UNIVERSITI TEKNOLOGI MARA

MECHANICAL PROPERTIES OF KENAF REINFORCED THERMOPLASTICS: EFFECT OF VARIOUS SURFACE TREATMENTS

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ABSTRACT

Natural fibres are proven advantageous as fillers for composites over manmade fibres. They possess non abrasiveness compare to glass fibre, low in cost, abundantly available, biodegradable and can be recycled. One of potential natural fibre that has gained interest is kenaf fibres *(Hibiscus Cannabinus L.).* The bast of kenaf fibres are excellent reinforcing materials when compounding with thermoplastics, commonly polypropylene (PP) and polyethylene (PE). However, the hydrophilic behavior of kenaf fibres leads to poor adhesion with hydrophobic polymer matrices which a factor in determining the physical and mechanical properties of composites. In this study, silane, maleic anhydride and alkali treatment were used as chemical treatments for kenaf-low density polyethylene (LDPE) composites. The fibre loadings were varied from 5wt% to 25wt%. Silane and maleic anhydride treatment were 3wt% concentration, respectively and alkali treatment was 10wt%. Tensile, flexural and impact tests were conducted according to appropriate ASTM standards. While the surface fracture of composites were determined by scanning electron microscopy (SEM). The results obtained indicated that the kenaf fibres have high potential as reinforcement in LDPE composites and the chemical treatments enhanced the properties of the composites but at varying degrees. The tensile and flexural properties of treated and untreated composites were found to increase with the increasing of kenaf contents however, reduce in elongation at breaks and impact strength. Silane treatment showed slight improvement in tensile properties however maleic anhydride and alkali treatment did not demonstrate improvement in mechanical properties. The SEM evidence in tensile fractures of both untreated and treated kenaf-LDPE composites revealed that the fibres mostly ruptured outside the matrix due to lack of fibre-matrix adhesion and as a result, reduce the strengths. This finding would suggest that the surface treatments were unable to bond fibre and matrix sufficiently due to less efficient adsorption of surface treatment and critical time factor when compounding.

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CHAPTER 1

INTRODUCTION

1.1 Background of The Study

We live on a planet where polymeric materials are made for human ease. Instead, we even work and sleep with them. They have transformed our modern life towards high capability and efficiency. It is not unusual that we can travel a hundred times faster than normal, do things that were difficult in the past and our health is moreover being improved. Polymeric materials have remarkably impacted our life nowadays.

Polymer matrices can be reinforced with fibres to reduce cost and improving their properties and dimensional stability. Common manmade fibres such as fibreglass, aramid & carbon fibres have been used in composite materials to revolutionise our appliances into more economical value. Usually they offer tremendous performance for high-end products. In spite of being too useful however, these materials would negatively affect us in return. Their shortcoming revealed as soon as they are being discarded. Normally, composite materials are very difficult to decompose under natural condition and with respect of time will lead to critical environmental problems. One of the big issues nowadays is the green house effect. Huge manipulation on petroleum products would create global warming.

In lieu of these problems, there are great extents to manipulate composite materials by utilizing natural fibres with polymer matrices. This type of composite is not