

ภาคผนวก

ส่วนที่ 1 ผลการวิเคราะห์ทางสถิติ โดยใช้โปรแกรม SAS ให้ผลดังนี้

1. ค่าการวิเคราะห์ด้วยโปรแกรมทางสถิติ sas ทดสอบแรง Tensile ของแผ่นฟิล์มไฟโบรินผสมพอลิเมอร์

1.1 Polyethylene oxide (PEO)

The SAS System 17:09 Wednesday, June 9, 2010 (PEO tensile) 1

Analysis of Variance Procedure

Class Level Information

Class Levels Values

RATIO 4 A B C D

Number of observations in data set = 32

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	123974155750000.00000	41324718583333.30000	102.15	0.0001
Error	28	11327576250000.00000	404556294642.85700		
Corrected Total	31	135301732000000.00000			

R-Square	C.V.	Root MSE	FILM Mean
0.916279	13.16119	636047.39968249	4832750.00000000

Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	123974155750000.00000	41324718583333.30000	102.15	0.0001

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 28 MSE= 4.046E11

Number of Means 2 3 4

Critical Range 651442 684490 705857

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	6910750	8	D
A			
A	6472625	8	C
B	3862125	8	B
C	2085500	8	A

1.2 Sodium alginate (AG)

The SAS System 17:11 Wednesday, June 9, 2010 (AG tensile)1

Analysis of Variance Procedure

Class Level Information

Class Levels Values

RATIO 4 A B C D

Number of observations in data set = 32

Analysis of Variance Procedure

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	298454034375000.00000	99484678125000.00000	6.12	0.0025
Error	28	454993087500000.00000	16249753125000.00000		
Corrected Total	31	753447121875000.00000			

R-Square	C.V.	Root MSE	FILM Mean
0.396118	17.01132	4031098.25295787	23696562.50000000

Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	298454034375000.00000	99484678125000.00000	6.12	0.0025

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 28 MSE= 1.625E13

Number of Means 2 3 4

Critical Range 4128665 4338116 4473534

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	28490000	8	A
B	23585000	8	B
B			
B	22651250	8	C
B			
B	20060000	8	D

1.3 Polyvinyl alcohol (PVA)

The SAS System 17:11 Wednesday, June 9, 2010 (PVA tensile)

Analysis of Variance Procedure

Class Level Information

Class	Levels	Values
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RATIO	4	A B C D
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Number of observations in data set = 32

Analysis of Variance Procedure

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	43646795250000.000000	14548931750000.000000	5.24	0.0054
Error	28	77807482250000.000000	2778838651785.710000		
Corrected Total	31	121454277500000.000000			

R-Square	C.V.	Root MSE	FILM Mean
0.359368	14.15083	1666984.89848760	11780125.00000000

Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	43646795250000.000000	14548931750000.000000	5.24	0.0054

The SAS System 17:11 Wednesday, June 9, 2010 (PVA tensile) 6

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 28 MSE= 2.779E12

Number of Means 2 3 4

Critical Range 1707332 1793946 1849946

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	13410000	8	A
A			
B A	12341250	8	D
B			
B C	10889875	8	C
C			
C	10479375	8	B

1.4 Compare 3 polymers

The SAS System 17:06 Wednesday, June 9, 2010 (Total tensile)

Analysis of Variance Procedure

Class Level Information

Class	Levels	Values
TYPE	3	A B C
RATIO	12	A1 A2 A3 A4 B1 B2 B3 B4 C1 C2 C3 C4

Number of observations in data set = 96

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	35	6397222833125001.0000	182777795232142.0000	25.03	0.0001
Error	60	438163488833332.0000	7302724813888.8600		
Corrected Total	95	6835386321958333.0000			

	R-Square	C.V.	Root MSE	FILM Mean	
	0.935898	20.11208	2702355.41960877	13436479.16666660	
Source	DF	Anova SS	Mean Square	F Value	Pr > F
TYPE	2	1639859361112.0000	819929680556.0000	0.11	0.8940
RATIO	11	6291258175958334.0000	571932561450757.0000	78.32	0.0001
TYPE*RATIO	22	104324797805556.0000	4742036263888.9100	0.65	0.8686

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 60 MSE= 7.303E12

WARNING: Cell sizes are not equal.

Harmonic Mean of cell sizes= 30.85714

Number of Means	2	3
Critical Range	1376178	1447702

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TYPE
A	13580278	36	B
A			
A	13456125	24	C
A			
A	13279583	36	A

The SAS System 17:06 ednesday, June 9, 2010 (Total tensile)

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 60 MSE= 7.303E12

Number of Means 2 3 4 5 6 7

Critical Range 2702759 2843230 2935901 3003318 3055267 3096848

Number of Means 8 9 10 11 12

Critical Range 3131038 3159720 3184153 3205225 3223578

Means with the same letter are not significantly different.

Duncan Grouping		Mean	N	RATIO
	A	28490000	8	B1
	B	23585000	8	B2
C	B	22651250	8	B3
C		20060000	8	B4
	D	13410000	8	C1
	D	12341250	8	C4
	D	10889875	8	C3
	D	10479375	8	C2
	E	6910750	8	A4
F	E	6472625	8	A3
F	G	3862125	8	A2
	G	2085500	8	A1

2 ค่าการวิเคราะห์ด้วยโปรแกรมทางสถิติ sas ทดสอบ % elongation ของแผ่นฟิล์ม ไฟเบอร์อินผสมพอลิเมอร์

2.1 Polyethylene oxide (PEO)

The SAS System 17:11 Wednesday, June 9, 2010 (PEO elongation)

Analysis of Variance Procedure

Class Level Information

Class	Levels	Values
RATIO	4	A B C D

Number of observations in data set = 32

The SAS System 17:11 Wednesday, June 9, 2010 (PEO elongation)

Analysis of Variance Procedure

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	55059.39659784	18353.13219928	20.74	0.0001
Error	28	24781.40694537	885.05024805		
Corrected Total	31	79840.80354322			

R-Square	C.V.	Root MSE	FILM Mean
0.689615	78.84989	29.74979408	37.72965625

Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	55059.39659784	18353.13219928	20.74	0.0001

The SAS System 17:11 Wednesday, June 9, 2010 (PEO elongation)

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the
experimentwise error rate

Alpha= 0.05 df= 28 MSE= 885.0502

Number of Means	2	3	4
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Critical Range	30.47	32.02	33.02
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Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	109.45	8	B
B	17.60	8	A
B			
B	13.00	8	C
B			
B	10.87	8	D

2.2 Sodium alginate (AG)

The SAS System 17:11 Wednesday, June 9, 2010 (AG elongation)

Analysis of Variance Procedure

Class Level Information

Class	Levels	Values
RATIO	4	A B C D

Number of observations in data set = 32

The SAS System 17:11 Wednesday, June 9, 2010 (AG elongation)

Analysis of Variance Procedure

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	35.96323034	11.98774345	27.24	0.0001
Error	28	12.32218762	0.44007813		
Corrected Total	31	48.28541797			

R-Square	C.V.	Root MSE	FILM Mean
0.744805	26.41418	0.66338385	2.51146875

Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	35.96323034	11.98774345	27.24	0.0001

The SAS System 17:11 Wednesday, June 9, 2010 (AG elongation)

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 28 MSE= 0.440078

Number of Means 2 3 4

Critical Range .6794 .7139 .7362

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	4.1765	8	A
B	2.6676	8	B
C	1.7429	8	C
C			
C	1.4589	8	D

2.3 Polyvinyl alcohol (PVA)

The SAS System 17:11 Wednesday, June 9, 2010 (PVA elongation)

Analysis of Variance Procedure

Class Level Information

Class Levels Values

RATIO 4 A B C D

Number of observations in data set = 32

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	86569.34677534	28856.44892511	47.38	0.0001
Error	28	17052.24569987	609.00877500		
Corrected Total	31	103621.59247522			

	R-Square	C.V.	Root MSE	FILM Mean	
	0.835437	58.07343	24.67810315	42.49465625	
Source	DF	Anova SS	Mean Square	F Value	Pr > F
RATIO	3	86569.34677534	28856.44892511	47.38	0.0001

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 28 MSE= 609.0088

Number of Means 2 3 4

Critical Range 25.28 26.56 27.39

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	130.50	8	A
B	31.04	8	B
C B	6.90	8	C
C	1.54	8	D

2.4 Compare 3 polymers

The SAS System 17:08 Wednesday, June 9, 2010 (Total elongation)

Analysis of Variance Procedure

Class Level Information

Class	Levels	Values
TYPE	3	A B C
RATIO	12	A1 A2 A3 A4 B1 B2 B3 B4 C1 C2 C3 C4

Number of observations in data set = 96

The SAS System 17:08 Wednesday, June 9, 2010 (Total elongation)

Analysis of Variance Procedure

Dependent Variable: FILM

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	35	178288.32536216	5093.95215320	8.55	0.0001
Error	60	35746.95595100	595.78259918		
Corrected Total	95	214035.28131316			

R-Square	C.V.	Root MSE	FILM Mean
0.832986	88.50581	24.40865828	27.57859375

Source	DF	Anova SS	Mean Square	F Value	Pr > F
TYPE	2	256.11352891	128.05676445	0.21	0.8072
RATIO	11	172189.30648028	15653.57331639	26.27	0.0001
TYPE*RATIO	22	5842.90535297	265.58660695	0.45	0.9808

The SAS System 17:08 Wednesday, June 9, 2010 (Total elongation)

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the
experimentwise error rate

Alpha= 0.05 df= 60 MSE= 595.7826

WARNING: Cell sizes are not equal.

Harmonic Mean of cell sizes = 30.85714

Number of Means 2 3

Critical Range 12.43 13.08

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	TYPE
A	29.479	24	C
A			
A	28.343	36	B
A			
A	25.548	36	A

The SAS System 17:08 Wednesday, June 9, 2010 (Total elongation)

Analysis of Variance Procedure

Duncan's Multiple Range Test for variable: FILM

NOTE: This test controls the type I comparisonwise error rate, not the
experimentwise error rate

Alpha= 0.05 df= 60 MSE = 595.7826

Number of Means 2 3 4 5 6 7 8 9 10 11 12

Critical Range 24.41 25.68 26.52 27.13 27.60 27.97 28.28 28.54 28.76 28.95 29.12

Means with the same letter are not significantly different.

Duncan Grouping	Mean	N	RATIO
A	130.50	8	C1
A	109.45	8	A2
B	31.04	8	C2
C B	17.60	8	A1
C B	13.00	8	A3
C B	10.87	8	A4
C B	6.90	8	C3
C B	4.18	8	B1
C	2.67	8	B2
C	1.74	8	B3
C	1.54	8	C4
C	1.46	8	B4

ส่วนที่ 2 ผลการเลี้ยงเซลล์ tissue culture plate (TCP)

ตารางที่ 1A การเจริญเติบโตของเซลล์บนจานเพาะเลี้ยงเนื้อเยื่อ (TCP)

Cell seeding/ culturing time point	ขั้นที่ 1		ขั้นที่ 2		ขั้นที่ 3		ขั้นที่ 4	
	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability
2 h	0.3848	100.00	0.3669	99.99	0.4048	100.00	0.3811	100.00
8 h	0.4134	107.42	0.3450	94.04	0.4269	105.47	0.4336	113.78
1 d	0.7728	200.83	0.8033	218.95	0.7016	173.33	0.6622	173.75
3 d	1.1611	301.73	1.2398	337.90	1.1890	293.72	1.0658	279.66
5 d	1.8911	491.46	1.8902	515.17	1.6698	412.49	1.6234	425.98
7 d	2.1075	547.69	2.1700	591.44	1.8534	457.86	1.7412	456.89

ตารางที่ 2A การเจริญของเซลล์บนแผ่นฟิล์มโพลีเอทิลีน/พอลิเอทิลีนออกไซด์ (90:10)

Cell seeding/ culturing time point	วันที่ 1		วันที่ 2		วันที่ 3		วันที่ 4	
	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability
2 h	0.0417	10.83	0.0258	7.04	0.0890	21.99	0.0630	16.53
8 h	0.0854	22.18	0.0912	24.85	0.1204	29.73	0.0693	18.18
1 d	0.0347	9.02	0.0277	7.55	0.0834	20.59	0.1612	42.29
3 d	0.0291	7.57	0.0232	6.33	0.1343	33.19	0.1513	39.70
5 d	0.1924	50.00	0.1844	50.26	0.3381	83.52	0.2072	54.37
7 d	0.1919	49.87	0.1038	28.29	0.4856	119.96	0.3177	83.36

ตารางที่ 3A การเจริญของเซลล์บนแผ่นฟิล์มไฟโพรอิน/Polyethylene oxide (85:15)

Cell seeding/ culturing time point	ขั้นที่ 1		ขั้นที่ 2		ขั้นที่ 3		ขั้นที่ 4	
	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability	OD	%Cell viability
2 h	0.0885	22.99	0.0779	21.22	0.0652	16.11	0.0777	20.39
8 h	0.0780	20.27	0.0836	22.79	0.0780	19.27	0.0619	16.24
1 d	0.0298	7.75	0.0372	10.14	0.1126	27.82	0.0827	21.70
3 d	0.0367	9.55	0.0796	21.69	0.1244	30.73	0.1237	32.46
5 d	0.2041	53.04	0.2519	68.66	0.2529	62.48	0.2971	77.96
7 d	0.3172	82.43	0.1731	47.18	0.3481	85.99	0.5806	152.35

ตารางที่ 4A เปรียบเทียบจำนวนเซลล์ตั้งต้นของการเลี้ยงเซลล์บน TCP และแผ่นฟิล์มไฟโพรอินผสม PEO

Type of substrate	2h		8h		1d		3d		5d		7d	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
TCP	100.00	0.00	105.18	8.23	191.72	22.25	303.25	24.84	461.28	49.81	513.47	67.19
FB/PEO (90:10)	14.10	6.55	23.74	4.85	19.86	16.05	21.70	17.24	59.54	16.11	70.37	40.08
FB/PEO (85:15)	20.18	2.92	19.64	2.71	16.85	9.51	23.61	10.50	65.53	10.48	91.99	43.89

ตารางที่ 5A การเจริญเติบโตของเซลล์ในจานอาหารเลี้ยงเนื้อเชื้อ (TCP)

Cell seeding/ culturing time point	%Cell viability (% TCP at 2h)				Mean	SD
	ชั้นที่1	ชั้นที่2	ชั้นที่ 3	ชั้นที่4		
2 h	100.00	99.99	100.00	100.00	100.00	0.00
8 h	107.42	94.04	105.47	113.78	105.18	8.23
1 d	200.83	218.95	173.33	173.75	191.72	22.25
3 d	301.73	337.90	293.72	279.66	303.25	24.84
5 d	491.46	515.17	412.49	425.98	461.28	49.81
7 d	547.69	591.44	457.86	456.89	513.47	67.19

ตารางที่ 6A การเจริญเติบโตของเซลล์บนแผ่นฟิล์มไฟโบรอิน/Polyethylene oxide (90:10)

Cell seeding/ culturing time point	%Cell viability (% TCP at 2h)				Mean	SD
	ชั้นที่1	ชั้นที่2	ชั้นที่ 3	ชั้นที่4		
2 h	10.83	7.04	21.99	16.53	14.10	6.55
8 h	22.18	24.85	29.73	18.18	23.74	4.85
1 d	9.02	7.55	20.59	42.29	19.86	16.05
3 d	7.57	6.33	33.19	39.70	21.70	17.24
5 d	50.00	50.26	83.52	54.37	59.54	16.11
7 d	49.87	28.29	119.96	83.36	70.37	40.08

ตารางที่ 7A การเจริญเติบโตของเซลล์บนแผ่นฟิล์มไฟโบรอิน/Polyethylene oxide (85:15)

Cell seeding/ culturing time point	%Cell viability (% TCP at 2h)				Mean	SD
	ชั้นที่1	ชั้นที่2	ชั้นที่ 3	ชั้นที่4		
2 h	22.99	21.22	16.11	20.39	20.18	2.92
8 h	20.27	22.79	19.27	16.24	19.64	2.71
1 d	7.75	10.14	27.82	21.70	16.85	9.51
3 d	9.55	21.69	30.73	32.46	23.61	10.50
5 d	53.04	68.66	62.48	77.96	65.53	10.48
7 d	82.43	47.18	85.99	152.35	91.99	43.89