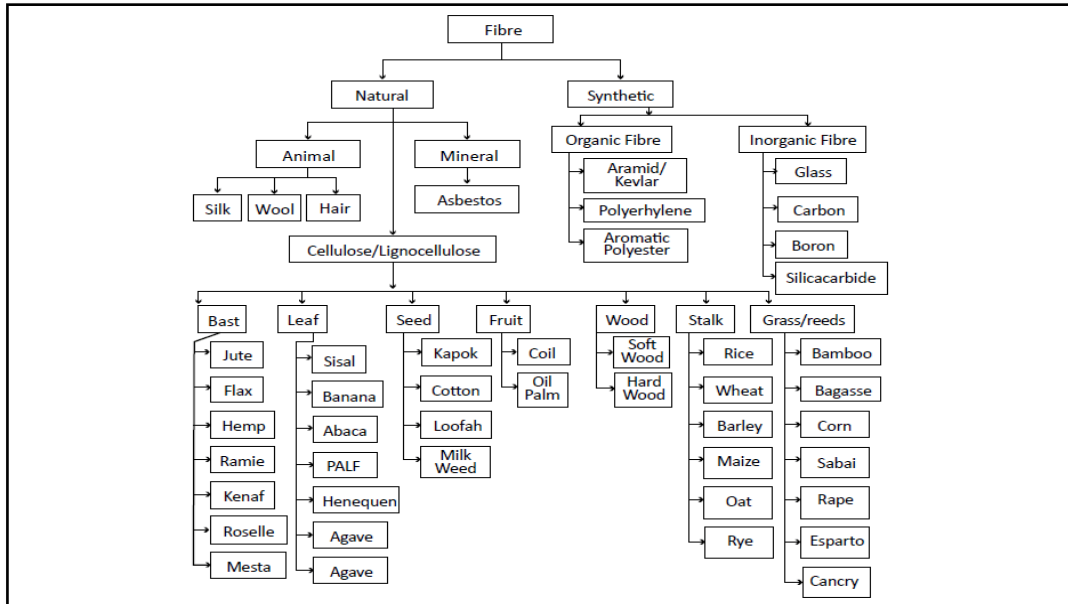


Figure 1.1 : Classification of natural fibre(Jawaid *et al.*,2010)

1.2 Problem Statement

Recently used on synthetic fibre as strengthened composites have an effect on the setting and cause pollution to the soil as there non-renewable, non-biodegradable and not eco-green friendly even it sensible mechanical properties. Besides, matrix composite iswide obtainable, renewable, recyclable, and biodegradable. Therefore, the combination fibreand thermoplastic used composite as the matrix materials that fully green materials for each inexperienced composite materials accustomed turn out composite might reveal an honest potential end in mechanical properties particularly for plastic industry product. But this materialhas some problem that should be further research to produce materials stronger and can replace plastic composite. Below is several problem statements:

1. Moisture sensitivity TPCS blended with PALF by different methods (mixture and layer).
2. Mechanical properties of TPCS in relation with PALF.
3. Different compositions of TPCS and PALF effect properties the strength material.
4. Compatibility between the different polymers through blend analysis.

1.3 Objective

There are three main goals to achieve in this project:

1. To ensure the compatibility biodegradable composite as a replacement for man-made fibre (synthetic fibre) or plastic.
2. To determine the effect of taking pineapple leaf fibre PALF on the composite properties of PALF / TPCS.
3. To study the effect of different preparation method of TPCS/PALF composites with length 2mm.
4. To determine the composition of PALF/TPCS with different method affect physical properties by duration of time (hours & weeks)

1.4 Work scope

This research will concern the characteristic on thermoplastic cornstarch blended with PALF on mechanical, physical and environmental properties.

1. The suggestion relevant ratio of PALF/TPCS composite will be experimental by mechanical, physical, and environment.
2. The composition of ratio in the PALF/TPCS composite was fixed at 20/80, 30/70, 40/60, 50/50 and 60/40.
3. Two methods will use for all specimen preparation, mixture and layer (lamina sandwich).
4. The mechanical properties for all specimen PALF/TPCS will be tested by duration time (hours and weeks).
5. The material length will be also be fixed by the length of 2mm for all method.
6. The properties of the TPCS/PALF composites will be foundand be experimentally by used mechanical test, physical test and environment testing.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The lately recently has seen the advancement of biodegradable materials that plans to change the human impact on nature. Inexperienced polymers area unit show the inclination set of this stream and varied bio-sourced plastics are created by industry. Starch as an agro-sourced polymer has obtained much attention in chemical and component industry recently due to its strong advantages such as low cost, easy to produce, wide availability, and totally green chemical without toxic residues. However, despite considerable industrial being out there, the basic properties (mechanical properties, condition sensitivity) of plasticized starch-based materials need to be accumulated to change such materials to be very competitive with petroleum-based with ancient plastics over a wider vary of applications.

The various types of characteristic strands, for example hemp, oil palm, and bamboo fortified polymer composite have gotten an awesome significance in various car applications, auxiliary parts, pressing, and construction. Composite fibres are finding in electrical and electronic enterprises, aviation, sports, amusement gear, pontoons, apparatus office items, and many more. The across the board application in polymer composites because of its low particular weight, moderately high quality,

generally low generation cost, protection from consumption and exhaustion, absolutely biodegradable, enhancing the surface complete of shaped part composites, generally great mechanical properties, accessible and inexhaustible sources when contrasted with engineered filaments.

2.1.1 Matrix composite material application in the interior car

Many of the automotive firms at intervals the globe have do numerous investigation and testing thus on insert the composite in their products in car industry. The automotive manufacture in Europe has done numerous researches to extend the applications of fibre or composite in automotive trade particular in automotive interior like seat backs, parcel shelves, boot linens, front and rear door linens, truck linens, and door-trim panels. For that the utilization for automotive interior elements in industry, fibre embedded in polymers has been used for top demand request applications for exterior automobile body elements, like the middle section between the headlights higher than the fender of a passenger bus. Matrix composite using in interior of automotive as a result of half in automotive may be replace if customer want to change to the new part in interior by customer to get comfortable while driving(Mohammed et al., 2015)

2.1.2 Matrix composite and natural fibre composites application in the industry

In addition, other side the automotive industry, the applications of matrix composite are found in building and construction, aerospace, sports, and more, such as partition boards, ceilings, boats, office products, and machinery. The think about one among the best demand materials used as a region of inexperienced materials at now. The foremost application of composite materials area unit focused on non-load bearing indoor parts in technology due to their vulnerability to environment attack. It can be