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APPENDICES

Table A.1 Raw data for average thickness calculation of the silk nonwoven fabrics.

Samples No	Thickness, (mm)						
	40PE30	60PE30	40PET30	60PET20	60PET25	60PET30	60PET35
1	0.436	0.504	0.288	0.384	0.354	0.402	0.296
2	0.434	0.472	0.300	0.448	0.348	0.382	0.352
3	0.398	0.498	0.284	0.41	0.360	0.358	0.296
4	0.404	0.462	0.284	0.374	0.362	0.466	0.322
5	0.382	0.486	0.284	0.402	0.360	0.418	0.308
6	0.386	0.484	0.264	0.358	0.304	0.480	0.326
7	0.388	0.510	0.266	0.344	0.302	0.446	0.29
8	0.358	0.468	0.290	0.318	0.364	0.478	0.342
9	0.438	0.438	0.304	0.382	0.382	0.386	0.368
10	0.382	0.518	0.286	0.364	0.316	0.394	0.370
AVE.	0.401	0.484	0.285	0.378	0.345	0.421	0.327
S.D.	0.027	0.025	0.013	0.036	0.028	0.044	0.030
% C.V.	6.79	5.08	4.42	9.62	8.04	10.38	9.15

Table A.2 Raw data for average actual areal density calculation of the nonwoven fabrics.

Samples	No.	Prepared Weight, (g) of 20 x 20 cm	Areal Density (g/m^2)
40PE30	1	2.5897	64.742
	2	2.5655	64.138
	3	2.2253	55.632
	4	2.4425	61.062
	5	2.3015	57.538
	6	2.2656	56.640
	7	2.4082	60.205
	8	2.2308	55.770
	9	2.3509	58.772
	10	2.4124	60.310
	AVE.	2.3792	59.481
	S.D.	0.1293	3.232
	% C.V.	5.43	5.43
60PE30	1	2.9920	74.800
	2	2.9728	74.320
	3	3.0585	76.462
	4	2.7146	67.865
	5	3.1477	78.692
	6	3.9239	98.098
	7	3.788	94.700
	8	3.4418	86.045

Table A.2 Continued.

Samples	No.	Prepared Weight, (g) of 20 x 20 cm	Areal Density (g/m^2)
	9	3.2128	80.320
	10	3.7462	93.655
	AVE.	3.2998	82.496
	S.D.	0.4056	10.139
	% C.V.	12.29	12.29
40PET30	1	2.2149	55.372
	2	2.1525	53.812
	3	2.3146	57.865
	4	1.9270	48.175
	5	2.0326	50.815
	6	1.9865	49.662
	7	2.0993	52.482
	8	2.0476	51.190
	9	1.8695	46.738
	10	1.9888	49.720
	AVE.	2.0633	51.583
	S.D.	0.1351	3.376
	% C.V.	6.55	6.55
60 PET 20	1	2.1457	53.642
	2	2.6290	65.725
	3	2.6838	67.095

Table A.2 Continued.

Samples	No.	Prepared Weight, (g) of 20 x 20 cm	Areal Density (g/m^2)
	4	2.1856	54.640
	5	2.4482	61.205
	6	2.3802	59.505
	7	2.4055	60.138
	8	2.4348	60.870
	9	2.7208	68.020
	10	2.6360	65.900
	AVE.	2.4670	61.674
	S.D.	0.2004	5.009
	% C.V.	8.12	8.12
60PET25	1	2.6714	66.785
	2	2.3991	59.978
	3	2.7368	68.420
	4	2.7617	69.042
	5	2.8919	72.298
	6	2.1527	53.818
	7	2.2702	56.755
	8	2.8870	72.175
	9	2.9068	72.670
	10	2.1300	53.250
	AVE.	2.5808	64.519
	S.D.	0.3124	7.809
	% C.V.	12.10	12.10

Table A.2 Continued.

Samples	No.	Prepared Weight, (g) of 20 x 20 cm	Areal Density (g/m^2)
60PET30	1	2.6957	67.392
	2	2.5978	64.945
	3	2.5556	63.890
	4	3.0018	75.046
	5	3.0441	76.102
	6	2.9518	73.795
	7	3.0816	77.040
	8	3.2461	81.152
	9	3.0447	76.118
	10	2.9696	74.24
	AVE.	2.9189	72.972
	S.D.	0.2262	5.655
	% C.V.	7.75	7.75
60PET35	1	2.6384	65.960
	2	2.8221	70.552
	3	2.3056	57.640
	4	2.4359	60.898
	5	2.3494	58.735
	6	2.8521	71.302
	7	2.7108	67.770
	8	3.0319	75.798
	9	2.5606	64.000
	10	2.6483	66.208

Table A.2 Continued.

Samples	No.	Prepared Weight, (g) of 20 x 20 cm	Areal Density (g/m^2)
	AVE.	2.6355	65.886
	S.D.	0.2311	5.779
	% C.V.	8.77	8.77

Table A.3 Raw data for average moisture percentage calculation of the nonwoven fabrics.

Samples	No.	Mass Before Dry, (g)	Absolute Dry Mass, (g)	Moisture, %
40PE30	1	2.5881	2.5361	2.05
	2	2.5647	2.5156	1.95
	3	2.2235	2.1787	2.06
	4	2.4436	2.3967	1.96
	5	2.3028	2.2556	2.09
	AVE.	2.4245	2.3765	2.02
	S.D.	0.1597	0.1573	0.06
	% C.V.	6.59	6.62	3.12
60PE30	1	2.9838	2.8688	4.01
	2	2.9676	2.8609	3.73
	3	3.0523	2.9476	3.55
	4	2.7098	2.6224	3.33
	5	3.1443	3.0389	3.47
	AVE.	2.9716	2.8677	3.62
	S.D.	0.1621	0.1548	0.26
	% C.V.	5.45	5.40	7.26
40PET30	1	2.2117	2.1520	2.77
	2	2.1497	2.0881	2.95
	3	2.3124	2.2540	2.59
	4	1.9235	1.8735	2.67
	5	2.0293	1.9692	3.05
	AVE.	2.1253	2.0674	2.81
	S.D.	0.1525	0.1497	0.19
	% C.V.	7.17	7.24	6.82

Table A.3 Continued.

Samples	No.	Mass Before Dry, (g)	Absolute Dry Mass, (g)	Moisture, %
60PET20	1	2.1442	2.0798	3.10
	2	2.6288	2.5431	3.37
	3	2.6799	2.5920	3.39
	4	2.1840	2.1160	3.21
	5	2.4443	2.3758	2.88
	AVE.	2.4162	2.3413	3.19
	S.D.	0.2467	0.2366	0.21
	% C.V.	10.21	10.11	6.59
60PET25	1	2.667	2.5688	3.81
	2	2.3965	2.3141	3.56
	3	2.7328	2.6388	3.56
	4	2.7605	2.6634	3.64
	5	2.8875	2.7834	3.74
	AVE.	2.6888	2.5937	3.66
	S.D.	0.1820	0.1744	0.11
	% C.V.	6.77	6.72	3.03
60PET30	1	2.6988	2.6222	2.92
	2	2.5994	2.5202	3.14
	3	2.5580	2.4850	2.94
	4	3.0028	2.9149	3.02
	5	3.0444	2.9530	3.10
	AVE.	2.7807	2.6991	3.02
	S.D.	0.2281	0.2207	0.96
	% C.V.	8.20	8.18	3.18

Table A.3 Continued.

Samples	No.	Mass Before Dry, (g)	Absolute Dry Mass, (g)	Moisture, %
60PET35	1	2.3471	2.2855	2.70
	2	2.4349	2.3693	2.77
	3	2.3032	2.2440	2.64
	4	2.8194	2.7470	2.64
	5	2.6309	2.5627	2.66
	AVE.	2.5071	2.4417	2.68
	S.D.	0.2152	0.2101	0.55
	% C.V.	8.58	8.60	2.05

Table A.4 Raw data for average air permeability calculation of the silk nowoven fabrics.

Samples	Air Permeability, (cm^3 /s/cm^2)							
	1	2	3	4	5	AVE.	S.D.	%C.V.
40PE30	179	203	182	198	229	198.2	20.02	10.10
60PE30	159	163	167	170	164	164.6	4.16	2.53
40PET30	183	193	202	223	162	192.6	22.59	11.73
60PET20	254	224	162	175	158	194.6	42.36	21.77
60PET30	138	152	196	167	190	168.6	24.61	14.60

Table A.5 Raw data for tensile strength calculation in machine direction of the 40PE30 nonwoven fabrics.

40PE30 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.414	92.77	8.96	33.42	27.69
2	0.428	103.80	9.70	34.87	27.43
3	0.460	72.02	6.26	31.32	21.37
4	0.434	91.55	8.44	35.02	24.89
5	0.448	103.80	9.26	35.06	25.89
6	0.448	89.11	7.96	31.85	26.66
7	0.510	80.57	6.32	30.10	26.62
8	0.410	89.72	8.75	29.87	28.14
9	0.468	83.01	7.10	34.07	22.49
10	0.428	70.19	6.56	30.02	21.24
AVE.	0.445	87.65	7.93	32.56	25.24
S.D.	0.029	11.49	1.28	2.17	2.63
% C.V.	6.65	13.15	16.20	6.67	10.44

Table A.6 Raw data for tensile strength calculation in machine direction of the 60PE30 nonwoven fabrics.

60PE30 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.486	45.17	3.72	33.38	12.99
2	0.448	98.27	8.77	36.54	26.57
3	0.574	76.29	5.32	33.72	18.33
4	0.502	102.5	8.17	32.54	31.51
5	0.556	50.66	3.64	29.72	21.98
6	0.504	57.37	4.55	32.42	17.07
7	0.544	62.87	4.62	36.20	14.37
8	0.508	79.35	6.25	33.42	18.70
9	0.452	74.46	6.59	36.16	17.92
10	0.386	47.61	4.93	30.29	16.42
AVE.	0.496	69.46	5.66	33.44	19.59
S.D.	0.056	20.28	1.76	2.36	5.66
% C.V.	11.38	29.20	31.18	7.07	28.93

Table A.7 Raw data for tensile strength calculation in machine direction of the 40PET30 nonwoven fabrics.

40PET30 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.336	64.70	7.70	39.25	23.69
2	0.300	67.75	9.03	39.33	25.34
3	0.260	56.15	8.64	40.86	19.98
4	0.258	48.83	7.57	39.71	18.67
5	0.274	34.18	4.99	41.43	14.00
6	0.276	45.78	6.63	41.85	16.37
7	0.258	50.66	7.85	39.29	18.08
8	0.284	34.79	4.90	37.08	14.37
9	0.302	61.65	8.16	35.74	24.09
10	0.284	41.50	5.85	40.86	15.77
AVE.	0.283	50.60	7.13	39.54	19.04
S.D.	0.024	11.90	1.47	1.92	4.13
% C.V.	8.62	23.52	20.60	4.85	21.72

Table A.8 Raw data for tensile strength calculation in machine direction of the 60PET20 nonwoven fabrics.

60PET20 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.366	44.56	4.87	44.72	14.79
2	0.410	42.72	4.17	39.46	14.40
3	0.426	45.17	4.24	42.16	15.01
4	0.418	41.50	3.97	40.99	13.57
5	0.34	34.18	4.02	42.10	11.72
6	0.428	47.61	4.45	44.56	13.50
7	0.402	49.44	4.92	42.96	15.24
8	0.406	37.84	3.73	41.72	13.75
9	0.372	30.52	3.28	37.49	11.29
10	0.334	41.50	4.97	42.51	14.22
AVE.	0.390	41.50	4.26	41.87	13.75
S.D.	0.035	5.89	0.55	2.18	1.32
% C.V.	8.90	14.19	12.94	5.21	9.64

Table A.9 Raw data for tensile strength calculation in machine direction of the 60PET25 nonwoven fabrics.

60PET25 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.268	53.10	7.92	38.60	21.73
2	0.282	42.11	5.97	38.68	19.78
3	0.268	44.56	6.65	42.11	21.13
4	0.258	60.42	9.37	42.65	22.03
5	0.484	82.40	6.81	42.30	22.56
6	0.350	73.24	8.37	39.06	25.70
7	0.316	56.76	7.18	39.29	21.28
8	0.326	61.04	7.49	39.06	21.74
9	0.382	54.93	5.75	47.26	15.48
10	0.334	54.93	6.58	45.24	17.46
AVE.	0.327	58.50	7.21	41.42	20.89
S.D.	0.068	12.11	1.11	3.03	2.81
% C.V.	20.93	20.75	15.43	7.31	13.46

Table A.10 Raw data for tensile strength calculation in machine direction of the 60PET30 nonwoven fabrics.

60PET30 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.304	95.83	12.61	27.69	32.93
2	0.358	78.74	8.80	33.76	29.93
3	0.380	86.06	9.06	38.57	29.31
4	0.360	89.72	9.97	33.19	30.50
5	0.332	76.29	9.19	29.03	28.36
6	0.344	107.4	12.49	28.88	31.34
7	0.324	73.85	9.12	28.92	31.14
8	0.364	93.38	10.26	36.89	28.80
9	0.334	92.77	11.11	40.36	30.10
10	0.374	88.50	9.46	34.90	29.42
AVE.	0.347	88.25	10.21	33.22	30.19
S.D.	0.024	10.10	1.41	4.49	1.36
% C.V.	6.90	11.45	13.83	13.52	4.49

Table A.11 Raw data for tensile strength calculation in machine direction of the 60PET35 nonwoven fabrics.

60PET35 Samples No.	Thickness (mm)	Machine Direction			
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %	Initial Modulus (N/mm^2)
1	0.308	95.83	12.44	28.00	44.57
2	0.292	92.77	12.71	40.93	32.38
3	0.306	112.6	14.72	39.41	32.00
4	0.312	104.4	13.38	39.10	33.03
5	0.296	100.7	13.61	38.45	31.21
6	0.314	105.6	13.45	42.57	32.35
7	0.312	116.0	14.87	39.75	37.48
8	0.322	113.2	14.06	37.80	34.77
9	0.310	116.0	14.96	42.42	35.37
10	0.326	103.1	12.66	42.34	32.45
AVE.	0.310	106.20	13.69	39.08	34.56
S.D.	0.010	8.25	0.94	4.25	3.99
% C.V.	3.34	7.78	6.87	10.88	11.56

Table A.12 Raw data for tensile strength calculation in cross-machine direction of the 40PE30 nonwoven fabrics.

40PE30 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.390	4.88	0.50	37
2	0.370	4.97	0.54	27
3	0.366	3.85	0.42	18
4	0.380	4.15	0.44	20
5	0.378	4.01	0.42	16
6	0.368	4.08	0.44	20
7	0.384	4.82	0.50	37
8	0.376	2.01	0.21	17
9	0.370	2.20	0.24	14
10	0.376	4.64	0.49	21
AVE.	0.376	3.96	0.42	22.7
S.D.	0.008	1.06	0.11	8.3
% C.V.	2.01	26.66	26.25	36.56

Table A.13 Raw data for tensile strength calculation in cross-machine direction of the 60PE30 nonwoven fabrics.

60PE30 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.440	4.29	0.39	17
2	0.486	2.40	0.20	9
3	0.560	4.50	0.32	18
4	0.546	4.83	0.35	22
5	0.520	2.43	0.19	12
6	0.556	3.14	0.23	22
7	0.532	5.88	0.44	28
8	0.480	5.53	0.46	22
9	0.516	4.77	0.37	19
10	0.502	3.83	0.30	14
AVE.	0.514	4.16	0.32	18.3
S.D.	0.038	1.20	0.10	5.6
% C.V.	7.35	30.92	29.34	30.60

Table A.14 Raw data for tensile strength calculation in cross-machine direction of the 40PET30 nonwoven fabrics.

40PET30 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.278	3.00	0.43	23
2	0.290	6.09	0.84	23
3	0.296	6.14	0.83	30
4	0.306	4.78	0.62	24
5	0.284	6.28	0.88	28
6	0.300	5.91	0.79	32
7	0.304	4.25	0.56	31
8	0.270	2.33	0.34	27
9	0.290	3.92	0.54	22
10	0.274	6.25	0.91	29
AVE.	0.289	4.90	0.67	26.9
S.D.	0.013	1.46	0.20	3.7
% C.V.	4.34	29.93	30.02	13.75

Table A.15 Raw data for tensile strength calculation in cross-machine direction of the 60PET20 nonwoven fabrics.

60PET20 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.354	2.74	0.31	22
2	0.334	1.77	0.21	16
3	0.376	2.36	0.25	16
4	0.350	2.97	0.34	30
5	0.314	2.17	0.28	16
6	0.362	2.95	0.33	21
7	0.336	2.43	0.29	13
8	0.332	2.36	0.28	21
9	0.376	1.51	0.16	28
10	0.350	2.47	0.28	26
AVE.	0.348	2.37	0.27	20.9
S.D.	0.020	0.47	0.05	5.7
% C.V.	5.71	19.80	19.99	27.27

Table A.16 Raw data for tensile strength calculation in cross-machine direction of the 60PET25 nonwoven fabrics.

60PET25 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.426	2.90	0.27	24
2	0.426	3.07	0.29	19
3	0.434	3.74	0.34	25
4	0.416	3.44	0.33	18
5	0.370	3.20	0.35	20
6	0.374	2.82	0.30	22
7	0.386	2.99	0.31	24
8	0.384	2.84	0.30	27
9	0.372	2.58	0.28	23
10	0.412	3.66	0.36	25
AVE.	0.400	3.12	0.31	22.7
S.D.	0.025	0.38	0.03	2.9
% C.V.	6.30	12.22	9.77	12.77

Table A.17 Raw data for tensile strength calculation in cross-machine direction of the 60PET30 nonwoven fabrics.

60PET30 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.336	7.16	0.85	25
2	0.394	9.37	0.95	26
3	0.362	8.81	0.97	23
4	0.360	7.37	0.82	20
5	0.372	7.81	0.84	16
6	0.380	8.34	0.88	17
7	0.392	8.85	0.90	18
8	0.386	9.46	0.98	25
9	0.360	8.44	0.94	18
10	0.362	8.22	0.91	15
AVE.	0.370	8.38	0.90	20.3
S.D.	0.018	0.78	0.06	4.1
% C.V.	4.85	9.25	6.20	20.20

Table A.18 Raw data for tensile strength calculation in cross-machine direction of the 60PET35 nonwoven fabrics.

60PET35 Samples No.	Thickness (mm)	Cross-machine Direction		
		Max. Load (N)	Max. Stress (N/mm^2)	Elongation at Break, %
1	0.354	4.90	0.55	27
2	0.332	5.19	0.62	29
3	0.336	5.42	0.64	14
4	0.334	5.21	0.62	16
5	0.310	5.03	0.65	17
6	0.316	5.69	0.72	20
7	0.302	5.24	0.69	17
8	0.298	4.14	0.56	24
9	0.344	4.59	0.53	23
10	0.354	4.58	0.52	20
AVE.	0.328	5.00	0.61	20.7
S.D.	0.020	0.46	0.07	4.9
% C.V.	6.24	9.16	11.17	23.67

Table A.19 Raw data for average tear strength calculation of the nonwoven fabrics tested by pendulum method and single tongue method.

Samples	No.	Maximum Load, N	
		Pendulum Method	Single Tongue Method
40PE30	1	10.54	5.39
	2	10.04	5.39
	3	11.27	4.41
	4	10.54	5.39
	5	9.80	5.88
	6	10.29	4.41
	7	10.29	4.41
	8	10.29	5.39
	9	10.29	4.90
	10	10.78	3.92
	AVE.	10.41	4.95
	S.D.	0.40	0.63
	% C.V.	3.89	12.74
60PE30	1	9.80	5.39
	2	10.78	5.39
	3	9.80	4.41
	4	8.33	4.90
	5	10.29	4.90
	6	10.78	3.92
	7	9.31	4.41
	8	10.78	3.43
	9	9.31	4.90
	10	10.78	4.90
	AVE.	10.00	4.66
	S.D.	0.84	0.62
	% C.V.	8.40	13.36

Table A.19 Continued.

Samples	No.	Maximum Load, N	
		Pendulum Method	Single Tongue Method
40PET30	1	10.78	2.94
	2	10.29	2.94
	3	9.80	2.94
	4	9.80	2.45
	5	11.76	2.94
	6	11.27	2.45
	7	9.80	3.43
	8	10.29	3.43
	9	10.78	2.94
	10	10.29	3.92
	AVE.	10.49	3.04
	S.D.	0.66	0.45
	% C.V.	6.31	14.82
60PET20	1	10.54	1.40
	2	10.78	1.31
	3	12.25	0.91
	4	11.02	1.03
	5	12.25	1.37
	6	10.29	1.43
	7	12.25	1.13
	8	10.78	0.88
	9	12.74	1.13
	10	11.52	1.19
	AVE.	11.44	1.18
	S.D.	0.87	0.20
	% C.V.	7.62	16.84

Table A.19 Continued.

Samples	No.	Maximum Load, N	
		Pendulum Method	Single Tongue Method
60PET25	1	13.72	3.92
	2	12.25	4.41
	3	12.25	4.41
	4	11.76	4.41
	5	11.76	3.92
	6	14.21	4.41
	7	11.76	3.92
	8	11.76	3.92
	9	12.25	3.92
	10	10.29	3.92
	AVE.	12.20	4.12
	S.D.	1.09	0.25
	% C.V.	8.97	6.15
60PET30	1	12.74	3.43
	2	12.00	3.92
	3	13.72	5.39
	4	11.76	4.90
	5	12.25	4.90
	6	12.74	4.41
	7	11.76	3.92
	8	11.27	5.39
	9	11.76	4.90
	10	13.23	3.92
	AVE.	12.32	4.51
	S.D.	0.77	0.68
	% C.V.	6.22	15.20

Table A.19 Continued.

Samples	No.	Maximum Load, N	
		Pendulum Method	Single Tongue Method
60PET35	1	15.68	6.37
	2	12.74	4.9
	3	13.72	4.41
	4	11.27	5.88
	5	12.25	4.90
	6	13.23	5.39
	7	15.68	4.90
	8	15.68	6.37
	9	12.25	4.90
	10	12.74	4.41
	AVE.	13.52	5.24
	S.D.	1.62	0.73
	% C.V.	11.98	13.97

BIOGRAPHY

Miss Kachamas Tumrongsak was born in Bangkok, Thailand, on June 12, 1970. She received a Bachelor of Science degree with a major in Polymer Science and Textiles from Chulalongkorn university in 1992. She started as a graduate student in Department of Material Science with a major in Applied Polymer Science and Textile Technology, Chulalongkorn university in June 1992, and completed the programme in March 1995.