UNIVERSITI TEKNOLOGI MARA

RICE STRAW REINFORCED POLY(LACTIC ACID) BIOPOLYMER. MECHANICAL AND THERMAL PROPERTIES

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ABSTRACT

THE EFFECT OF FIBRE CONTENT ON THERMAL AND MECHANICAL PROPERTIES OF POLY(LACTIC ACID) REINFORCED WITH RICE STRAW.

Poly(lactic) acid is currently a most potential and popular polymeric material, which will play a key role in building of a sustainable bioeconomy. Knowledge of biodegradation of PLA is crucial for treating plastic wastes and easing the serious energy crisis. The biodegradability of Poly(lactic) acid based on microorganisms (bacteria and fungus) and biochemical processes of degradation have been advanced in recent years. However, using 100 percent amount of Poly(lactic) acid to produce a plastic film need high cost and the plastic film tend to be brittle. Addition of natural fibre which is rice straw has reduced the cost as well as enhanced the strength of the film. The objectives of this study is to fabricate biopolymer Poly(lactic) acid reinforced with various ratio of RS namely 0, 10, 20, 30, and 40 (% w/w). Other than that, the aim of this study is to investigate thermal and mechanical properties of PLA/RS biopolymer by various testing such as Fourier Transform Infrared Analysis (FTIR), Differential Scanning Calorimeter (DSC), tensile, and water absorption test and as well as to analyse biodegradability of PLA/RS biopolymer by soil-degradability test. The result of FTIR distinctly showed that bonding of hydrogen present between the polymers can increase the toughness of the film. This bonding is presented at frequency 2996 cm^{-1} and 3500cm^{-1} which contributed to the hydrogen bonding. In this research the optimum fibre loading is 10% because it the higher value of tensile strength among others which is 15.11MPa. Other than that, the percent crystallinity of film with optimum rice straw fibre content is higher than neat Poly(lactic) acid film which is 253.80% as compared to 133.13%. The PLA/RS film also can withstand under modest to high temperature with the highest melting temperature (Tm) at 59.64°C and optimum glass temperature (Tg) at 152.08°C. Besides, the percentage of water intake of PLA/RS increased gradually with increment of RS fibre through the hydrophobicity property in RS fibre was lead to improvement in biodegradation.

TABLE OF CONTENT

	Page
ABSTRACT	IV
ABSTRAK	V
ACKNOWLEDGEMENT	VI
TABLE OF CONTENT	VII
LIST OF TABLES	IX
LIST OF FIGURES	X
LIST OF ABBREVIATIONS	XII
CHAPTER 1: INTRODUCTION	
1.1 Background	1
1.2 Problem Statement	3
1.3 Significant of Study	4
1.4 Objectives	4
CHAPTER 2: LITERATURE REVIEW	
2.1 Background	5
2.2 Type of Plastics	6
2.2.1 Poly-lactic acid (PLA) as a Biodegradable Plastic	7
2.2.2 Application of Biodegradable Plastic	8
2.3 Rice Straw (RS)	9
2.4 Maleic Anhydride (MA)	11
2.5 Effect of Filler Loading on the Mechanical Properties of RS reinforced PLA Biopolymer.	11
CHAPTER 3: METHODOLOGY	
3.1 Material	14
3.2 Pre-treatment of RS	15
3.3 Preparation of Biopolymer	15
3.4 Characterization and Testing	16
3.4.1 Fourier Transform Infrared Spectroscopy (FTIR)	16
3.4.2 Differential Scanning Calorimeter (DSC)	16

3.4.3 Tensile Test 17
3.4.4 Water Absorption Test 18
3.4.5 Biodegradable Test 18
3.5 Flow Chart 19

CHAPTER 4: RESULT AND DISCUSSION
4.1 Fourier Transform Infrared (FTIR) Analysis 20
4.2 Differential Scanning Calorimeter (DSC) 23
4.3 Tensile Test 25
4.4 Water Absorption Test 28
4.5 Biodegradable Test 29

CHAPTER 5: CONCLUSION AND RECOMMENDATION
5.1 Conclusion 31
5.2 Recommendation 32

REFRENCES 33

CURRICULUM VITAE 36