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Table A.3 Results of drop test of treated cotton from experiments to determine the optimum LAS:monomer ratio.

LAS:Monomer	Time for droplet to disappear(min:sec)					Average
1:10	0:59	0:46	1:58	2:18	0:46	1:21
1:11	0:25	0:44	2:19	1:29	5:19	2:03
1:12	>30	>30	15:25	>30	22:08	25:30
1:13	>30	15:27	>30	>30	>30	27:05
1:14	>30	>30	>30	>30	>30	>30
1:15	>30	>30	>30	>30	>30	>30

Table A.4 Results of drop test of treated cotton from experiments to determine the optimum monomer:initiator ratio.

Monomer:Initiator	Time for droplet to disappear(min:sec)					Average
1:0	0:00	0:00	0:00	0:00	0:00	0:00
1:2	2:32	2:01	1:55	2:4	1:24	2:06
1:2.5	6:27	4:31	3:46	9:33	13:45	7:36
1:3	12:06	19:24	15:13	24:18	18:25	17:53
1:3.5	>30	29:18	>30	>30	26:25	29:08
1:4	>30	>30	>30	>30	>30	>30

Table A.5 Results of %wt retained of untreated and treated cotton from TGA.

Temp(°C)	%W untreated cotton	%W treated cotton
30	99.42	99.93
40	96.77	99.03
50	94.79	98.14
60	93.25	97.44
70	92.99	96.87
80	90.95	96.44
90	90.11	96.11
100	89.39	95.83

Temp(°C)	%W untreated cotton	%W treated cotton
110	88.80	95.65
120	88.32	95.51
130	87.92	95.41
140	87.52	95.32
150	87.04	95.26
160	86.52	95.2
170	86.12	95.13
180	85.82	95.07

Temp(°C)	%W untreated cotton	%W treated cotton
190	85.6	95.02
200	85.41	94.96
210	85.22	94.89
220	84.98	94.83
230	84.55	94.73
240	84.18	94.62
250	84.05	94.47
260	83.93	94.25
270	83.72	93.94
280	83.49	93.51
290	83.17	92.90
300	82.71	92.01
310	82.01	90.71
320	80.85	88.67
330	78.69	85.29
340	73.77	79.17
350	62.81	68.42
360	44.33	51.7
370	23.65	31.49
380	12.24	17.57
390	10.14	14.82
400	9.593	14.35
410	9.074	13.95
420	8.60	13.55
430	8.139	13.17
440	7.679	12.79

Temp(°C)	%W untreated cotton	%W treated cotton
450	7.261	12.43
460	6.866	12.12
470	6.465	11.83
480	6.058	11.58
490	5.724	11.35
500	5.38	11.15
510	5.01	10.96
520	4.69	10.79
530	4.39	10.63
540	4.067	10.48
550	3.792	10.34
560	3.525	10.2
570	3.288	10.06
580	3.103	9.939
590	2.955	9.819
600	2.836	9.701
610	2.735	9.598
620	2.635	9.499
630	2.528	9.4
640	2.432	9.3
650	2.378	9.204
660	2.288	9.101
670	2.205	9.003
680	2.116	8.903
690	2.015	8.796

Appendix B Admicellar polymerization of sodium styrene sulfonate

Table B.1 Results of color strength of treated cotton from experiments to determine the polymerization time.

Polymerization time (min)	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.083	0.083	0.083
15	2.064	2.100	2.082
30	2.661	2.786	2.7235
45	3.014	3.123	3.0685
60	3.641	3.546	3.5935
120	3.654	3.815	3.7345
180	3.806	3.938	3.872

Table B.2 Results of color strength of treated cotton from experiments to determine the optimum sodium styrene sulfonate concentration.

NaSS concentration (μM)	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.775	0.805	0.79
5000	0.841	0.752	0.7965
10000	0.876	1.013	0.9445
20000	1.757	1.921	1.839
30000	3.514	3.615	3.5645
40000	4.755	4.831	4.793
50000	5.640	5.695	5.6675
60000	5.838	6.208	6.023
70000	6.637	6.016	6.3265

Table B.3 Results of color strength of treated cotton from experiments to determine the optimum monomer:initiator ratio at NaSS concentration of $5000\mu\text{M}^*$.

Monomer:Initiator	Color strength of treated cotton		Average color strength
	Front	Back	
1:0	0.110	0.114	0.112
1:1	0.159	0.165	0.162
1:2	0.195	0.195	0.195
1:3	0.216	0.221	0.219
1:4	0.277	0.222	0.250
1:6	0.309	0.303	0.306

* System operation was done at severe washing condition.

Table B.4 Results of color strength of treated cotton from experiments to determine the optimum monomer:initiator ratio at NaSS concentration of $15000\mu\text{M}^*$.

Monomer:Initiator	Color strength of treated cotton		Average color strength
	Front	Back	
3:1	0.241	0.250	0.246
3:2	0.264	0.279	0.272
1:1	0.303	0.300	0.302
1:2	0.392	0.419	0.406
1:4	0.501	0.516	0.509

* System operation was done at severe washing condition.

Table B.5 Results of color strength of treated cotton from experiments to determine the optimum salt concentration.

NaCl concentration (μM)	Color strength of treated cotton		Average color strength
	Front	Back	
0	1.813	1.847	1.830
0.05	2.752	2.825	2.7885
0.1	2.887	3.134	3.0105
0.15	3.200	3.594	3.397

Table B.6 Results of color strength of treated cotton from experiments to determine the optimum pH.

NaCl concentration (μM)	Color strength of treated cotton		Average color strength
	Front	Back	
3	0.287	0.284	0.2855♦
4	0.237	0.244	0.2405
5	0.222	0.219	0.2205

♦ The treated cotton starts to brittle after polymerization.

Table B.7 Results of color strength of treated cotton from experiments that varied the dyeing time at 30°C.

Dyeing time (min)	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.080	0.080	0.080
15	1.718	1.756	1.737
30	1.958	2.083	2.0205
60	1.857	2.145	2.001
120	1.745	1.884	1.8145

Table B.8 Results of color strength of treated cotton from experiments that varied the dyeing time at 50°C.

Dyeing time (min)	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.080	0.080	0.080
15	2.857	2.818	2.8375
30	3.227	3.588	3.4075
60	4.129	3.956	4.0425
120	4.621	4.887	4.754

Table B.9 Results of color strength of treated cotton from experiments that varied the dye concentration at 30000 μ M NaSS.

% weight dye	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.083	0.083	0.083
1	3.895	3.231	3.563
2	4.056	4.238	4.147
3	4.364	4.690	4.527

Table B.10 Results of color strength of treated cotton from experiments that varied the dye concentration at 60000 μ M NaSS.

% weight dye	Color strength of treated cotton		Average color strength
	Front	Back	
0	0.083	0.083	0.083
1	5.763	5.803	5.783
2	6.241	6.210	6.2255
3	5.905	7.065	6.485

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