EFFECT OF MOLECULAR ORIENTATION ON PERMEABILITY AND OPTICAL GRATING FOR POLYMERIC AGRICULTURAL FILMS

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ABSTRACT

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Blends of natural rubber (NR) with linear low-density polyethylene (LLDPE) were prepared by chill roll cast film extrusion. The addition of NR and epoxidized natural rubber (ENR) to LLDPE significantly decreased the MFI of LLDPE. The effect of increasing the amount of NR in binary blends, and ENR in reactive blends, was to reduce molecular orientation, lower crystallinity, lower yield stress, give higher oxygen permeability and shift UV absorption to the visible region. For pure LLDPE, when increasing DR that affected to increase orientation, and crystallinity, and to lower UV absorption that shifted to lower wavelength. The melting (T_m) and crystallization (T_c) changed slightly with increasing draw ratio. The uniaxial orientation in chill roll cast film process was investigated by infrared dichoism. Molecular orientation increased with DR for the LLDPE pure, binary blend and reactive blends. Film yield strengths of both binary and reactive blends decreased with increasing NR content even at increased DR. LLDPE being of lower viscosity showed lower crystallinity, higher gas permeability and produce thinner films. Good oxygen permeability and selective visible light allows the reactive blended film to be used in agricultural application.

บทคัดย่อ

นิธิกร สิงห์สัตย์: ผลของการจัดเรียงตัวต่อการซึมผ่านและช่องการผ่านแสงของของฟิล์มผสมทางการเกษตร (Effect of Molecular Orientation on Permeability and Optical Grating for Polymeric Agricultural Films) อ. ที่ปรึกษา : ผศ.ดร.รัตนวรรณ มกรพันธุ์, ศ.ดร.อเล็กซานเดอร์ เอ็ม เจมิสัน 63 หน้า ISBN 974-17-2334-2

การผสมของยางธรรมชาติกับพอลิเอธิลีนความหนาแน่นต่ำเชิงเส้นถูกเตรียมโดยวิธีการขึ้นรูปแบบฟิลม์รีด การเติมยางธรรมชาติและยางธรรมชาติอิพอกซิไดส์ลงในพอลิเอทธิลีน ความหนาแน่นต่ำเชิงเส้น ทำให้อัตราการไหลลดลง ทำให้การจัดเรียงตัวของโมเลกุลลดลง, ปริมาณผลึกลดลง,การซึมผ่านของก๊าซออกซิเจนดีขึ้นและดูดกลืนคลื่นสีในช่วงที่มีความยาวคลื่นสูงขึ้นสำหรับพอลิเอทธิลีนบริสุทธิ์เมื่อเพิ่มอัตราเร็วในการดึงทำให้การจัดเรียงตัวดีขึ้น, การตกผลึกดีขึ้น และการดูดกลืนคลื่นแสงในความยาวคลื่นต่ำลง อุณหภูมิของการหลอมเหลวและอุณหภูมิของการตกผลึกเพิ่มขึ้นเล็กน้อยเมื่อเพิ่มอัตราส่วนความเร็ว แผ่นฟิลม์แบบรีดถูกตรวจสอบโดยเทคนิคการดูดกลืนรังสีอินฟาเรดโดยที่เมื่อเพิ่มอัตราส่วนความเร็วโมเลกุลจะเรียงตัวดีขึ้น ความทนทานต่อแรงลดลงเมื่อเพิ่มปริมาณของยางธรรมชาติ พอลิเอทธิลีนความหนาแน่นต่ำเชิงเส้นที่มีความหนืดต่ำกว่าจะมีการจัดเรียงตัวของโมเลกุลต่ำกว่า, แก๊สซึมผ่านสูงกว่า, แผ่นฟิล์มบางกว่า พอลิเอธิลีนความหนาแน่นต่ำเชิงเส้นผสมกับยางธรรมชาติอิพอกซิไดส์จะถูกนำไปใช้ในการทำแผ่นฟิลม์เพื่อการเกษตรเนื่องจากการซึมผ่านของก๊าซออกซิเจนดีและสามารถเลือกช่วงการดูดกลืนแสงได้ดี

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TABLE OF CONTENTS

		PAGE
	Title Page	i
	Abstract (in English)	iii
	Abstract (in Thai)	iv
	Acknowledgements	v
	Table of Contents	vi
	List of Tables	viii
	List of Figures	x
CHAPTER		
I	**INTRODUCTION**	1
II	**LITERATURE SURVEY**	3
	2.1 Polymer Blends	3
	2.2 Films Permeability	3
	2.3 Molecular Orientation	5
	2.4 Epoxidized Natural Rubber	7
	2.5 Linear Low Density Polyethylene	8
III	**EXPERIMENTAL**	10
	3.1 Materials	10
	3.1.1 Linear Low Density Polyethylene	10
	3.1.2 Natural Rubber	10
	3.1.3 Maleic Anhydride	11
	3.1.4 Epoxidized Natural Rubber	11
	3.2 Experimetal	12
	3.2.1 Preparation of Natural Rubber	12
	3.2.2 Preparation of LLDPE/NR Blends	12
	3.2.3 Preparation of LLDPE/NR/MA/ENR Blends	12
	3.2.4 Chill Roll Cast Film Extrusion	13

CHAPTER **PAGE**

3.2.5 Testing and Characterization 13

3.2.5.1 Melt Flow Index 13

3.2.5.2 X-ray Diffractrometer 13

3.2.5.3 Gas Permeability Tester 14

3.2.5.4 UV-VIS Spectrometer 14

3.2.5.5 Thermal Properties 14

3.2.5.6 Birefringence 15

3.2.5.7 Infrared Dichroism 15

3.2.5.8 Tensile Testing 15

IV RESULTS AND DISCUSSION 16

4.1 Melt Flow Index 16

4.2 X-ray Diffractometer 17

4.3 Birefringence 19

4.4 Infrared Dichroism 22

4.5 Gas Permeability 25

4.6 UV-Vis Spectrometer 27

4.7 Thermal Properties 33

4.8 Thickness Tester 37

4.9 Mechanical Properties 39

V CONCLUSION 41

REFERENCES 42

APPENDICES

Appendix A Degree of crystallinity of pure LLDPE and its blends with ENR and NR 44

Appendix B Gas permeability of pure LLDPE and its blends with ENR and NR 53

Appendix C Melting and crystalline temperatures of pure LLDPE and its blends with ENR and NR 56

Appendix D Thickness of pure LLDPE and its blends with ENR and NR 58

Appendix E Orientation of pure LLDPE and its blends with ENR and NR 59

Appendix F Tensile at yield of pure LLDPE and its blends With ENR and NR 60

CURRICULUM VITAE 63

LIST OF TABLES

TABLE		PAGE
3.1	Physical properties of LLDPE films	10
3.2	Specification for standard Thai rubber (STR 5L)	11
4.1	Melt flow index of LLDPE/NR blends	16
4.2	Melt flow index of LLDPE/ENR/NR blends	16
4.3	Birefringence of pure LLDPE films at MFI = 1	19
4.4	Birefringence of pure LLDPE films at MFI = 6	20
4.5	Birefringence of L1/90/10	20
4.6	Birefringence of L6/90/10	20
4.7	Birefringence of L1/80/20	21
4.8	Birefringence of L6/80/20	21
4.9	Birefringence of L1/ENR/NR	21
4.10	Birefringence of L6/ENR/NR	22
A1	Degree of crystallinity of pure LLDPE and its blends with ENR and NR	44
B1	Gas permeability of pure L1	53
B2	Gas permeability of L1/90/10	53
B3	Gas permeability of L1/80/20	53
B4	Gas permeability of L1/ENR/NR	54
B5	Gas permeability of pure L6	54
B6	Gas permeability of L6/90/10	54
B7	Gas permeability of L6/ENR/NR	55
C1	Melting, crystalline temperature of pure LLDPE and its blends with ENR and NR	56
D1	Thickness of pure LLDPE and its blends with ENR and NR	58
E1	Orientation function of pure LLDPE and its blends with ENR and NR	59
F1	Tensile at yield of pure LLDPE	60
F2	Tensile at yield of L1/90/10	60
F3	Tensile at yield of L1/80/20	60
F4	Tensile at yield of L1/ENR/NR	61

LIST OF TABLES

TABLE		PAGE
F5	Tensile at yield of L6	61
F6	Tensile at yield of L6/90/10	61
F7	Tensile at yield of L6/80/20	62
F8	Tensile at yield of L6/ENR/NR	62

LIST OF FIGURES

FIGURE		PAGE
4.1	Degree of crystallinity of LLDPE MFI = 1 at composition 100/0, 90/10, 80/20 at DR 7, 10, 15	17
4.2	Degree of crystallinity of LLDPE MFI = 6 at composition 100/0, 90/10, 80/20 at DR 7, 10, 15	18
4.3	Orientation function of LLDPE MFI = 1 at DR 7, 10, 15	23
4.4	Orientation function of LLDPE MFI = 6 at DR 7, 10, 15	23
4.5	Orientation function of L1/ENR/NR and L6/ENR/NR at DR 7, 10, 15	24
4.6	Gas permeability of LLDPE MFI = 1 at composition 100/0, 90/10, 80/20 at DR 7, 10, 15	25
4.7	Gas permeability of LLDPE MFI = 6 at composition 100/0, 90/10, 80/20 at DR 7, 10, 15	26
4.8	UV absorbance of LLDPE MFI = 1 at composition 100/0 at DR 7, 10, 15	27
4.9	UV absorbance of LLDPE MFI = 6 at composition 100/0 at DR 7, 10, 15	28
4.10	UV absorbance of LLDPE MFI = 1 at composition 90/10 at DR 7, 10, 15	29
4.11	UV absorbance of LLDPE MFI = 1 at composition 80/20 at DR 7, 10, 15	29
4.12	UV absorbance of LLDPE MFI = 6 at composition 90/10 at DR 7, 10, 15	30
4.13	UV absorbance of LLDPE MFI = 6 at composition 80/20 at DR 7, 10, 15	30
4.14	UV absorbance of the L1/ENR/NR at DR 7, 10, 15	31
4.15	UV absorbance of the L6/ENR/NR at DR 7, 10, 15	32
4.16	T_m of L1 100/0 and L6 100/0 at draw ratio 7, 10, 15	33
4.17	T_m of L1 90/10 and 80/20 at draw ratio 7, 10, 15	33

LIST OF FIGURES

FIGURE **PAGE**

4.18 T_m of L6 90/10 and 80/20 at draw ratio 7, 10, 15 34

4.19 T_m of L1/ENR/NR and L6/ENR/NR at draw ratio 7, 10, 15 34

4.20 T_c of L1 100/0 and L6 100/0 at draw ratio 7, 10, 15 35

4.21 T_c of L1 90/10 and 80/20 at draw ratio 7, 10, 15 35

4.22 T_c of L6 90/10 and 80/20 at draw ratio 7, 10, 15 36

4.23 T_c of L1/ENR/NR and L6/ENR/NR at draw ratio 7, 10 , 15 37

4.24 Thickness of L1 and LLDPE blends at 7, 10, 15 37

4.25 Thickness of L6 and LLDPE blends at 7, 10, 15 38

4.26 Stress at yield of pure LLDPE MFI = 1 and LLDPE blends at DR 7, 10, 15 39

4.27 Stress at yield of pure LLDPE MFI = 6 and LLDPE blends at DR 7, 10, 15 40

A1 XRD spectra of L1 at draw ratio 7, 10, 15 45

A2 XRD spectra of L1/90/10 at draw ratio 7, 10, 15 46

A3 XRD spectra of L1/80/20 at draw ratio 7, 10, 15 47

A4 XRD spectra of L6 at draw ratio 7, 10, 15 48

A5 XRD spectra of L6/90/10 at draw ratio 7, 10, 15 49

A6 XRD spectra of L6/80/20 at draw ratio 7, 10, 15 50

A7 XRD spectra of L1/ENR/NR at draw ratio 7, 10, 15 51

A8 XRD spectra of L6/ENR/NR at draw ratio 7, 10, 15 52