APPENDIX

Appendix A Calculations of the reagents used to prepare hydroxyl-terminate PDMS (PDMS-OH)

1. Synthesis of 2,000 g/mol PDMS prepolymer

Density of D_4 monomer = 0.95 g/mol

Density of 1,1,3,3-tratamethyldisiloxane (end capper) = 0.76 g/mol

Molecular weight of 1,1,3,3-tratamethyldisiloxane (end capper) = 134.33 g/mol

Starting from D_4 monomer 20 ml

20 mL of D_4 monomer = 20 ml x 0.95 g/mol

= 19 g

Mole of 2,000 g/mol PDMS $= \frac{19g}{2{,}000g/mol}$

= 9.5×10^{-3} mol

Molar ratio of PDMS to 1,1,3,3-tratamethyldisiloxane endcapper = 1:1

Thus mole of the endcapper needed = 9.5×10^{-3} mol

Volume of the endcapper needed $= (9.5x10^{-3}\, mol)(134.33g/mol)\frac{1}{0.76g/mol}$

= 1.68 ml

To calculate the catalyst (triflic acid) needed in the reaction (need 0.65 %v of D_4)

Volume of triflic acid needed $= (0.65)(\frac{1}{100})(20ml)$

= 0.13 ml

2. Synthesis of 2,000 g/mol PDMS-OH from 2,000 g/mol PDMS prepolymer

Density of allyl alcohol = 0.85g/ml

Molecular weight of allyl alcohol =58.08 g/mol

Starting from PDMS prepolymer 20 g

Mole of the PDMS prepolymer $= \frac{20g}{5{,}000g/mol}$

$= 4x10^{-3}$ mol

Two times of allyl alcohol needed to terminate the PDMS prepolymer at both ends (Molar ratio of PDMS to allyl alcohol = 1:2)

Therefore, mole of allyl alcohol needed $= 2x4x10^{-3}mol$

Volume of allyl alcohol needed $= 0.008mol(58.08g/mol)(\frac{1}{0.85g/ml})$

$=$ <u>0.55 ml</u>

To calculate the catalyst (Pt) needed in the reaction (need 1/10,000 mol of allyl alcohol)

Weight of the Pt catalyst needed $= 0.008mol(10^{-4})(195g/mol)(\frac{100}{2.2\%})$

$= 0.071$ g

Appendix B Estimation of the molecular weights of PDMS from ^{1}H NMR

An example of 2,000g/mol PDMS was illustrated.

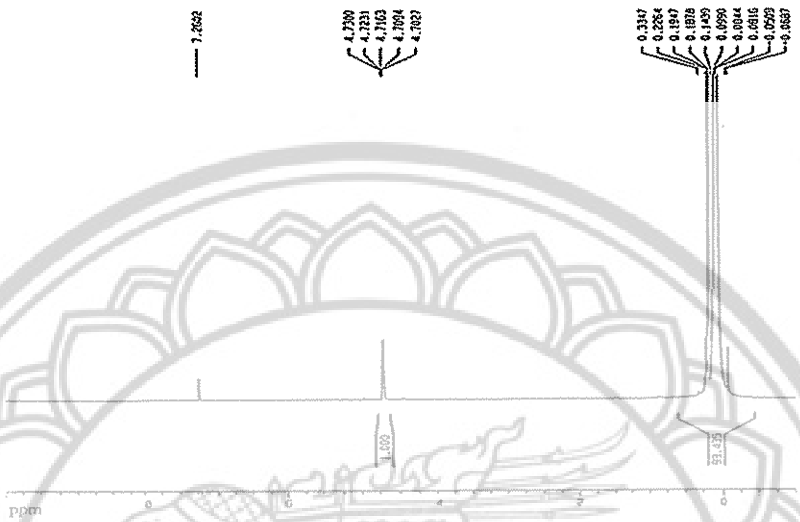

Figure 52 ^{1}H-NMR spectrum of PDMS-OH (2K) in $CDCl_3$

At about 4.7 ppm is Si-H of hydrogen terminated of PDMS (PDMS-H)

Si-H have area $= 1$

2H has area $= \frac{1}{2}$

$= 0.5$

At 0 ppm is 6H of methyl protons on a silicon atom along the chain has area = 99.435

Amount of H $= \frac{99.435}{0.5}$

$= 198.87$ H

6H of methyl protons on a silicon atom $= \frac{198.87}{6}$

Repeating unit = 33.145 unit

1 unit has molecular weight = 74 g/mol

33.145 units have molecular weight $= (33.145)(74 g/mol)$

= 2,452.73 g/mol

* Calculation of the other molecular weight used the same approach

Appendix C An example of the calculation of percent crosslinking

Table 12 Weight of 2K PDMS-modified chitosan (C-PDMS 2K) before and after dissolution

wt% of 2K PDMS	Dried weight before dissolution, w_1 (g)			Dried weight after dissolution, w_2 (g)		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
1%	**0.0163 g**	0.0161	0.0167	**0.0073 g**	0.0072	0.0065
5%	0.0248	0.0257	0.0251	0.0109	0.0122	0.0099
10%	0.0169	0.0167	0.0161	0.0091	0.0086	0.0089
20%	0.0121	0.0114	0.0118	0.0066	0.0061	0.0066

$$\text{Percent crosslinking (\%)} = \frac{w_2}{w_1} x100$$

where w_1 = weight of the films before dissolution

w_2 = weight of the films before dissolution

An example of 1% weight of 2K PDMS;

$$\text{Percent crosslinking (\%)} = \frac{0.0073}{0.0163} x100$$

$$= 44.78\ \%$$

Table 13 Reported percent crosslinking (%) of C-PDMS 2K

wt% of PDMS 2K	Percent crosslinking (%)			Average	S.D.
	Trial 1	Trial 2	Trial 3		
1%	**44.78%**	44.72	38.92	42.81	3.37
5%	43.95	47.47	39.44	43.62	4.02
10%	53.85	51.49	55.28	53.54	1.91
20%	54.54	53.51	55.93	54.66	1.22

Appendix D Calculations of Equilibrium Water Content (%EWC)

Table 14 Weights of 2K PDMS-modified chitosan (C-PDMS 2K)

wt% of PDMS 2K	dried weight (g)(w_d)			swelling weight (g)(w_s)		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
0%	0.0303	0.0272	0.0291	0.0733	0.0622	0.0609
1%	**0.0226 g**	0.0229	0.0225	**0.0687 g**	0.0763	0.0729
5%	0.0228	0.0232	0.0237	0.0846	0.0813	0.0803
10%	0.0185	0.0192	0.0194	0.0713	0.0676	0.0758
20%	0.0239	0.0245	0.0238	0.0944	0.0917	0.0892

Percent equilibrium water content (% EWC) = $\frac{W_s - W_d}{W_d} x100$

Where W_s = weight of the swollen film

W_d = weight of the dry film

An example of 1% weight of PDMS

$$\% EWC = \frac{0.0687g - 0.0226g}{0.0226g} x100$$

$$= 203.98\ \%$$

Table 15 Reported percent equilibrium water content (% EWC) of C-PDMS 2K

wt% of PDMS 2K	Equilibrium water content (% EWC)			Average	S.D.
	Trial 1	Trial 2	Trial 3		
0%	141.91	128.67	109.28	126.62	16.41
1%	**203.98 %**	233.19	224.00	220.39	14.93
5%	271.05	250.43	238.82	253.43	16.32
10%	285.40	252.08	290.72	276.07	20.94
20%	294.98	274.29	274.79	281.35	11.80

Appendix E Calculations of tensile strength and elongation at break

Calculations of tensile strength

An example of sample 1 of C-PDMS 2K

Table 16 Reported tensile strength and percent elongation at break of C-PDMS 2K

Sample	Sample width (mm)	Sample thickness (mm)	Range (mm)	Max Load (kN)	Max Strength (N/mm^2)	Increased length (mm)	Elongation at break (%)	Area (mm^2)
1	10	0.5010	30	0.2334	46.59	1.11	3.71	5.0
2	10	0.3616	30	0.1800	49.77	1.53	5.10	3.6
3	10	0.2333	30	0.1134	48.60	1.63	5.43	2.3
4	10	0.2596	30	0.1246	47.98	1.76	5.86	2.6
5	10	0.2730	30	0.1230	45.05	1.51	5.02	2.7

$$\text{Tensile strength } (N/mm^2) = \frac{\text{Breaking force (N)}}{\text{Cross - section area of the sample } (mm^2)}$$

Sample width = 10 mm

Sample thickness = 0.5010 mm

Observed breaking force = 0.2334 kN

$$\text{Tensile strength } (N/mm^2) = \frac{(0.2334N)}{(0.5010mm)x(10mm)}x1000$$

$$= 46.59 \text{ N/mm}^2$$

Calculations of percent elongation

$$\text{Percent elongation at break (\%)} = \frac{\text{The increase in length at breaking point (mm)}}{\text{Original length (mm)}} \times 100$$

The increased length = 1.11 mm

The original length = 30 mm

$$\text{\% elongation at break (\%)} = \frac{1.11mm}{30mm}x100$$

$$= 3.71 \text{ \%}$$

Figure 53 ^{1}H-NMR spectrum of PDMS-H (2K) in $CDCl_3$

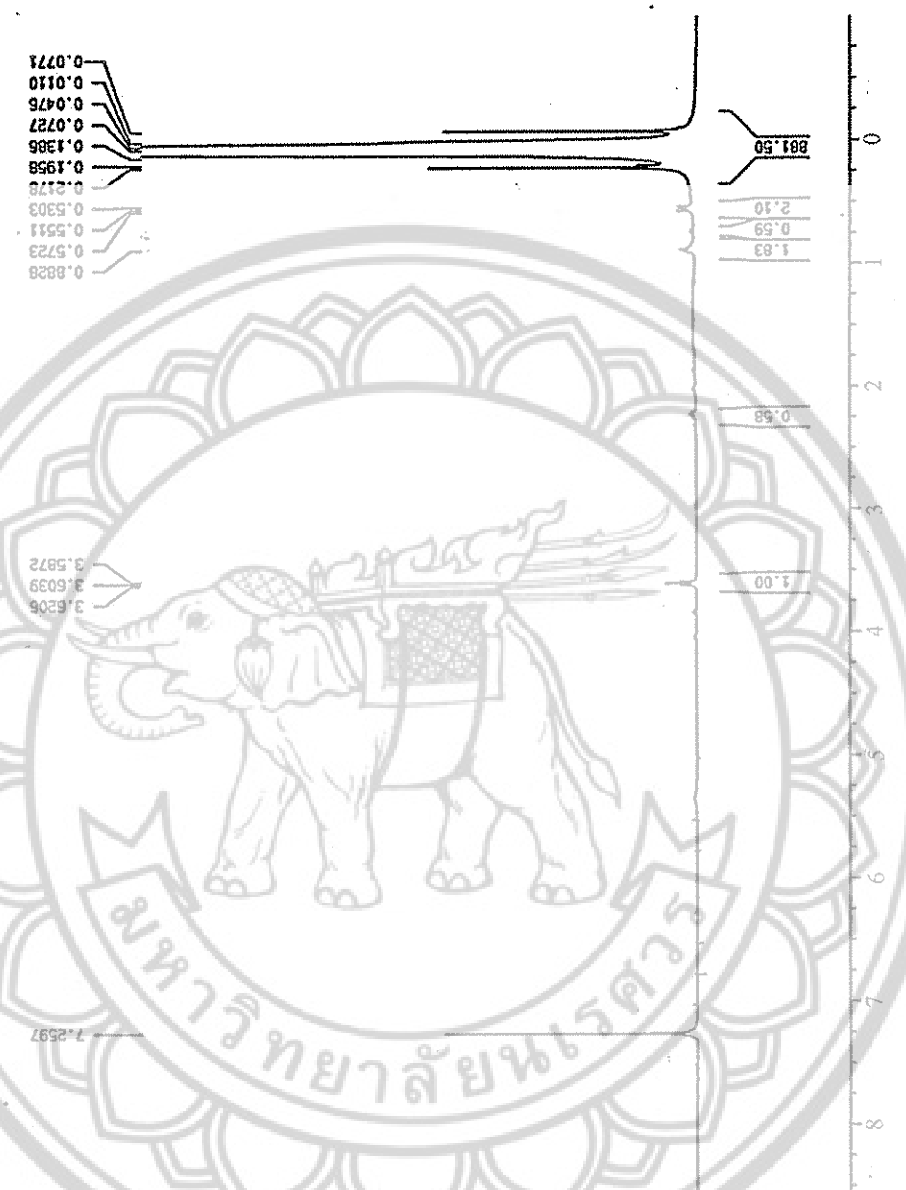

Figure 54 ^{1}H-NMR spectrum of PDMS-OH (2K) in $CDCl_3$

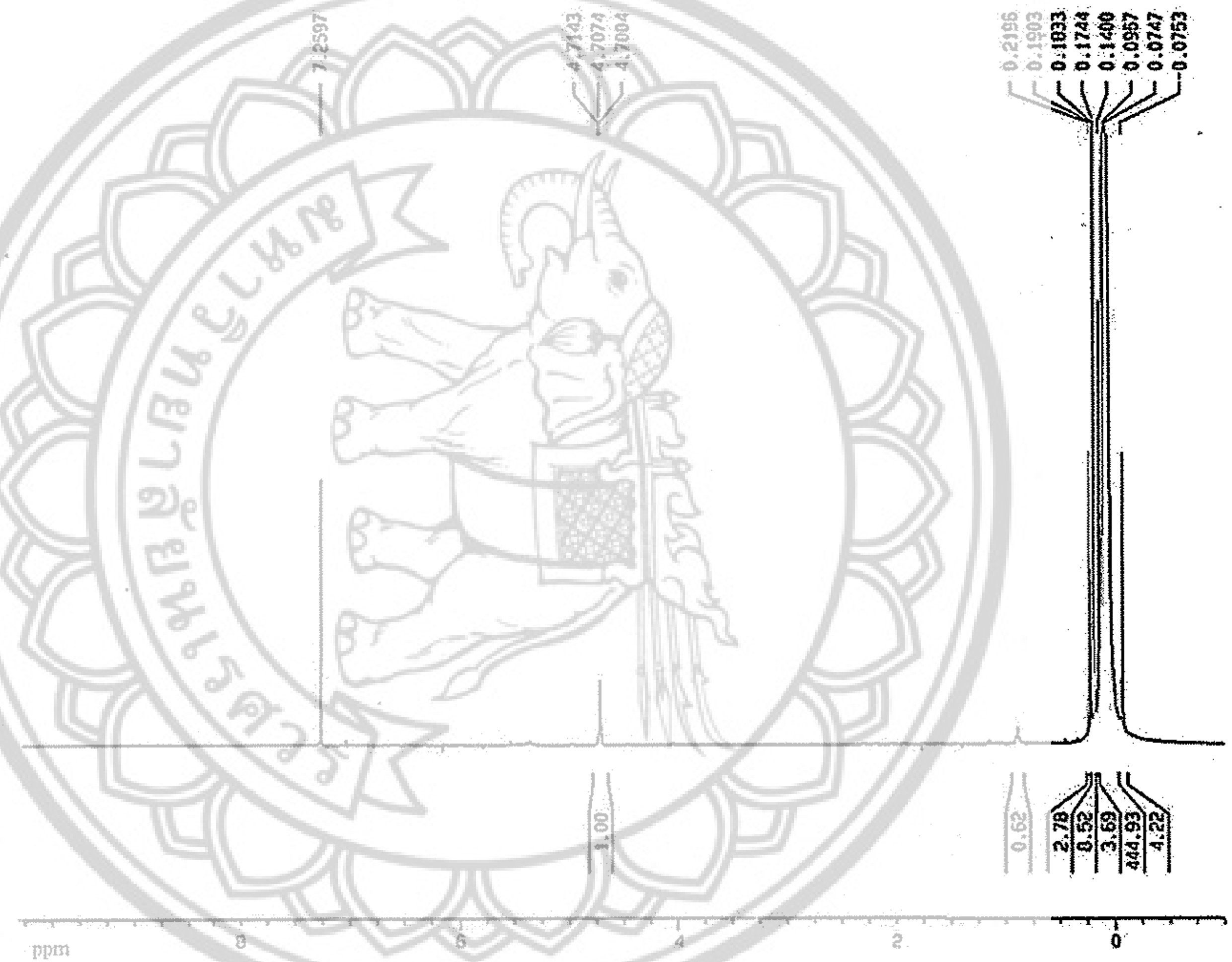

Figure 55 ^{1}H-NMR spectrum of PDMS-H (8K) in $CDCl_3$

Figure 56 ^{1}H-NMR spectrum of PDMS-OH (8K) in $CDCl_3$

Figure 57 ^{1}H-NMR spectrum of HDI in $CDCl_3$

Figure 58 ^{1}H-NMR spectrum of HDA in $CDCl_3$

Figure 59 FT-IR spectra of PDMS-H 2K and PDMS-OH 2K

Figure 60 FT-IR spectra of PDMS-H 8K and PDMS-OH 8K

Figure 61 FT-IR spectra of HDI and HDA

Figure 62 FT-IR spectra of HDA, PDMS and PDMS-HDA

Figure 63 FT-IR spectra of HDA, PEG and PEG-HDA

Figure 64 FT-IR spectra of chitosan oligomer and CMC