REFERENCES

Atis, C.D., Karahan, O. (2007) Properties of steel fiber reinforced fly ash concrete. Construction and Building Materials.

Bendak, A., El-Marsafi, S.M. (1991) Effects of chemical modifications on polyester fibers. Journal of Islamic Academy of Sciences, 4(4), 275-284.

Chen, W., McCarthy, T.J. (1998) Chemical surface modification of poly(ethylene terephthalate). Macromolecules, 31, 3648-3655.

Cokeliler, D., Erkut, S., Zemek, J., Biederman, H., Mutlu, M. (2007) Modification of glass fibers to improve reinforcement: A plasma polymerization technique. Dental Materials, 23, 335-342.

Hwai-Chug Wu, Victor C. Li (1999) Fiber/cement interface tailoring of plasma treatment. Cement & Concrete Composites, 21, 205-212.

Hwai-Chug Wu, Victor C. Li (1996) Effect of plasma treatment of polyethylene fibers on interface and cementitious composite properties. Journal of the American Ceramic Society, 79(3), 700-704.

Ibrahim, M.S., Salmawi, K.M.E., Ibrahim, S.M. (2005) Electron-beam modification of textile fabrics for hydrophilic finishing. Applied Surface Science, 241, 309–320.

Jantarapatin, N. (2006) Application of admicellar polymerization in fiber reinforced concrete. M.S. Thesis, The Petroleum and Petrochemical College, Chulalongkorn University, Bangkok, Thailand.

Kaczmarek, H., Kowalonek, J. (2002) The influence of side groups and polarity of polymers on the kind and effectiveness of their surface modification by air plasma action. European Polymer Journal, 38(9), 1915-1919.

Kanda, T., Li, V.C. (1998) Interface property and apparent strength of high-strength hydrophilic fiber in cement matrix. Journal of Material in Civil Engineering, 10(1), 5-13.

Kawase, T., Uchida, M., Fujii, T., Minagawa, M. (1992) Effects of grafting with acrylic acid on removal of oily soil from polyester fabric. Textile Research Journal, 62(11), 663-668.

Long, J.H., Paul S.L., Lampo, R.G. (1989) Bond strength between geotextiles and concrete. Geotextiles and Geomembranes, 8(2), 113-132.

Matarredona, O.M., Mach, K., Rieger, M.M., O'Rear, E.A. (2003) Alteration of wettability and inhibition of corrosion in narrow aluminium 7075 gaps by thin polymer films. Corrosion Science, 45, 2541–2562.

Pino, E.S., Machado, L.D.B., Giovedi, C. (2007) Improvement of carbon fiber surface properties using electron beam irradiation. Nuclear Science and Techniques, 18(1), 39-41.

Pongprayoon, T., O'Rear, E.A., Yanumet, N., Yuan, W.L. (2003) Wettability of Cotton Modified by Admicellar Polymerization. Langmuir, 19, 3770-3778.

Pongprayoon, T., Yanumet, N., O'Rear, E.A. (2002) Admicellar Polymerization of Styrene on Cotton. Journal of Colloid and Interface Science, 249, 227–234.

Pongprayoon, T., Yanumet, N., O'Rear, E.A., Alvarez, W.E., Resasco, D.E. (2005) Surface characterization of cotton coated by a thin film of polystyrene with and without a cross-linking agent. Journal of Colloid and Interface Science, 281, 307–315.

Rafi, M.M., Nadjai, A., Ali, F., Talamona, D. (2008) Aspects of behaviour of CFRP reinforced concrete beams in bending. Construction and Building Materials, 22, 277–285.

Riccardi, C., Barni, R. (2003) Surface modification of poly(ethylene terephthalate) fibers induced by radio frequency air plasma treatment. Applied Surface Science, 211, 386–397.

Rungruang, P., Grady, B.P., Supaphol, P. (2006) Surface-modified calcium carbonate particles by admicellar polymerization to be used as filler for isotactic polypropylene. Colloids and Surfaces A: Physicochem. Eng. Aspects, 275, 114-125.

Sacak, M., Bastug, N., Taku, M. (1993) Azobisisobutyronitrile-initiated graft copolymerization of methyl methacrylate onto poly(ethylene terephthalate) fibers. Journal of Applied Polymer Science, 50, 1123-1129.

Sakhalkar, S.S., Hirt, D.E. (1995) Admicellar Polymerization of Polystyrene on Glass Fibers. Langmuir, 11, 3369-3373.

Salgaonkar, L.P., Jayaram, R.V. (2005) Polyaniline film formation in hexadecyl trimethyl ammonium bromide admicelles on hydrous zirconia surface. Journal of Colloid and Interface Science, 291, 92–97.

Shenton, M.J., Stevens, G.C. (1998) Atmospheric pressure non-equilibrium plasma processing of polymers. Europhysics Conference Abstracts, 22C, 2587-2590.

Tang, W.C., Lo, T.Y., Balendran, R.V. (2008) Bond performance of polystyrene aggregate concrete (PAC) reinforced with glass-fibre-reinforced polymer (GFRP) bars. Building and Environment, 43, 98–107.

Uchida, E., Twata, H., Ikada, Y. (2000) Surface structure of poly(ethylene terephthalate) film grafted with poly(methacrylic acid). Polymer, 41, 3609-3614.

Wang, Y., Backer, S., Li, V.C. (1987) A experimental study of synthetic fiber reinforced cementitious composites. Journal of Materials Science, 22, 4281-4291.

Xu, W., Liu, X. (2003) Surface modification of polyester fabric by corona discharge irradiation. European Polymer Journal, 39, 199 –202.

APPENDICES

Appendix A Calibration Curve of Standard DBSA

Procedure:

The standard solution of DBSA in distilled water was prepared from stock solution of 5 mM in volumetric flask 50 ml. The amount of DBSA in standard solution was measured by a UV spectrometer at 224 nm.

Calculation of a molar absorbtivity of DBSA from the calibration curve

$$A = \varepsilon bc$$

When, A = Absorbance

ε = The molar absorbtivity (L mol^{-1} cm^{-1})

b = The path length of the cuvette (cm)

c = Concentration of solution (mol/L)

From the equation of calibration curve, the molar extinction coefficient of DBSA is the slope of the calibration curve.

At 224 nm;

$$Y = 10586X$$

Therefore, the molar absorbtivity of DBSA at 224 nm is 1.0586×10^4 L mol^{-1} cm^{-1}

Table A1 Absorbance values of the standard DBSA

[DBSA](μM)	Absorbance			
	I	II	III	Average
20	0.201	0.201	0.202	0.201
40	0.417	0.418	0.419	0.418
60	0.632	0.631	0.631	0.631
80	0.855	0.854	0.855	0.855
100	1.058	1.058	1.060	1.059

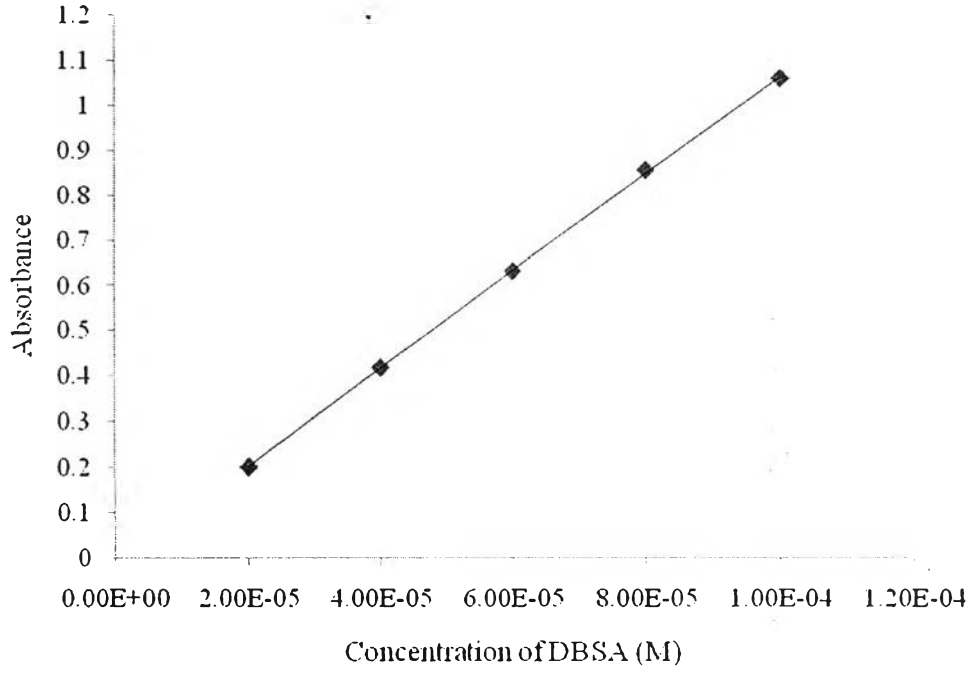

Figure A1 Calibration curve of the standard DBSA

APPENDIX B Determination of Equilibrium Adsorption Time

The calculation of $[DBSA]_{equi}$ can be calculated following this equation.

Y = Absorbance

X = [DBSA]

X = y/10586

0.5 ml supernatant was pipetted and diluted with distilled water pH = 4 in a 25 ml volumetric flask so, $[DBSA]_{equi}$ can be calculated from

$$C_1V_1 = C_2V_2$$

$$X = C_1 = [DBSA]_{flask}\ ,\ V_1 = 50\ ml$$

$$[DBSA]_{fi} = C_2 = [DBSA]_{vial}\ ,\ V_2 = 0.5\ ml$$

$$C_2 = (X \times 50)/0.5\ M$$

Calculation of the amount of adsorbed DBSA on polyester fabric

$$[DBSA]_{ads} = \{([DBSA]_{ini} - [DBSA]_{fi}) \times V\}/1000$$

$$\text{Adsorption } \mu mol/\ g\ PES = [DBSA]_{ads} \times 60)/1000\}/\text{weight of fabric}$$

Table B1 The equilibrium DBSA concentration at various adsorption time

Time	Exp. I			Exp. II		
(h)	Absorbance	[DBSA]equi	[DBSA]PES	Absorbance	[DBSA]equi	[DBSA]PES
3	0.531	0.00502	3.00E-06	0.530	0.00501	3.40E-06
6	0.524	0.00495	6.10E-06	0.524	0.00495	6.50E-06
9	0.517	0.00488	9.80E-06	0.517	0.00488	9.60E-06
12	0.509	0.00481	1.35E-05	0.507	0.00479	1.41E-05
15	0.503	0.00475	1.61E-05	0.501	0.00474	1.67E-05
18	0.503	0.00475	1.63E-05	0.502	0.00473	1.71E-05
21	0.503	0.00475	1.64E-05	0.502	0.00474	1.66E-05
24	0.503	0.00475	1.61E-05	0.502	0.00475	1.65E-05
36	0.502	0.00474	1.66E-05	0.501	0.00474	1.70E-05

Table B2 The amount of adsorbed DBSA at various time

Time(h)	I [DBSA]PES (μmol/ g PES)	II [DBSA]PES (μmol/ g PES)	Average [DBSA]PES (μmol/ g PES)	SD
3	3.0	3.4	3.2	0.3
6	6.1	6.5	6.3	0.3
9	9.8	9.6	9.7	0.1
12	13.5	14.1	13.8	0.4
15	16.1	16.7	16.4	0.4
18	16.3	17.1	16.7	0.6
21	16.4	16.6	16.5	0.1
24	16.1	16.5	16.3	0.3
36	16.6	17.0	16.8	0.3

APPENDIX C Determination of The Surfactant Adsorption Isotherm

Table C1 The equilibrium DBSA concentration

$[DBSA]_{ini}$ (μM)	I $[DBSA]_{equi}$ (μM)	II $[DBSA]_{equi}$ (μM)	Average $[DBSA]_{equi}$ (μM)	SD
10	2.0	0.8	1.4	0.8
50	38.0	35.2	36.6	2.0
100	55.4	57.0	56.2	1.1
200	134.0	128.0	131.0	4.2
400	294.6	287.4	291.0	5.1
600	394.6	388.2	391.4	4.5
1000	736.8	726.4	731.6	7.4
1300	1034.6	1027.8	1031.2	4.8
1500	1210.6	1204.6	1207.6	4.2
2000	1663.4	1674.2	1668.8	7.6
4000	3662.0	3649.6	3655.8	8.8
6000	5639.4	5633.4	5636.4	4.2

Table C2 The amount of adsorbed DBSA at equilibrium

$[DBSA]_{ini}$ (μM)	I [DBSA]PES (μmol/ g PES)	II [DBSA]PES (μmol/ g PES)	Average [DBSA]PES (μmol/ g PES)	SD
10	0.4	0.5	0.4	0.1
50	0.5	0.6	0.5	0.1
100	2.0	1.9	1.9	0.1
200	3.0	3.3	3.1	0.2
400	4.5	4.8	4.7	0.3
600	9.6	9.9	9.8	0.2
1000	11.6	12.1	11.8	0.4
1300	12.5	12.8	12.6	0.2
1500	12.7	13.0	12.9	0.2
2000	14.5	13.9	14.2	0.4
4000	14.3	14.9	14.6	0.4
6000	14.3	14.6	14.5	0.2

APPENDIX D Determination of The Monomer Adsolublization Isotherm

Procedure:

The standard solution of methyl acrylate monomer in surfactant solution was prepared from stock solution of 5 mM in a 50 ml volumetric flask. The amount of methyl acrylate monomer in standard solution was measured by a UV spectrometer at 237 nm.

Calculation of a molar absorbtivity of DBSA from the calibration curve

$$A = \varepsilon bc$$

When, A = Absorbance

ε = The molar absorbtivity (L mol^{-1} cm^{-1})

c = Concentration of solution (mol/L)

From the equation of calibration curve, the molar extinction coefficient of methyl acrylate monomer is the slope of the calibration curve.

At 237 nm;

$$Y = 127.16X$$

Therefore, the molar absorbtivity of methyl acrylate monomer at 237 nm is 1.2716×10^2 L mol^{-1} cm^{-1}

Table A1 Absorbance values of the standard methyl acrylate monomer

[MA] (mM)	Absorbance			
	I	II	III	Average
1	0.127	0.125	0.126	0.126
2	0.253	0.251	0.251	0.252
3	0.382	0.383	0.383	0.383
4	0.504	0.506	0.504	0.505
5	0.639	0.639	0.638	0.639

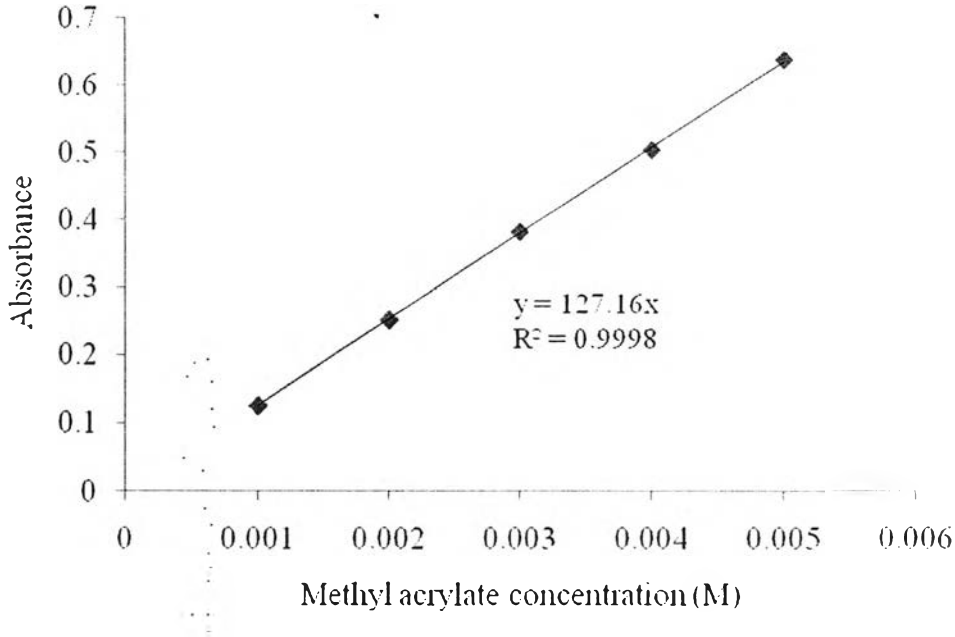

Figure D1 Calibration curve of the standard MA monomer

Appendix E Contact Angle Measurement on The PMA-Coated Polyester Fabric

Table E1 Contact angle of the PMA-coated polyester fabric at various conditions

AIBN:MA	DBSA:MA	Contact angle θ, degree										
		1	2	3	4	5	6	7	8	9	10	Average
1:5	1:2	126.8	128.3	126.9	122.0	120.0	123.8	121.0	117.0	126.7	121.8	123.0±4.4
		115.1	116.7	127.3	125.5	114.6	127.2	126.0	122.7	123.4	127.3	
	1:5	124.5	123.3	132.1	122.6	135.1	126.5	131.0	126.7	124.2	128.2	127.4±3.4
		123.8	127.1	128.6	131.7	128.5	127.6	131.1	127.7	125.1	123.5	
	1:10	129.1	134.3	133.5	132.4	137.5	128.8	139.2	132.2	129.5	133.7	132.9±3.7
		133.1	135.8	128.0	137.8	137.4	137.5	127.4	129.3	131.4	129.2	
	1:15	121.4	128.1	128.3	126.2	126.8	132.0	131.8	133.7	129.7	132.8	129.2±3.7
		127.9	126.1	130.7	135.2	130.7	123.3	127.2	125.6	130.9	134.7	
1:10	1:2	126.1	132.4	128.3	124.8	129.1	121.6	124.1	122.5	128.7	128.1	127.5±3.8
		119.7	125.9	132.7	132.1	132.7	125.2	128.9	130.6	126.8	129.5	
	1:5	135.1	125.1	124.5	132.1	124.3	124.8	135.6	127.6	135.2	124.8	131.1±4.6
		134.6	133.3	135.5	133.8	126.6	130.5	134.8	132.6	135.7	135.8	
	1:10	137.7	142.0	142.4	136.0	135.5	134.9	136.7	142.7	129.3	133.5	134.7±5.5
		124.4	126.2	135.5	133.8	140.2	140.4	126.3	133.5	130.8	131.2	
	1:15	134.2	132.5	136.6	134.6	140.9	127.3	134.2	135.8	132.7	138.1	133.8±3.1
		130.6	136.0	130.1	132.1	136.4	132.2	135.1	131.6	134.3	130.5	

Table E2 Contact angle of the PMA-coated polyester fabric at various conditions

AIBN:MA	DBSA:MA	Contact angle θ, degree										
		1	2	3	4	5	6	7	8	9	10	Average
1:15	1:2	121.0	127.9	130.1	130.1	133.6	130.0	132.1	132.0	123.8	128.6	129.5±4.2
		120.4	129.5	123.2	135.5	131.7	131.5	131.7	132.8	130.9	133.8	
	1:5	128.7	125.5	131.4	129.4	132.7	131.4	130.2	126.3	134.8	127.5	131.2±4.2
		136.2	128.5	135.3	125.7	136.5	123.9	136.3	136.0	130.7	136.1	
	1:10	136.5	136.5	134.9	136.6	132.3	129.5	130.7	128.9	132.2	135.7	132.0±4.3
		131.9	136.9	129.3	127.3	136.2	128.8	121.3	125.8	135.7	132.9	
	1:15	132.7	127.7	130.8	127.3	134.4	132.6	131.6	135.6	136.1	132.8	133.4±3.4
		135.8	141.1	132.4	131.5	138.1	137.5	134.1	131.9	129.8	133.7	
1:20	1:2	121.9	125.3	130.1	128.8	122.5	129.8	134.4	130.8	129.5	126.3	130.4±4.1
		129.6	135.8	133.5	134.8	129.4	132.1	131.2	130.2	136.8	135.0	
	1:5	129.2	134.6	130.4	136.1	135.7	123.3	132.9	131.9	127.3	135.3	132.6±3.7
		132.3	134.6	137.7	135.8	130.9	129.4	128.9	137.9	133.7	133.9	
	1:10	128.4	135.4	134.0	134.1	127.3	129.4	130.3	135.4	128.8	130.8	131.7±3.0
		130.4	135.9	130.6	134.1	126.8	133.2	127.5	133.2	135.7	132.3	
	1:15	134.5	141.3	128.9	136.2	130.3	140.7	142.3	137.5	132.1	132.5	134.5±4.4
		137.6	135.2	132.7	128.9	126.0	138.4	132.6	131.7	134.9	135.5	

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2. Duangpichakul, S.; O'Haver, J.; and Nithitanakul, M. (2009, April 22) Application of Admicellar Polymerization in Fiber Reinforced Concrete; Methyl Acrylate as a Monomer. Proceedings of the 15th PPC Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand.

Presentations:

1. Duangpichakul, S.; O'Haver, J.; and Nithitanakul, M. (2009, March 22-26) Application of Admicellar Polymerization in Fiber Reinforced Concrete. Paper presented at 237th ACS National Meeting & Exposition, Utah, USA.
2. Duangpichakul, S.; O'Haver, J.; and Nithitanakul, M. (2009, April 22) Application of Admicellar Polymerization in Fiber Reinforced Concrete; Methyl Acrylate as a Monomer. Paper presented at 15th PPC Symposium on Petroleum, Petrochemicals and Polymers, Bangkok, Thailand.