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APPENDICES

Appendix A Characterization of raw material

Table A1 Percent yield of chitin

Samples	Dry weight (%)
Dry shrimp shell	100.00
Decalification product	30.48
Deproteinization product	22.87
Chitin	22.87

Table A2 Percent yield of chitin hydrogel

Number of samples	Chitin solution (g)	Chitin hydrogel (g)
1	100	50.85
2	100	52.12
3	100	54.6
Average	100	52.53
SD	0	1.907258

Table A3 Percent of chitin and water contents in chitin hydrogel

Number of samples	Wet weight (g)	Dry weight (g)	Chitin (%)	Water (%)
1	1.7320	0.06	3.464203	96.5358
2	1.7179	0.0588	3.422784	96.57722
3	1.7008	0.0495	2.910395	97.0896
Average	1.7169	0.0561	3.267517	96.73248
SD	0.015624	0.0057	0.30848	0.30848

Table A3 Degree of deacetylation of chitin powder and chitin hydrogel

Number of samples - Type of chitin	Degree of deacetylation (%DD)				SD
	1	2	3	Average	
Chitin powder	35.26	36.61	34.3	35.39	1.160474
Chitin hydrogel	38.19	37.98	35.91	37.36	1.260119

Appendix B Deacetylation of chitin hydrogel with KOH/MeOH

Table B1 Effect of amount of chitin hydrogel in KOH solution on the percent of degree of deacetylation

Amount of chitin hydrogel (g)	Degree of deacetylation (%DD)				SD
	1	2	3	Average	
10	60.76	62.33	61.14	61.41	0.819085
20	57.58	56.68	58.88	57.71333	1.106044
30	52.89	53.64	55.24	53.92333	1.200347

Table B2 Effect of amount of chitin hydrogel in KOH solution on the percent of solubility

Amount of chitin hydrogel (g)	% Solubility				SD
	1	2	3	Average	
10	30.26	31.51	28.44	30.07	1.543794
20	22.42	24.48	23.64	23.51333	1.035825
30	16.56	15.84	18.26	16.88667	1.242632

Table B1 Effect of 0% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using solution plasma technique

0% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	40.15	44.71	43.26	42.71	2.329814
2	47.22	46.88	48.92	47.67	1.092947
3	48.12	49.82	50.12	49.35	1.078579
4	52.88	51.78	53.84	52.83	1.030793
5	56.23	55.44	54.26	55.31	0.991413

Table B2 Effect of 7% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using solution plasma technique

7% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	53.82	55.18	54.12	54.37	0.714516
2	62.74	61.9	60.11	61.58	1.343292
3	66.79	63.95	63.28	64.67	1.863447
4	67.95	66.91	65.64	66.83	1.156907
5	70.12	68.55	67.82	68.83	1.175287

Table B3 Effect of 10% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using solution plasma technique

10% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	60.76	62.33	61.14	61.41	2.227308
2	66.61	68.51	68.25	67.79	1.030146
3	68.54	70.61	69.26	69.47	1.050857
4	72.25	71.78	73.25	72.26	0.750755
5	72.26	70.67	75.39	74.44	2.401506

Table B4 Effect of 0% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using conventional heat treatment

0% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	38.12	37.92	38.98	38.34	0.563205
2	39.21	39.4	40.62	39.74333	0.765136
3	40.88	40.56	41.4	40.94667	0.42395
4	42.11	42.84	43.26	42.73667	0.581922
5	43.21	44.56	45.71	44.49333	1.251333

Table B5 Effect of 7% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using conventional heat treatment

7% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	40.13	39.22	38.14	39.16333	0.996209
2	43.88	41.71	45.39	43.66	1.849838
3	47.88	48.71	50.39	48.99333	1.278762
4	50.23	52.88	53.65	52.25333	1.794055
5	55.42	56.64	55.53	55.86333	0.674858

Table B6 Effect of 10% w/v KOH concentration in methanol solvent on degree of deacetylation of chitin hydrogel by using conventional heat treatment

10% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	38.19	37.98	35.91	37.36	1.260119
1	42.13	41.22	40.14	41.16333	0.996209
2	47.11	46.25	45.66	46.34	0.729178
3	52.88	51.71	50.39	51.66	1.245753
4	52.23	54.88	55.65	54.25	1.794055
5	57.42	58.64	53.53	56.53	2.668726

Appendix C Solubility of chitin hydrogel by plasma treated

Table C1 Effect of 7% w/v KOH concentration in methanol solvent on solubility of plasma treated chitin hydrogel

7% (w/v) KOH concentration					
Reaction time (hour)	7% solubility of plasma treated chitin hydrogel				
	1	2	3	Average	SD
0	0	0	0	0	0
1	19.74	20.26	22.64	20.88	1.546221
2	24.29	24.86	26.52	25.23	1.158548
3	41.24	42.18	44.56	42.66	1.711257
4	46.6	51.54	52.88	50.24	3.307507
5	55.5	58.5	59.46	57.82	2.06572

Table C2 Effect of 10% w/v KOH concentration in methanol solvent on solubility of plasma treated chitin hydrogel

10% (w/v) KOH concentration					
Reaction time (hour)	% solubility of plasma treated chitin hydrogel				
	1	2	3	Average	SD
0	0	0	0	0	0
1	42.1	38.3	39.81	40.07	1.913296
2	47.83	53.22	50.36	50.47	2.696683
3	52.34	61.5	62.73	58.85667	5.677009
4	88.33	85.08	90.62	88.01	2.783828
5	90.94	89	92.49	90.81	1.748628

Appendix D Yield of plasma treated chitin hydrogel

Table D1 Yield of plasma treated chitin hydrogel with 0% w/v KOH concentration

0% (w/v) KOH concentration					
Reaction time (hour)	% Yield of plasma treated chitin hydrogel				
	1	2	3	Average	SD
0	100	100	100	100	0
1	80.53	81.36	85.71	82.53	2.782199
2	75.55	76.43	73.22	75.06	1.658684
3	70.56	71.61	69.31	70.49	1.151448
4	66.12	65.71	67.78	66.54	1.096099
5	60.34	61.22	59.23	60.26	0.997213

Table D2 Yield of plasma treated chitin hydrogel with 7% w/v KOH concentration

7% (w/v) KOH concentration					
Reaction time (hour)	% Yield of plasma treated chitin hydrogel				
	1	2	3	Average	SD
0	100	100	100	100	0
1	77.89	78.91	79.59	78.79667	0.855648
2	66.48	67.12	65.99	66.53	0.566657
3	44.19	42.26	45.21	43.88667	1.49821
4	35.13	32.22	36.76	34.70333	2.299877
5	30.12	25.71	28.25	28.02667	2.213466

Table D3 Yield of plasma treated chitin hydrogel with 10% w/v KOH concentration

10% (w/v) KOH concentration					
Reaction time (hour)	-% Yield of plasma treated chitin hydrogel				
	1	2	3	Average	SD
0	100	100	100	100	0
1	81.51	74.44	75.14	77.03	3.895549
2	61.43	62.95	60.19	61.52333	1.382365
3	46.085	43.63	40.12	43.27833	2.998009
4	37.5456	28.0485	30.51	32.0347	4.928718
5	30.3041	25.61	24.57	26.82803	3.054943

Table D4 Yield of conventional heat treatment chitin hydrogel with 10% w/v KOH concentration

10% (w/v) KOH concentration					
Reaction time (hour)	% Yield of plasma treated chitin hydrogel				
	1	2	3	Average	SD -
0	100	100	100	100	0
1	95.36	96.78	92.19	94.77667	2.349943
2	81.51	80.24	78.26	80.00333	1.637875
3	56.48	58.34	59.77	58.19667	1.649677
4	49.69	50.12	52.98	50.93	1.788323
5	45.17	44.56	46.23	45.32	0.845044

Appendix E Acid hydrolysis of chitin hydrogel by using solution plasma in acetic acid solution

Table E1 Degree of deacetylation of depolymerized chitin hydrogel

Number of samples Time (hours)	Degree of deacetylation (%DD)				SD
	1	2	3	Average	
3	45.68	43.12	45.89	44.89667	1.542217
5	47.89	48.56	48.26	48.23667	0.335609

Table E1 Effect of depolymerized chitin hydrogel at 3 hours in 1% v/v acetic acid solution and deacetylated in 10 % KOH/MeOH on the degree of deacetylation.

3 hours of depolymerization in 1%v/v acetic acid and deacetylation at 10% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	45.68	43.12	45.89	44.90	1.542217
1	65.53	67.53	66.24	66.43	1.01392
2	72.64	71.399	69.51	71.18	1.57614
3	74.22	73.78	71.84	73.28	1.266333
4	75.08	75.96	74.88	75.64	0.574572
5	74.63	76.67	77.18	76.16	1.349333

Table E2 Effect of depolymerized chitin hydrogel at 5 hours in 1% v/v acetic acid solution and deacetylated in 10 % KOH/MeOH on the degree of deacetylation.

5 hours of depolymerization in 1%v/v acetic acid and deacetylation at 10% (w/v) KOH concentration					
Reaction time (hour)	Degree of deacetylation (%DD)				
	1	2	3	Average	SD
0	47.89	48.56	48.26	48.23667	0.335609
1	68.23	69.81	70.24	69.42667	1.058411
2	74.73	72.66	73.26	73.88333	1.561292
3	73.44	75.62	73.12	74.06	1.360441
4	76.12	76.48	76.66	76.42	0.274955
5	80.28	76.36	78.88	78.50667	1.986488

Table E3 Effect of depolymerized chitin hydrogel at 3 hours in 1% v/v acetic acid solution and deacetylated in 10 % KOH/MeOH on the solubility.

3 hours of depolymerization in 1%v/v acetic acid and deacetylation at 10% (w/v) KOH concentration					
Reaction time (hour)	% Solubility				
	1	2	3	Average	SD
1	59.16	60.77	63.38	61.10333	2.129656
2	69.82	73.06	76.5	73.12667	3.340499
3	79.73	79.62	82.96	80.77	1.897393
4	88.91	90.86	92.35	90.70667	1.725118
5	91.04	94.3	96.3	93.88	2.655033

Table E4 Effect of depolymerized chitin hydrogel at 5 hours in 1% v/v acetic acid solution and deacetylated in 10 % KOH/MeOH on the solubility.

5 hours of depolymerization in 1%v/v acetic acid and deacetylation at 10% (w/v) KOH concentration					
Reaction time (hour)	% Solubility				
	1	2	3	Average	SD
1	67.42	68.2	69.28	67.81	0.934024
2	76.06	76.5	80.4	76.28	1.084866
3	88.47	74.88	75.56	81.675	1.192644
4	93.55	95.03	95.36	94.29	0.963967
5	97.32	98.64	92.49	97.98	1.034601

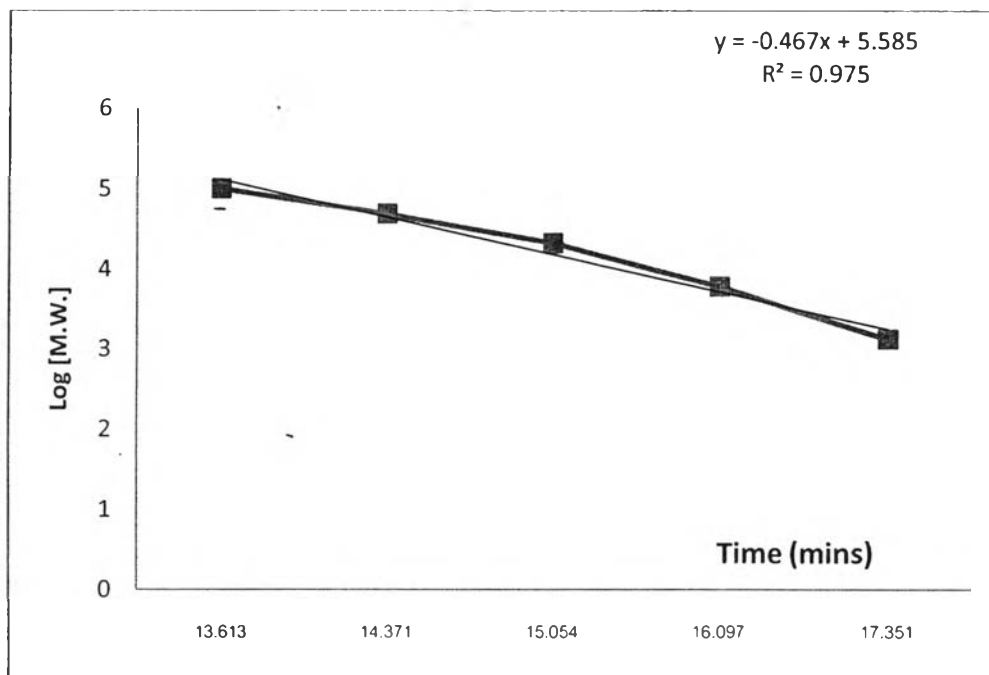
Appendix F Determination of Molecular weight by GPC**Figure F1 Calibration curve for GPC measurement using pullulan standard**

Table F2 The molecular weight of deacetylation chitin hydrogel in 10% w/v KOH/MeOH with different times by using solution plasma

Conditions	Treated chitin hydrogel 3 hours	Treated chitin hydrogel 4 hours	Treated chitin hydrogel 5 hours
M_w	340,124	324,709	321,624
M_n	116,703	124,551	128,701
PDI	2.91	2.61	2.50
M_z	738,640	633,138	610,783

Table F3 The molecular weight of depolymerization chitin hydrogel in 1%v/v acetic solution and deacetylation in 10% w/v KOH/MeOH with different times by using solution plasma

Conditions	Treated chitin hydrogel 3 hours	Treated chitin hydrogel 4 hours	Treated chitin hydrogel 5 hours
M_w	281,454	272,856	251,567
M_n	117,292	128,705	123,631
PDI	2.40	2.12	2.03
M_z	636,744	620,890	615,871

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