

**PREPARATION AND CHARACTERIZATION OF STARCH-BASED
COMPOSITE FOAMS**



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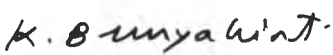
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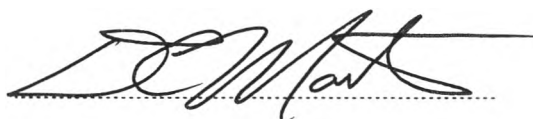
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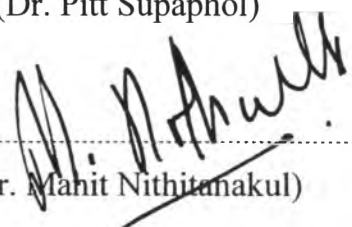

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บทคัดย่อ

คุณดาว ปรีชาวงศ์ : การเตรียมและวิเคราะห์คุณสมบัติของคอมพอสิตโฟมที่มีแป้งเป็นส่วนประกอบหลัก (Préparation and Characterization of Starch-Based Composite Foams)
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งานวิจัยนี้เป็นการเตรียมคอมพอสิตโฟมโดยวิธีเบคจากแป้งมันสำปะหลังและพอลิเมอร์สังเคราะห์ที่ย่อยสลายได้ ได้แก่ พอลิไวนิลแอลกอฮอล์ พอลิแลคติก เอซิกและพอลิคาโพรแลคโตน จากการศึกษาโดยใช้กล้องสแกนนิ่งอิเล็กตรอนไมโครสโคป (Scanning Electron Microscope) พบว่าขอบบนและล่างของโฟมจะมีความหนาแน่นสูงในขณะที่ส่วนกลางของโฟมจะมีความหนาแน่นต่ำ ในงานวิจัยนี้ได้ทำการศึกษาผลกระทบของความชื้นสัมพัทธ์ เวลาในการเก็บโฟม การเติมพอลิเมอร์สังเคราะห์ที่ย่อยสลายได้ และการเติมพลาสติกไซเซอร์ที่มีต่อสมบัติเชิงกล ผลจากการศึกษาสมบัติเชิงกลพบว่า ค่าการทนต่อแรงดึง และค่าการทนต่อแรงโค้งงอจะให้ค่าสูงสุดที่สภาวะความชื้นสัมพัทธ์ 42 เปอร์เซ็นต์และใช้เวลาในการเก็บ 2 วัน และการเติมพอลิเมอร์สังเคราะห์สามารถปรับปรุงค่าการทนต่อแรงดึง ค่าการทนต่อแรงโค้งงอ และค่าการยืดตัว ณ จุดขาดของโฟมได้ ในขณะที่การเติมพลาสติกไซเซอร์ทำให้ค่าการทนต่อแรงดึง และค่าการทนต่อแรงโค้งงอของโฟมลดลงแต่เพิ่มค่าการยืดตัว ณ จุดขาดของโฟม นอกจากนี้การศึกษามบัติการดูดซับน้ำ แสดงให้เห็นว่า การเติมพอลิเมอร์สังเคราะห์ที่ย่อยสลายได้สามารถลดการดูดซับน้ำของโฟมได้และจากการศึกษาการย่อยสลายด้วยเอนไซม์อะไมเลสพบว่าพอลิเมอร์นี้มีผลน้อยมากต่อการย่อยสลายของแป้ง

ABSTRACT

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Keywords: Starch foams/ Composite foams/ Starch/ Poly(vinyl alcohol)/ Poly(lactic acid)/ Polycaprolactone

Starch-based composite foams were prepared by baking a mixture of starch and a synthetic biodegradable polymer (i.e., poly(vinyl alcohol), poly(lactic acid), and poly(ϵ -caprolactone)) in a hot mold. This process can be used to prepare a thin-walled object, such as a plate. Scanning electron micrographs of the cross-sectional view of the foams showed that the cellular size is very dense in the outer layer and less dense in the inner layer. The effects of relative humidity, storage time, the presence of synthetic biodegradable polymers, and the presence of plasticizers (i.e., glycerol, urea, and ammonium chloride) on tensile and flexural properties were investigated. For all formulations, the amount of relative humidity which gave the maximum value of the ultimate strength of the foams was 42%, while the storage time which gave the maximum value of the ultimate strength of the foams was 2 days (only tested for a fixed relative humidity of 42%). Addition of the synthetic biodegradable polymers improved the ultimate strength and the elongation at break of the foams. Increasing the plasticizer contents increased the elongation at break at the expense of the ultimate strength. Water absorption and biodegradability of the foams were also studied. Increasing the synthetic biodegradable polymer contents increased the water resistivity of the foams. Enzymatic degradation tests showed that the foams were degraded by enzyme α -amylase.

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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	ix
List of Figures	xvi
CHAPTER	
I INTRODUCTION	1
II LITERATURE SURVEY	17
II EXPERIMENTAL	24
3.1 Material	24
3.1.1 Biodegradable Polymer	24
3.1.2 Plasticizers	24
3.1.3 Additives	24
3.1.4 Diethyl Ether	25
3.1.5 Salts	25
3.1.6 Enzyme	25
3.2 Experimental Procedure	25
3.2.1 Preparation of Starch Composite Foams	25
3.2.1.1 Tapioca Starch Preparation	25
3.2.1.2 Preparation of Starch Batter	26
3.3 Humidity Testing	26

CHAPTER	PAGE
3.3 Mechanical Properties	27
3.3.1 Tensile Testing	27
3.3.2 Flexural Testing	27
3.4 Microstructure Charaterization	27
3.5 Moisture Determination	28
3.6 Water Absorption	28
3.7 Enzymatic Degradation	28
IV RESULTS AND DISCUSSION	
4.1 Morphology	29
4.2 Moisture Content	31
4.2.1 Effect of Relative Humidity	32
4.2.2 Effect of Storage Time	34
4.2.3 Effect of Polymers	36
4.2.4 Effect of Plasticizers	37
4.3 Mechanical Properties	39
4.3.2 Tensile Properties	40
4.3.2.1 Effect of Relative Humidity	40
4.3.2.2 Effect of Storage Time	43
4.3.2.3 Effect of Polymers	46
4.3.2.4 Effect of Plasticizers	48
4.3.3 Flexural Properties	51
4.3.3.1 Effect of Relative Humidity	51
4.3.3.2 Effect of Storage Time	54
4.3.3.3 Effect of Polymers	57
4.3.3.4 Effect of Plasticizers	59
4.4 Water Absorption	61
4.5 Enzymatic Degradation	62

CHAPTER		PAGE
V	CONCLUSIONS	64
	REFERENCES	65
	APPENDICES	68
	CURRICULUM VITAE	114

LIST OF TABLES

TABLE		PAGE
1.1	Advantages and disadvantages of foamed versus non-foamed plastics	5
1.2	Effect of starch type on mechanical properties of films cast from aqueous solution	8
1.3	Physical properties of poly(vinyl alcohol)	10
1.4	Effect of stereochemistry and crystallinity on mechanical properties of poly(lactic acid)	11
1.5	Physical properties of polycaprolactone	12
A1	Moisture content of starch foams as a function of relative humidity	67
A2	Moisture content of starch-10% PVA composite foams as a function of relative humidity	67
A3	Moisture content of starch-30% PVA composite foams as a function of relative humidity	68
A4	Moisture content of starch-10% PLA composite foams as a function of relative humidity	68
A5	Moisture content of starch-30% PLA composite foams as a function of relative humidity	69
A6	Moisture content of starch-10% PCL composite foams as a function of relative humidity	69
A7	Moisture content of starch-30% PCL composite foams as a function of relative humidity	70
A8	Moisture content of starch foams as a function of storage time	70

TABLE	PAGE
A9 Moisture content of starch-10% PVA composite foams as a function of storage time	71
A10 Moisture content of starch-30% PVA composite foams as a function of storage time	71
A11 Moisture content of starch-10% PLA composite foams as a function of storage time	72
A12 Moisture content of starch-30% PLA composite foams as a function of storage time	72
A13 Moisture content of starch-10% PCL composite foams as a function of storage time	73
A14 Moisture content of starch-30% PCL composite foams as a function of storage time	73
B1 Tensile strength of starch foams as a function of relative humidity	74
B2 Tensile strength of starch-10% PVA composite foams as a function of relative humidity	74
B3 Tensile strength of starch-30% PVA composite foams as a function of relative humidity	75
B4 Tensile strength of starch-10% PLA composite foams as a function of relative humidity	75
B5 Tensile strength of starch-30% PLA composite foams as a function of relative humidity	76
B6 Tensile strength of starch-10% PCL composite foams as a function of relative humidity	76
B7 Tensile strength of starch-30% PCL composite foams as a function of relative humidity	77

TABLE	PAGE
B8 Tensile strength of starch foams as a function of storage time	77
B9 Tensile strength of starch-10% PVA composite foams as a function of storage time	78
B10 Tensile strength of starch-30% PVA composite foams as a function of storage time	78
B11 Tensile strength of starch-10% PLA composite foams as a function of storage time	79
B12 Tensile strength of starch-30% PLA composite foams as a function of storage time	79
B13 Tensile strength of starch-10% PCL composite foams as a function of storage time	80
B14 Tensile strength of starch-30% PCL composite foams as a function of storage time	80
B15 Tensile strength of starch foams containing glycerol as a plasticizer	81
B16 Tensile strength of starch foams containing urea as a plasticizer	81
B17 Tensile strength of starch foams containing ammonium chloride as a plasticizer	82
C1 Elongation at break of starch foams as a function of relative humidity	83
C2 Elongation at break of starch-10% PVA composite foams as a function of relative humidity	83
C3 Elongation at break of starch-30% PVA composite foams as a function of relative humidity	84

TABLE	PAGE
C4 Elongation at break of starch-10% PLA composite foams as a function of relative humidity	84
C5 Elongation at break of starch-30% PLA composite foams as a function of relative humidity	85
C6 Elongation at break of starch-10% PCL composite foams as a function of relative humidity	85
C7 Elongation at break of starch-30% PCL composite foams as a function of relative humidity	86
C8 Elongation at break of starch foams as a function of storage time	86
C9 Elongation at break of starch-10% PVA composite foams as a function of storage time	87
C10 Elongation at break of starch-30% PVA composite foams as a function of storage time	87
C11 Elongation at break of starch-10% PLA composite foams as a function of storage time	88
C12 Elongation at break of starch-30% PLA composite foams as a function of storage time	88
C13 Elongation at break of starch-10% PCL composite foams as a function of storage time	89
C14 Elongation at break of starch-30% PCL composite foams as a function of storage time	89
C15 Elongation at break of starch foams containing glycerol as a plasticizer	90
C16 Elongation at break of starch foams containing urea as a plasticizer	90

TABLE	PAGE
C17 Elongation at break of starch foams containing Ammonium chloride as a plasticizer	91
D1 Flexural strength of starch foams as a function of relative humidity	92
D2 Flexural strength of starch-10% PVA composite foams as a function of relative humidity	92
D3 Flexural strength of starch-30% PVA composite foams as a function of relative humidity	93
D4 Flexural strength of starch-10% PLA composite foams as a function of relative humidity	93
D5 Flexural strength of starch-30% PLA composite foams as a function of relative humidity	94
D6 Flexural strength of starch-10% PCL composite foams as a function of relative humidity	94
D7 Flexural strength of starch-30% PCL composite foams as a function of relative humidity	95
D8 Flexural strength of starch foams as a function of storage time	95
D9 Flexural strength of starch-10% PVA composite foams as a function of storage time	96
D10 Flexural strength of starch-30% PVA composite foams as a function of storage time	96
D11 Flexural strength of starch-10% PLA composite foams as a function of storage time	97
D12 Flexural strength of starch-30% PLA composite foams as a function of storage time	97

TABLE	PAGE
D13 Flexural strength of starch-10% PCL composite foams as a function of storage time	98
D14 Flexural strength of starch-30% PCL composite foams as a function of storage time	98
D15 Flexural strength of starch foams containing glycerol as a plasticizer	99
D16 Flexural strength of starch foams containing urea as a plasticizer	99
D17 Flexural strength of starch foams containing ammonium chloride as a plasticizer	100
E1 Maximum strain of starch foams as a function of relative humidity	101
E2 Maximum strain of starch-10% PVA composite foams as a function of relative humidity	101
E3 Maximum strain of starch-30% PVA composite foams as a function of relative humidity	102
E4 Maximum strain of starch-10% PLA composite foams as a function of relative humidity	102
E5 Maximum strain of starch-30% PLA composite foams as a function of relative humidity	103
E6 Maximum strain of starch-10% PCL composite foams as a function of relative humidity	103
E7 Maximum strain of starch-30% PCL composite foams as a function of relative humidity	104
E8 Maximum strain of starch foams as a function of storage time	104

TABLE	PAGE
E9 Maximum strain of starch-10% PVA composite foams as a function of storage time	105
E10 Maximum strain of starch-30% PVA composite foams as a function of storage time	105
E11 Maximum strain of starch-10% PLA composite foams as a function of storage time	106
E12 Maximum strain of starch-30% PLA composite foams as a function of storage time	106
E13 Maximum strain of starch-10% PCL composite foams as a function of storage time	107
E14 Maximum strain of starch-30% PCL composite foams as a function of storage time	107
E15 Maximum strain of starch foams containing glycerol as a plasticizer	108
E16 Maximum strain of starch foams containing urea as a plasticizer	108
E17 Maximum strain of starch foams containing ammonium chloride as a plasticizer	109
F1 Water absorption of starch-based composite foams	110
G1 Weight loss of enzymatic degradation of starch-based composite foams	111
H1 Density of starch-based composite foams	112

LIST OF FIGURES

FIGURE	PAGE
1.1 Structure of amylose	7
1.2 Structure of amylopectin	7
1.3 Structure of poly(vinyl alcohol)	9
1.4 Structure of poly(lactic acid)	10
1.5 Structure of polycaprolactone	11
1.6 Types of flexural testing equipment	15
4.1 Scanning electron micrograph of cross sections of (A) starch foam, (B) starch-30% PVA, (C) starch-30% PLA, and (D) starch-30% PCL.	30
4.2 Moisture contents of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (A) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	33
4.3 Moisture contents of starch-based composite foams as a function of storage time at 42% RH and 25°C of (A) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	35
4.4 Effect of polymers on moisture contents of starch-based composite foams at 42% RH for 2 days.	36
4.5 Effect of plasticizers on moisture contents of starch-based composite foams at 42% RH for 2 days.	37
4.6 Tensile strength of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (A) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	41

FIGURE	PAGE
4.7 Elongation at break of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (B) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	42
4.8 Tensile strength of starch-based composite foams as a function of storage time at 42% RH and 25°C of (C) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	44
4.9 Elongation at break of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (D) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	45
4.10 Effect of polymers on tensile strength of starch-based composite foams at 42% RH for 2 days.	46
4.11 Effect of polymers on elongation at break of starch-based composite foams at 42% RH for 2 days.	47
4.12 Effect of plasticizers on tensile strength of starch-based composite foams at 42% RH for 2 days.	48
4.13 Effect of plasticizers on elongation at break of starch-based composite foams at 42% RH for 2 days.	49
4.14 Tensile strength of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (E) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	52

FIGURE	PAGE
4.15 Maximum strain of starch-based composite foams as a function of relative humidity at 25°C for 7 days of (F) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	53
4.16 Tensile strength of starch-based composite foams as a function of storage time at 42% RH and 25°C of (G) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	55
4.17 Maximum strain of starch-based composite foams as a function of storage time at 42% RH and 25°C of (H) starch-PVA foams, (B) starch-PLA foams, and (C) starch-PCL foams.	56
4.18 Effect of polymers on flexural strength of starch-based composite foams at 42% RH for 2 days.	57
4.19 Effect of polymers on maximum strain of starch-based composite foams at 42% RH for 2 days.	58
4.20 Effect of plasticizers on flexural strength of starch-based composite foams at 42% RH for 2 days.	59
4.21 Effect of plasticizers on maximum strain of starch-based composite foams at 42% RH for 2 days.	60
4.22 Water absorption of starch-based composite foams.	61
4.23 Enzymatic degradation of starch-based composite foams by α -amylase at 55°C.	62