

raf

TP1180\_F37\_2012.



0000100134

The mechanical properties of polypropylene / polylactic acid (PP/PLA) polymer blends / Farhana Masron.

### SUPERVISOR DECLARATION

“I declare that I have read this thesis and in my opinion  
this report is sufficient in terms of scope and quality for the award of  
the degree of Bachelor of Mechanical Engineering (Structure and Material)”

Signature : 

Supervisor : *Mohd Naw Azmi bin Nordin*

Date : *3 July 2012*

**THE MECHANICAL PROPERTIES OF  
POLYPROPYLENE / POLYLACTIC ACID (PP/PLA) POLYMER BLENDS**

**FARHANA BTE MASRON**

**This report is submitted to Faculty of Mechanical Engineering as a requirement to  
get award of Degree of Mechanical Engineering (Structure & Material)**

**Faculty of Mechanical Engineering  
Universiti Teknikal Malaysia Melaka**

**JUNE 2012**

## DECLARATION

“I hereby declare that the work in this report is my own except for summaries and quotations which have been duly acknowledged.”

Signature : .....

Author : FARHANA BTE MASRON

Date : 30 JUNE 2012

I dedicate this dissertation to my family, especially...  
to Dad, Masron b. Ahmad Dasuki and  
Mom, Habsah bt. Surip for instilling the importance of hard work  
and higher education;  
to friends, Narissa, Hafizah and Fakhrezah—may you also be motivated  
and encouraged to reach your dreams;  
finally to Hamzaitul Akmarizal,  
thank you for your strength, support and inspiration.

## ACKNOWLEDGEMENTS

In the name of Allah, I was very thankful for His kindness that helps me a lot in facing all challenges to make this project succeed.

A big thank you goes to my supervisor, Mr Mohd Nur Azmi bin Nordin for all his guidance and also sharing knowledge and experiences that help me a lot in completing this project smoothly. I also like to thank to all lecturers and staffs of Faculty of Mechanical Engineering that involved directly or indirectly in giving helps, options and ideas. Also, not forgotten, special thank to the lecturers and staffs of Faculty of Manufacturing Engineering because of their help throughout in this project.

I am also obliged to everyone who had directly and indirectly involved in contributing the ideas. Millions of appreciations to my beloved family for their moral and materials support. I would like to thank all my friends for their support and giving their constructive critics. With the support and love given by all of you, I hope I will become a successful person and can contribute to my beloved country, Malaysia. Thank you.

## ABSTRACT

Polypropylene (PP) was chosen as raw material in this study due to low cost and good mechanical properties. This factor encourages many researchers in many fields of study to choose PP as the material. In the other side, PLA has advantage in degradability because it is classified as a biodegradable polymer under specific condition. The objective of this study is to produce the PP/PLA polymer blends. The purpose of producing this polymer blends is to investigate the mechanical properties of PP/PLA polymer blends by running several mechanical tests such as tensile, 3 points bending and Charpy impact test. In this study, the specimens of PP/PLA polymer blends with difference weight ratio were produced and the optimum weight ratio will be evaluated in each mechanical test that had been done. Other than that, biodegradable test was run to investigate the biodegradability of polymer blends and FTIR test to investigate the bonding of new polymer blends. In this study, the specimens of the PP/PLA polymer blends with the different weight percentage – PLA 5 wt%, 10 wt% and 15 wt % produced by melting compound process. From the tensile test, PP/PLA 5 wt% had higher tensile strength but same Young's modulus with other blends. For flexural properties, PP/PLA 10 wt% had highest flexural strength and modulus compared to Neat PP and PP/PLA polymer blends. For impact strength, the PP/PLA blends had low impact strength compared to Neat PP. For biodegradable test, PP/PLA polymer blends showed that the blends had ability to biodegrade in specific condition for 8 weeks and PP/PLA 10 wt% showed the highest percentage of weight reduction which was 1.3%. Finally, from the FTIR test, the chemical bonding of PP/PLA polymer blends showed that the blends had combination of chemical bonding of PP and PLA.

## ABSTRAK

PP dipilih di dalam kajian ini kerana telah digunakan secara meluas di dalam pelbagai bidang dan harganya yang rendah berbanding polimer lain sehingga telah menarik minat banyak syarikat menggunakannya sebagai bahan mentah dalam penghasilan produk mereka. Jika dilihat dari sudut berbeza, PLA pula mempunyai kebolehan untuk terurai atau degradasi kerana PLA telah dikenalpasti sebagai polimer biodegradasi sekiranya berada di dalam keadaan yang sesuai. Di dalam penyelidikan ini, bahan uji kaji iaitu PP dan PLA polimer akan disatukan bersama dan akan dihasilkan dengan nisbah berat yang berbeza antara PP dan PLA- 5 wt%, 10 wt% dan 15 wt%, dan seterusnya nisbah berat optimum akan dinilai berdasarkan setiap keputusan ujian mekanikal yang telah dijalankan. Ujian mekanikal yang dijalankan bertujuan untuk mengkaji sifat-sifat mekanik dengan menjalankan ujian seperti ujian ketegangan, kelenturan, hentaman Charpy dan kekerasan. Daripada kajian ini, PP/PLA 5 wt% mempunyai kekuatan tegangan yang paling tinggi tetapi nilai modulus Young yang sama dengan komposisi lain. Untuk ujian lenturan, PP/PLA 10 wt% mempunyai nilai ketegangan lenturan yang paling tinggi berbanding komposisi lain. Daripada kajian ini. Kebolehan biodegradasi oleh PLA telah menyebabkan campuran polimer PP/PLA juga mewarisi sifat biodegradasinya. Kaedah “Fourier Transform Infrared Radiation” (FTIR) dijalankan untuk mengkaji keterlarutan campuran yg telah dihasilkan. Istilah keterlarut campuran adalah penting untuk menganalpasti jenis ikatan kimia polimer. Jenis ikatan kimia ini akan memberi kesan kepada sifat-sifat mekanik.

## TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	<b>TITLE PAGE</b>	i
	<b>DECLARATION</b>	ii
	<b>DEDICATION</b>	iii
	<b>ACKNOWLEDGEMENTS</b>	iv
	<b>ABSTRACT</b>	v
	<b>ABSTRAK</b>	vi
	<b>TABLE OF CONTENTS</b>	vii
	<b>LISTS OF FIGURE</b>	x
	<b>LIST OF TABLE</b>	xiv
	<b>LIST OF ABBREVIATION AND SYMBOLS</b>	xv
<b>CHAPTER 1</b>	<b>INTRODUCTION</b>	
	1.1 BACKGROUND	1
	1.1.1 Polymer	1
	1.1.2 Crystallinity In Polymers	2
	1.1.3 Melting Temperature, $T_m$ and Glass Transition Temperature, $T_g$ in Polymers	6
	1.1.4 Polymer blends	8
	1.1.5 Polypropylene (PP)	10
	1.1.6 Polylactide (PLA)	14
	1.2 PROBLEM STATEMENTS	17
	1.3 OBJECTIVE	18
	1.4 SCOPE	18



<b>CHAPTER</b>	<b>TITLE</b>	<b>PAGE</b>
<b>CHAPTER 2</b>	<b>LITERATURE REVIEW</b>	
	2.1 INTRODUCTION	19
	2.1.1 Tensile and Flexural Test	19
	2.1.2 Charpy Impact Test	26
	2.2 BIODEGRADABLE POLYMERS	28
	2.2.1 Biodegradation of PLA	29
	2.3 FTIR SPECTROSCOPY	31
<b>CHAPTER 3</b>	<b>METHODOLOGY</b>	
	3.1 INTRODUCTION	35
	3.2 MATERIALS	36
	3.3 SAMPLES PREPARATION	37
	3.3.1 PP/PLA Specimens	37
	3.3.2 Neat PP Specimens	43
	3.4 MECHANICAL TEST	43
	3.4.1 Tensile Test	43
	3.4.2 Flexure Test	44
	3.4.2 Charpy Impact Test	45
	3.5 BIODEGRADABLE TEST	46
	3.6 FTIR TEST	47
<b>CHAPTER 4</b>	<b>RESULT AND ANALYSIS</b>	
	4.1 INTRODUCTION	48
	4.2 TENSILE TEST RESULT	48
	4.3 FLEXURAL TEST RESULT	54
	4.4 CHARPY IMPACT TEST	59
	4.5 BIODEGRADABLE TEST	60
	4.6 FTIR SPECTROSCOPY	60

<b>CHAPTER</b>	<b>TITLE</b>	<b>PAGE</b>
<b>CHAPTER 5</b>	<b>DISCUSSION</b>	
	5.1 INTRODUCTION	63
	5.2 TENSILE AND FLEXURAL PROPERTIES	63
	5.3 IMPACT STRENGTH	68
	5.4 BIODEGRADABILITY	69
	5.5 FTIR SPECTROSCOPY	70
<b>CHAPTER 6</b>	<b>CONCLUSION AND RECOMMENDATION</b>	
	6.1 CONCLUSION	68
	6.2 RECOMMENDATION	69
	<b>REFERENCES</b>	73
	<b>APPENDIX</b>	78

## LIST OF FIGURES

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Schematic illustration of molecular structure of polymers (a) linear, (b) branched, (c) cross-linked and (d) network	2
1.2	Crystalline and amorphous region in polymer	3
1.3	Schematic of detailed structure of a spherulite	4
1.4	Stages in the deformation of semicrystalline polymer. (a) Two adjacent chain folded lamellae and interlamellar amorphous material before deformation. (b) Elongation of amorphous tie chains during first stage of deformation. (c) Tilting of lamellar chain folds during the second stage. (d) Separation of the crystalline block segments during the third stage. (e) Orientation of block segments and tie chains with the tensile axis in final stage	5
1.5	Specific volume versus temperature for amorphous (curve A), semicrystalline (curve B) and crystalline (curve C)	7
1.6	Monomer of PP	10
1.7	Monomer of propylene become polypropylene after polymerization	10
1.8 (a)	Schematics of metallocene catalyst	11
1.8 (b)	Ziegler-Natta catalyst	11
1.9	Mechanism of Ziegler-Natta polymerization process	11
1.10	Tacticity of Polymer	12
1.11	Production of PLA	14
1.12	From left: D-lactide, L-lactide and Meso-lactide	15

2.1	Universal Tensile Test Machine	20
2.2	Tensile Test Specimens	20
2.3	Stress vs strain curve for tensile test	21
2.4	Tensile strengths of metals, ceramics, polymer and composites/fibers	22
2.5	Flexural test specimens in testing machine	23
2.6	Tensile strength and modulus for PP/lignin blends	24
2.7	Flexural strength and modulus for PP/lignin blends	24
2.8	Stress-strain curves for PLA/PCL blends	25
2.9	Flexural strength of PLA/PCL blends	25
2.10	Charpy Impact test instrument	26
2.11	Classification of Biodegradable Polymers	28
2.12	PLA hydrolysis and molecular weight loss	30
2.13	Degradation of PLA under landfill condition	31
2.14	Wavenumber at characteristic frequencies	32
2.15	Wavenumber of PP using FTIR	33
2.16	Wavenumber of lactic acid (LA) and PLA using FTIR	34
3.1	Flow Chart of the fabrication process	36
3.2	HAAKE Internal Mixer	38
3.3 (a)	Compound of PP/PLA polymer blends	38
3.3 (b)	Pellet size of PP/PLA polymer blends	38
3.4	Crusher Machine	39
3.5	Pellet size of PP/PLA compound placed in mold	39
3.6	Hot Press Machine	40
3.7	Plate shape of PP/PLA polymer blends	40
3.8	Sample Cutter Machine	41
3.9 (a)	Dimension of tensile test specimen	41
3.9 (b)	Specimen of tensile test	41
3.10 (a)	Dimension for bending test	42
3.10 (b)	Specimen for bending test	42
3.11 (a)	Dimension of Charpy Impact test	42

3.11 (b)	Specimen of Charpy Impact test	42
3.12	Shimadzu Universal Testing Machine	43
3.13 (a)	Specimen during testing	44
3.13 (b)	Specimen after break	44
3.14	Specimen of bending test during testing	45
3.15	Charpy Impact Tester	45
3.16	Samples placed before buried in soil for biodegradable test	46
3.17	PerkinElmer Spectrum 100 FTIR Spectrometer	47
4.1	Stress-strain diagrams for Neat PP specimens	49
4.2	Stress-strain diagrams for PP/PLA 5 wt% specimens	50
4.3	Stress-strain diagrams for PP/PLA 10 wt% specimens	52
4.4	Stress-strain diagrams for PP/PLA 15 wt% specimens	53
4.5	Stress-strain diagrams for Neat PP specimens	54
4.6	Stress-strain diagrams for PP/PLA 5 wt% specimens	55
4.7	Graph of stress versus strain for PP/PLA 10 wt% specimens	57
4.8	Stress versus strain for PP/PLA 15 wt% specimens	58
4.9	FTIR spectra for Neat PP	61
4.10	FTIR spectra for Neat PLA	61
5.1	Stress-strain diagrams for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt% specimens	64
5.2	Graph of tensile strength and Young's modulus for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt%	65
5.3	Stress-strain diagrams for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt% specimens	66
5.4	Graph of flexural strength and flexural modulus for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt%	67
5.5	Graph of average impact energy for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt %	68
5.6	Graph of different weight percentage of Neat PP, PP/PLA 3 wt%, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt% specimens	69

5.7	FTIR spectra for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt%	70
-----	--	----

## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Melting and Glass Transition Temperatures for Some of Common Polymeric Materials	8
1.2	Mechanical properties	13
1.3	Mechanical properties of PLA	16
3.1	Properties of PP and PLA	37
3.2	Weight percentage (wt%) of PP and PLA for each type specimen	37
3.3	Weight of specimens for biodegradable test	46
4.1	Tensile properties for Neat PP specimen	49
4.2	Tensile properties for PP/PLA 5 wt% specimens	51
4.3	Tensile properties for PP/PLA 10 wt % specimens	52
4.4	Tensile properties for PP/PLA 15 wt% specimens	53
4.5	Flexural properties for Neat PP specimens	55
4.6	Flexural properties for PP/PLA 5 wt% specimens	56
4.7	Flexural properties for PP/PLA 10 wt% specimens	57
4.8	Flexural properties for PP/PLA 15 wt% specimens	58
4.9	Energy absorb by the Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt% specimens	59
4.10	Weight of Neat PP, PP/PLA 3 wt%, PP/PLA 5 wt%, PP/PLA 10wt % and PP/PLA 15 wt% specimens for eight weeks	60
5.1	Tensile properties for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt % specimens	64
5.2	Average flexural strength, strain and flexural modulus for Neat PP, PP/PLA 5 wt%, PP/PLA 10 wt% and PP/PLA 15 wt%.	66

**LIST OF ABBREVIATION AND SYMBOL**

PP	=	Polypropylene
PLA	=	Polylactic Acid
PE	=	Polyethylene
PS	=	Polystyrene
HDPE	=	High Density Polyethylene
LDPE	=	Low Density Polyethylene
PPO	=	poly(dimethylphenylene oxide)
UV	=	Ultra Violet
EPDM	=	Ethylene–Propylene–Diene Elastomer
FTIR	=	Fourier Transform Infra Red
SDN.BHD.	=	Sendirian Berhad
$T_m$	=	Melting temperature
$T_g$	=	Glass Temperature
m	=	Meter
mm	=	milimeter
g	=	gram
°C	=	degree Celcius
$\sigma$	=	Stress
E	=	Young's modulus
wt%	=	weight percentage



## CHAPTER 1

### INTRODUCTION

#### 1.1 BACKGROUND

##### 1.1.1 POLYMER

Polymer is a particular class of macro-molecules that consist of repeated chemical units, also called monomer, joined end to end, or possible in more complicated ways by covalent bonds to form a chain molecule. In a simple word, polymer means a chain of monomers repeated and linked with each other to produce a long chain. If there are only one monomer repeated in a chain, it is called homopolymer but copolymer occur when more than one monomer present. Carbon and hydrogen are the most common atoms in monomer but other atom may be present such as oxygen, nitrogen, and silicon. Some of the common polymers are polyethylene (PE), polystyrene (PS) and polypropylene (PP) [1]. Polymers also has many possible classification which are the type of polymerization process used to process them, structure of the polymer whether it is linear, branched or network polymer, and also based on their properties whether it is thermoplastics or thermosetting [2].

Figure 1.1 below represents the type of molecular structure of polymers. If monomers linked end to end in single chain, it called linear polymer. Polyethylene is an example of linear polymer. Branched polymer has molecular structure where the side-

branch chains connected to the main chain. In cross-linked polymer, a few linear chains are joined together at various positions by covalent bonds such as rubber. The term of network polymer is when multifunctional monomers that have three or more active covalent bands form three dimensional networks and epoxies belong to this group [3].

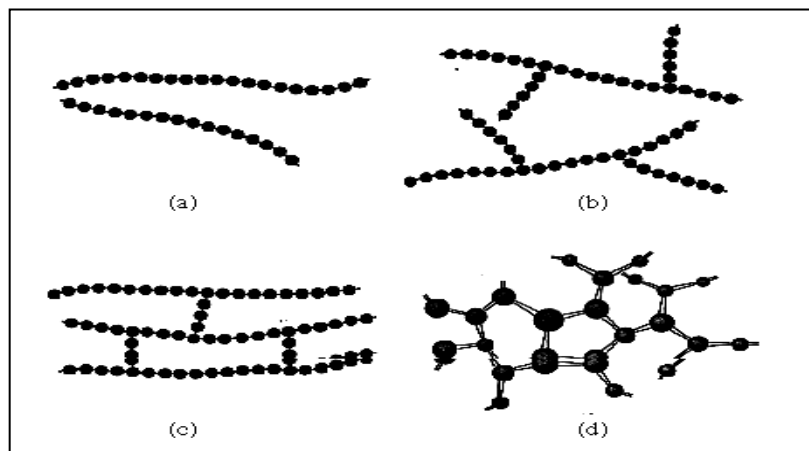


Figure 1.1 Schematic illustration of molecular structure of polymers (a) linear, (b) branched, (c) cross-linked and (d) network <sup>[4]</sup>

Linear and branched polymers form a class of materials known as thermoplastic. A thermoplastic material is a high molecular weight polymer that is not cross linked. That is why these materials flow when give heat and can be molded into many shapes which they retain when cool but differ with the thermosetting materials. A thermosetting material is a heavy cross-linking material and once the cross-links form; these polymers cannot be changed anymore without destroying the plastics.

### 1.1.2 CRYSTALLINITY IN POLYMERS

Polymers exist both in crystalline and amorphous region and this is called semicrystalline material. Crystalline region exists when the molecular chains packed in ordered arrangement and amorphous region exist in between these crystalline region which are arranged in disorganized state. Crystallinity is an indication of amount of crystalline region respect to amorphous region in polymer. Figure 1.2 illustrate the crystalline and amorphous region in polymer. When crystallinity increased, the rigidity,

tensile strength and opacity (due to light scattering) also increased. Amorphous polymers are usually less rigid, easily to deformed and often transparent. The factors that influence the degree of crystallinity are chain length, chain branching and interchain bonding. Crystallinity in a polymer is very important in order to determine its properties. The more crystalline region in the polymer, the stronger and less flexible it become.

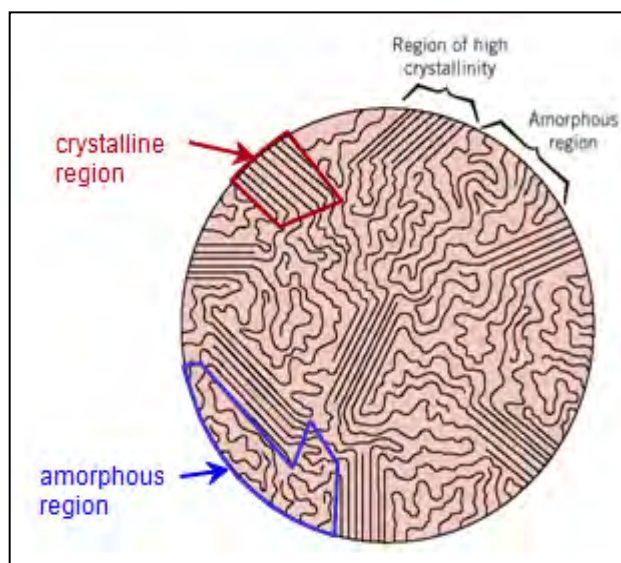


Figure 1.2 Crystalline and amorphous region in polymer [3]

For example, high density polyethylene (HDPE) form from very long unbranched hydrocarbon chains. These chains pack together easily in crystalline region and also alternate with amorphous region and finally produce the relatively strong and stiff. Compared to the low density polyethylene (LDPE) that form from smaller and many branched chains, these do not easily adopt crystalline structures. This polymer is softer, weaker, low density and easily deformed compared to HDPE. As a result, mechanical properties such as ductility, tensile strenght and hardness rise directly proportional to tha chain length [4].

Many polymers crystallized from a melt will form spherulites and each sperulites may grow to be spherical in shape and consist of lamellar such illustrated in Figure 1.3. Lamellar is the crystalline portion and the outside of lamellar is amorphous region. The lamellar crystals grows from center of spherullite [5]. To pass through amorphous

region, tie-chain molecules act as connecting links between adjacent lamellar. The surface of adjacent spherulites start to impinge on one another when the crystallization of a spherulitic structure near completion.

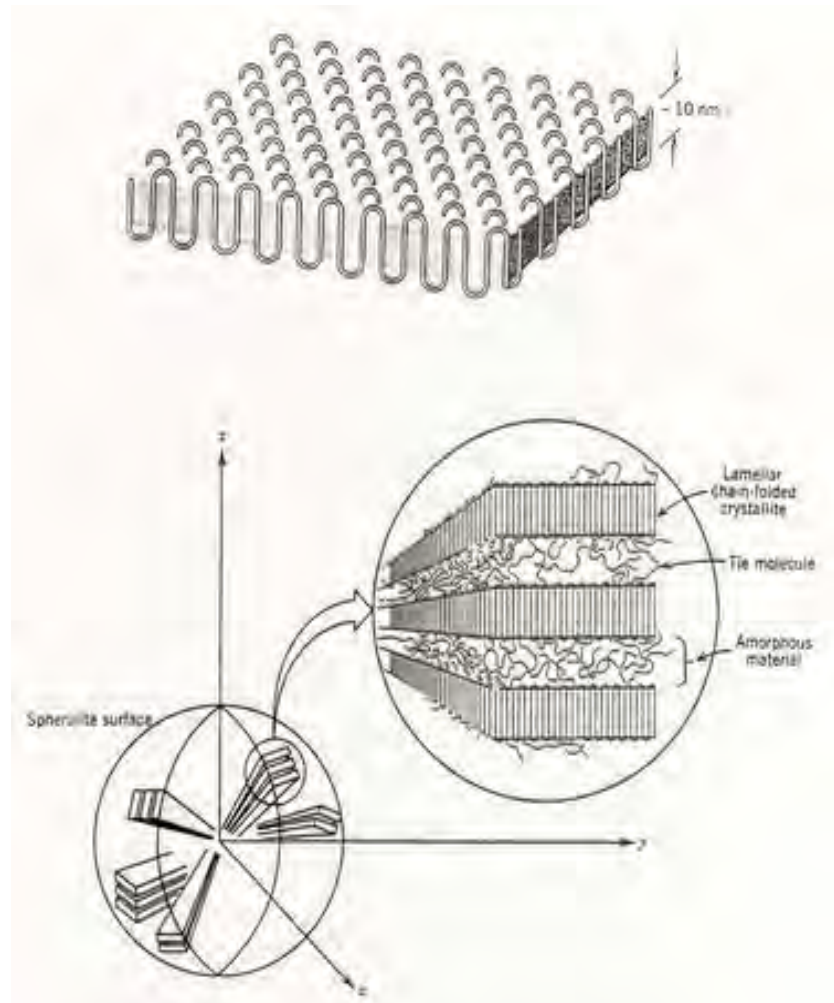


Figure 1.3 Schematic of detailed structure of a spherulite <sup>[4]</sup>

If tensile load applied to the semicrystalline polymer, two adjacent chain-folded lamellar and interlamellar amorphous tend to deform in Figure 1.4 (a). The lamellar will slide each other within the amorphous region become extended in the initial stage as shows in Figure 1.4 (b). In a period of time, the deformation continued and chain folds become aligned with the tensile axis as in Figure 1.4 (c). If more load given, separation between crystalline segments occurred showed in Figure 1.4 (d). Finally, the blocks and tie chains aligned along the direction of tensile axis as in Figure 1.4 (e). Thus, this is

important to choose the right polymer because each polymer has different crystallinity and also has different properties.

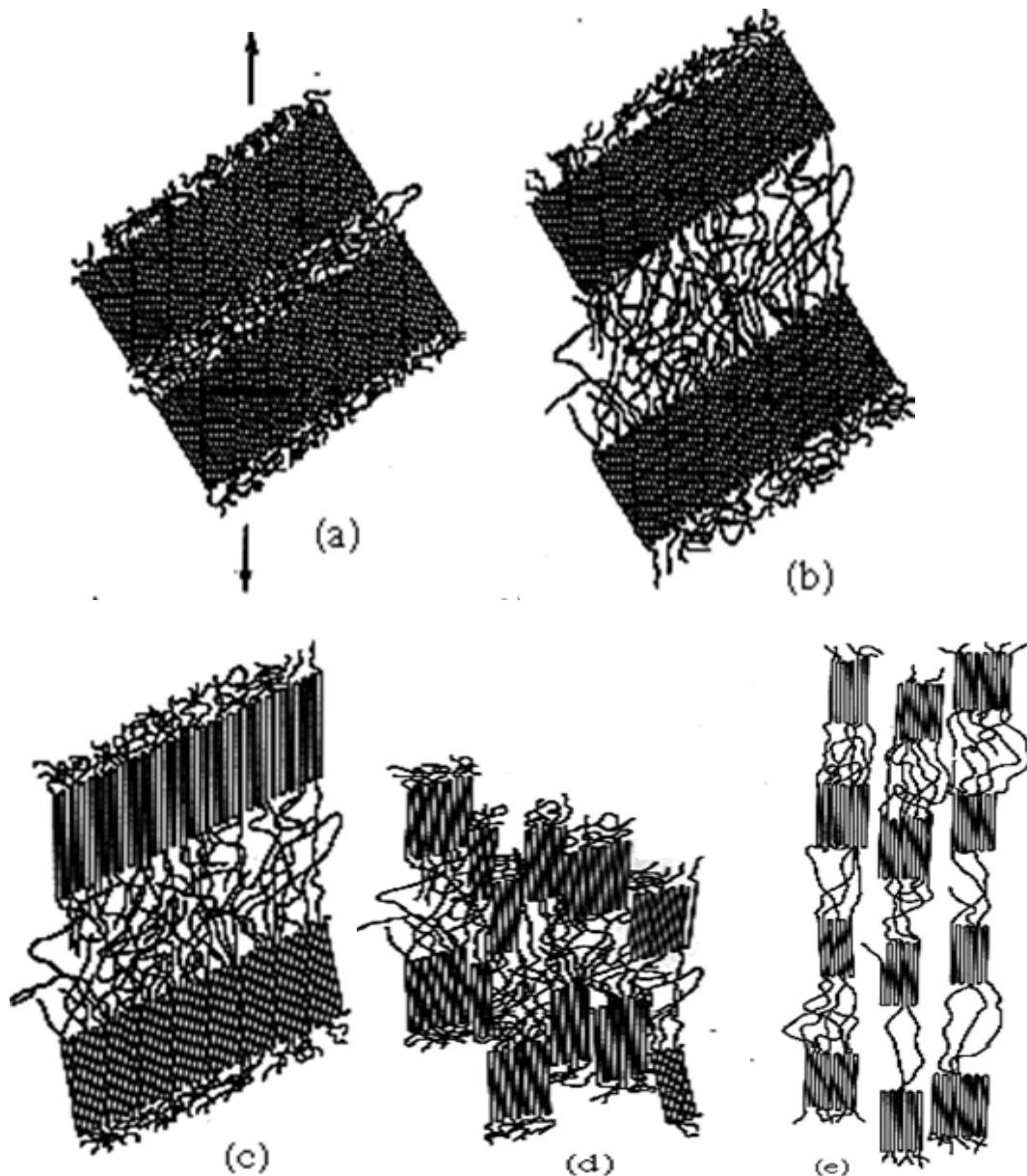


Figure 1.4 Stages in the deformation of semicrystalline polymer. (a) Two adjacent chain folded lamellae and interlamellar amorphous material before deformation. (b) Elongation of amorphous tie chains during first stage of deformation. (c) Tilting of lamellar chain folds during the second stage. (d) Separation of the crystalline block segments during the third stage. (e) Orientation of block segments and tie chains with the tensile axis in final stage<sup>[4]</sup>

### 1.1.3 MELTING TEMPERATURE, $T_m$ AND GLASS TRANSITION TEMPERATURE, $T_g$ IN POLYMER

At the melting temperature,  $T_m$ , the crystalline of polymers will lose their structure or melt.  $T_m$  depends on crystallinity, if crystallinity increases so does  $T_m$ . The melting of polymers takes place over a range of temperatures. The melting behaviour depends on temperature which it crystallizes. Impurities in the polymers also decrease the melting temperature.

The stiffness of the chain controlled by the ease of rotation about the chemical bonds along the chain give the huge effect. The chain flexibility can be lower by the presence of double bonds and aromatic groups in the polymer backbone and finally increase the  $T_m$ . The size and type of side groups influence the chain rotational freedom and flexibility and raise of  $T_m$ . Table 1.1 showed that PP has a higher  $T_m$  than PE which are 175°C and 115°C respectively. It is because methyl group in PP is larger than the hydrogen atom in PE and this increase the  $T_m$  [3].

Glass temperature,  $T_g$  is the temperature where the polymers lose their structural mobility of polymer chains and become rigid glass. The polymer will behave in increasingly brittle manner if the temperature drops below  $T_g$  and becomes more rubber-like if the temperature rise above  $T_g$ . The  $T_g$  also known as the temperature at which the molecules of the material move enough so that can be processed and polymers tend to be brittle below the  $T_g$  [6]. The value of  $T_g$  depends on molecular characteristics that affect chain stiffness, and all factors are same as the  $T_m$ . Thus,  $T_m$  and  $T_g$  is important during selecting materials for various applications.

Figure 1.5 is the  $T_m$  and  $T_g$  for amorphous, semicrystalline and crystalline materials respectively. For crystalline material (curve C), there is discontinuous changes in specific volume at  $T_m$  while the amorphous material (curve A), the curve is continuous. For the semicrystalline materials, the behaviour is intermediate between crystalline and amorphous [4].

Melting process involves the breaking of inter-chain bonds, so the glass and melting temperature depend on chain stiffness, molecular shape and size, side branches and cross-linking [5]. The right temperature must be setup because high temperature may degrade the polymer or destroy the chain and additives may decompose. If temperature is too low, the structure fails to achieve the required homogeneity and thus will reduce impact resistance [6]. Dwell time in process also play crucial role. If higher dwell time given, thermal decomposition may take place even the melt temperature is correct but if too short, the melt will not have time to fully homogeneous.

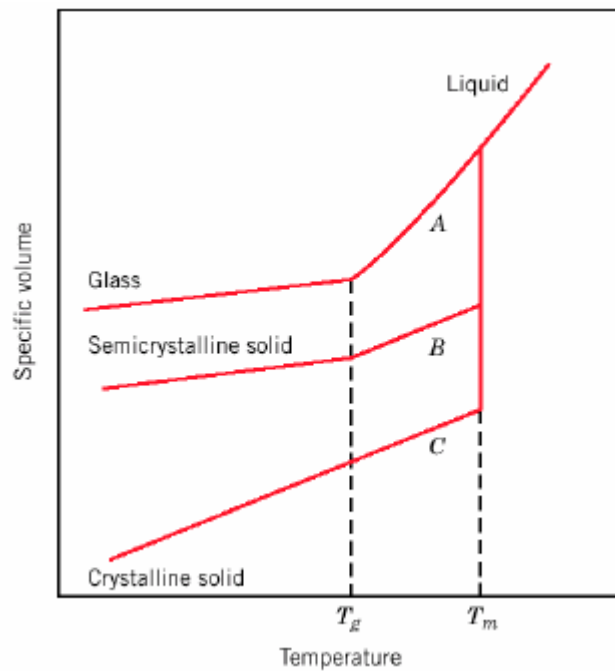


Figure 1.5 Specific volume versus temperature for amorphous (curve A), semicrystalline (curve B) and crystalline (curve C)<sup>[4]</sup>



Table 1.1 Melting and Glass Transition Temperatures for Some of Common Polymeric Materials [3,9]

Polymers	T <sub>m</sub> (°C)	T <sub>g</sub> (°C)
Polypropylene (PP)	165	-18
Poly-lactic Acid (PLA)	175	55 - 60
Polyethylene (PE)	115	110
Polytetrafluoroethylene (PTFE)	327	-97
Polystyrene (PS)	240	100
Polycarbonate (PC)	265	150

#### 1.1.4 POLYMER BLENDS

Polymer blends occur when two or more different polymers mixed together. There are two types of polymer blends which are miscible and immiscible polymer blends. For miscible polymer blends, the miscibility and homogeneity extend down to the molecular level which is no phase separation occur to the polymer. For immiscible polymer blends, there are phase separations occurs and sometimes called compatible blends. The compatible blends are also polymer alloy [11,14]. The light scattering, X-ray scattering, and neutron scattering can be used in order to investigate the phase of polymer blends.

In polymer blends, there are either homogenous or heterogeneous miscibility. Both polymers lose their identity and usually the new properties are arithmetical average of the polymer in homogeneous but in heterogeneous, the properties for involved polymers are present [12]. The weakness of the one polymer can affect the strengths of the polymer. But still, the blends can have better properties than individual element.