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## APPENDICES

### Appendix A Zeta Potential Experiment

#### Zeta Potential Measurement

An amount of 1.5 mg of ferric oxide powder or 0.1 mg of fabric was added into a surfactant solution having different pH value and then the mixture was stirred at 30°C for 24 hours. The solution was then transferred to an electrophoretic cell of a zeta meter (Zeta Meter. 3.0+ unit) equipped with a microscope module. After applying a suitable voltage according to the solution conductivity, the average zeta potential value of ferric oxide was obtained.

**Table A1** Data for zeta potential measurement of ferric oxide at pH 5 and variable MES at 30°C. Weight of ferric oxide = 1.5 mg.

MES Concentration (%w/v)	0.002	0.005	0.008	0.011	0.014	0.017	0.02	0.05	0.075
Zeta potential (-mV) 1	20.5	33.1	35.0	40.0	45.1	44.2	45.2	46.2	46.3
2	20.5	30.1	38.0	39.0	40.0	44.3	45.3	47.3	44.1
3	20.5	30.2	36.0	38.0	41.2	44.2	45.2	46.2	41.7
4	25.0	30.5	40.0	39.0	42.4	44.2	45.2	46.2	46.7
5	23.0	29.5	37.5	38.0	40.0	45.0	46.0	45.0	40.4
6	21.0	28.0	37.0	38.0	40.0	42.2	43.0	44.0	44.4
7	24.5	20.0	33.5	39.0	40.0	43.6	44.7	45.1	49.2
8	25.8	30.0	35.3	37.5	41.2	43.7	44.6	45.0	46.0
9	15.0	31.2	35.5	39.5	41.7	44.0	44.0	45.0	46.3
10	28.9	31.1	35.9	39.8	41.5	48.5	48.0	47.9	45.2
11	30.0	32.0	35.9	40.1	41.9	53.0	60.0	61.1	45.7
12	20.0	40.0	35.0	40.5	42.6	48.9	49.0	50.1	46.7
13	20.0	29.7	35.1	40.0	42.0	48.7	49.0	50.0	43.4
14	22.0	27.8	35.3	30.0	43.0	44.2	45.2	47.0	50.4
15	23.5	40.5	35.5	39.4	41.0	42.2	43.2	43.0	45.0
16	25.0	30.1	35.5	39.7	39.0	43.7	44.1	45.0	45.1
17	25.0	30.6	34.0	39.7	40.0	53.0	52.0	53.0	40.7
18	29.0	30.5	34.0	40.5	41.0	52.0	53.1	53.0	53.3
19	29.0	30.3	33.0	40.5	40.0	51.4	52.4	53.0	49.9
20	24.0	30.5	33.0	40.7	39.0	51.7	52.4	53.0	47.5
21	22.0	29.5	33.0	40.3	40.0	53.0	54.5	53.0	49.8
22	22.0	29.5	32.0	30.4	40.0	48.0	50.0	53.0	42.2
23	24.0	29.8	35.0	40.4	42.1	47.0	48.0	49.7	48.0
24	20.0	30.0	31.0	20.0	41.5	48.9	49.9	49.5	49.4
25	24.0	30.5	31.0	30.0	38.0	42.0	45.0	49.7	50.7
Averagenzeta potential (-mV)	23.37	30.60	34.88	37.60	40.97	46.86	47.96	48.84	46.32



Table A1 (Continue)

MES Concentration (%w/v)		0.1	0.12	0.14	0.16	0.18	0.2	0.25	0.3	0.4
Zeta potential (-mV)	1	52.0	60.2	66.6	53.8	61.3	59.0	63.9	69.4	79.0
	2	55.0	55.3	79.8	82.0	94.0	84.0	67.2	77.4	77.8
	3	40.3	47.7	65.8	97.0	68.7	68.0	66.0	66.6	79.1
	4	47.5	61.0	61.1	88.0	78.4	69.0	60.0	68.9	79.7
	5	58.0	61.0	73.0	49.4	79.6	58.0	60.0	66.7	79.9
	6	58.0	66.0	58.1	56.8	76.3	66.0	68.7	65.0	78.6
	7	49.1	63.7	53.3	90.0	76.0	69.0	67.9	69.0	67.7
	8	46.9	65.0	62.1	82.0	63.4	48.0	63.9	67.4	66.3
	9	59.0	66.0	53.8	70.7	76.8	69.7	65.7	73.2	70.0
	10	56.0	71.7	70.3	67.7	54.3	56.7	57.8	70.0	70.0
	11	56.1	60.3	52.6	93.0	60.0	67.7	68.9	60.0	60.0
	12	50.1	46.0	55.2	69.9	55.2	54.4	70.0	63.5	70.0
	13	48.6	41.0	50.9	74.9	58.5	58.1	63.4	75.8	75.5
	14	48.5	41.6	63.5	69.0	76.5	70.1	55.2	80.0	75.7
	15	45.3	55.3	56.6	60.2	63.4	79.0	76.5	75.8	76.7
	16	48.2	65.2	45.0	76.1	55.2	68.6	74.2	63.5	63.5
	17	44.2	44.5	65.4	85.0	55.8	68.5	74.2	73.2	60.0
	18	48.6	48.1	47.7	80.0	78.4	70.1	58.5	60.8	60.0
	19	44.6	47.3	59.7	75.6	60.0	55.0	63.4	60.2	89.0
	20	44.2	48.1	61.9	74.4	61.2	89.0	76.5	60.1	60.0
	21	48.6	48.1	62.1	78.7	76.5	79.0	76.5	79.9	65.1
	22	44.5	47.3	60.8	57.3	74.2	78.1	67.9	80.0	64.3
	23	43.5	42.8	73.5	74.1	74.2	77.7	73.0	84.0	67.1
	24	48.2	48.1	52.3	73.3	54.3	60.0	79.0	77.0	71.1
	25	41.5	48.1	47.9	58.8	58.5	60.0	70.0	67.0	67.0
Averagenzeta potential (-mV)		49.06	53.98	59.96	73.51	67.63	67.31	67.53	70.18	70.92

**Table A2** Data for zeta potential measurement of ferric oxide at pH 7 and variable MES at 30°C. Weight of ferric oxide = 1.5 mg.

MES Concentration (%w/v)	0.002	0.005	0.008	0.011	0.014	0.017	0.02	0.05	0.075
Zeta potential (-mV) 1	32.7	57.0	47.0	48.9	41.0	66.0	50.1	54.5	70.0
2	38.9	40.8	47.1	49.0	45.4	70.0	52.3	57.5	55.3
3	44.5	57.0	47.3	47.6	64.0	79.0	51.0	57.4	53.1
4	28.5	57.0	45.2	48.6	61.0	58.0	51.0	55.6	55.8
5	39.7	66.0	46.8	68.1	56.4	46.1	53.4	54.7	54.1
6	44.5	35.0	46.7	46.9	51.0	45.2	54.5	58.6	54.6
7	37.0	46.7	49.0	49.7	59.0	46.1	51.5	55.6	56.1
8	38.8	46.6	60.0	46.7	59.8	49.6	52.7	58.2	52.6
9	42.3	57.0	40.0	40.0	52.3	51.0	57.2	57.4	51.5
10	41.0	50.0	45.1	49.6	51.0	50.0	57.5	59.3	50.4
11	43.9	35.0	45.5	49.6	62.0	48.9	57.1	58.4	57.1
12	43.6	44.0	46.8	49.7	52.8	49.4	55.5	60.0	60.0
13	37.0	44.1	47.3	48.9	51.3	46.1	53.2	70.0	60.0
14	38.8	43.0	47.3	44.6	58.5	47.0	54.5	40.0	63.9
15	42.2	40.3	47.3	50.0	58.4	47.4	55.5	80.0	57.0
16	41.0	40.9	47.3	47.4	57.0	46.0	52.5	59.7	53.0
17	43.9	50.0	50.3	47.6	56.0	48.7	51.5	57.7	59.0
18	44.0	40.9	49.1	48.1	56.5	48.9	51.0	55.1	54.0
19	43.6	47.0	42.2	46.4	53.8	68.0	51.0	44.3	57.0
20	37.0	48.0	60.0	49.0	40.0	46.0	59.0	69.7	55.0
21	38.7	44.7	48.0	60.0	41.0	49.0	50.0	69.9	60.0
22	44.5	44.7	46.6	45.1	50.2	46.1	50.0	49.9	60.0
23	32.7	35.9	47.3	44.3	52.3	49.0	52.0	60.0	62.0
24	38.9	45.0	46.4	42.2	56.4	59.0	52.0	50.0	59.6
25	32.8	45.7	45.3	47.6	51.0	49.0	54.7	57.0	59.6
Averagenzeta potential (-mV)	39.62	46.49	47.64	48.62	53.52	52.38	53.23	58.02	57.23

Table A2 (Continue).

MES Concentration (%w/v)		0.1	0.12	0.14	0.16	0.18	0.2	0.25	0.3	0.4
Zeta potential (-mV)	1	60.0	52.3	89.0	67.4	69.7	78.9	70.4	85.0	80.0
	2	58.0	56.6	76.8	68.0	73.8	69.0	73.0	87.0	79.0
	3	58.0	49.8	85.0	76.1	62.1	65.0	80.0	87.0	78.7
	4	79.0	44.7	80.0	61.7	73.3	60.0	65.6	81.0	79.5
	5	57.0	97.0	84.0	87.0	66.8	67.0	60.3	74.7	79.7
	6	77.0	84.0	61.7	76.8	65.0	78.0	70.0	76.6	58.4
	7	68.6	66.6	67.5	87.0	69.0	75.0	76.0	75.9	69.0
	8	54.0	65.4	71.9	80.0	69.0	74.0	60.0	60.0	70.0
	9	55.7	61.0	66.4	85.0	68.0	75.0	67.2	75.8	71.0
	10	45.3	58.0	90.0	69.3	67.9	79.0	63.0	79.0	69.0
	11	48.2	79.2	68.2	70.1	74.7	70.0	75.0	80.0	69.0
	12	44.2	61.7	82.0	77.4	78.7	71.0	76.0	66.4	70.0
	13	48.6	61.7	68.0	69.2	68.6	79.7	79.0	66.5	76.0
	14	44.5	64.1	75.8	90.0	78.0	76.0	76.0	67.1	72.0
	15	43.5	75.1	63.5	65.0	70.0	62.0	72.1	67.7	75.0
	16	48.2	64.0	71.4	71.4	69.7	61.0	76.1	85.0	90.0
	17	41.5	64.0	72.8	71.0	71.9	78.0	79.4	85.0	87.0
	18	51.6	55.0	62.2	76.4	69.5	76.1	79.0	85.0	86.0
	19	62.1	54.0	61.7	95.0	67.0	78.3	72.0	84.0	81.0
	20	65.3	67.0	63.0	97.0	69.0	76.4	76.0	61.1	82.0
	21	64.2	54.0	90.0	97.0	77.0	70.0	78.0	59.5	81.0
	22	62.2	54.3	64.6	100.0	78.0	70.1	70.0	85.0	85.0
	23	67.7	72.4	64.4	87.0	76.8	60.1	76.7	84.0	87.0
	24	64.5	57.0	62.2	87.0	70.0	70.7	70.0	87.0	70.0
	25	64.3	54.7	60.0	87.0	70.5	60.0	76.0	65.7	77.7
Average zeta potential (-mV)		57.33	62.94	72.08	79.95	70.96	71.21	72.67	76.44	76.92

**Table A3** Data for zeta potential measurement of ferric oxide at pH 9 and variable MES at 30°C. Weight of ferric oxide = 1.5 mg.

MES Concentration (%w/v)		0.002	0.005	0.008	0.011	0.014	0.017	0.02	0.05	0.075
Zeta potential (-mV)	1	42.1	76.0	79.0	95.0	79.0	80.7	78.6	82.0	88.9
	2	58.4	73.0	79.0	92.0	77.4	77.0	79.4	81.0	77.7
	3	60.0	70.0	71.0	93.0	79.0	80.8	79.8	84.0	80.0
	4	69.6	73.0	74.0	92.0	74.0	74.5	78.5	85.0	79.0
	5	51.0	71.0	83.0	99.0	84.0	85.2	77.8	87.6	79.6
	6	51.5	78.0	71.0	88.0	82.0	82.0	77.5	86.3	75.5
	7	54.0	66.4	86.0	70.0	86.0	76.0	86.0	83.7	80.5
	8	54.0	78.7	74.0	70.0	71.0	84.0	86.0	85.1	83.3
	9	54.1	75.1	76.0	79.0	77.7	80.0	85.0	82.5	78.8
	10	56.3	75.0	84.0	70.0	76.6	82.9	87.0	82.0	78.5
	11	51.5	73.0	84.0	79.0	81.0	89.4	86.0	85.0	72.9
	12	51.5	75.3	86.0	78.7	74.6	84.6	85.0	90.1	75.5
	13	58.3	77.0	76.0	95.0	82.0	86.2	89.0	89.0	77.8
	14	52.1	70.0	79.0	92.0	79.0	82.0	83.0	83.0	76.5
	15	58.4	72.0	79.0	92.0	79.8	80.0	82.3	81.4	75.5
	16	66.0	77.0	84.0	91.0	77.8	3.0	81.4	80.8	92.5
	17	79.0	71.0	80.0	90.0	78.0	81.4	88.3	78.4	93.5
	18	78.0	70.0	85.0	90.0	77.0	86.0	81.3	74.1	79.0
	19	63.4	71.0	86.0	80.0	80.0	82.0	81.3	74.3	85.0
	20	62.4	76.0	73.0	80.0	81.0	82.0	83.9	85.0	72.0
	21	69.9	71.0	79.0	80.0	72.0	81.0	90.4	87.0	81.0
	22	70.0	70.0	86.0	87.0	87.0	89.4	70.7	83.0	86.0
	23	74.0	76.0	87.0	91.0	70.0	89.4	76.8	88.0	81.0
	24	64.0	73.0	83.0	94.0	70.0	87.3	69.0	76.2	79.0
	25	64.0	73.0	76.0	70.0	80.0	86.5	82.0	84.0	82.3
Average zeta potential (-mV)		60.54	73.26	80.00	85.51	78.24	79.73	81.84	83.14	80.45

Table A3 (Continue).

MES Concentration (%w/v)		0.1	0.12	0.14	0.16	0.18	0.2	0.25	0.3	0.4
Zeta potential (-mV)	1	86.0	86.3	93.2	80.0	89.2	89.0	90.0	89.2	90.0
	2	81.0	81.3	81.4	81.0	87.0	80.0	82.0	87.1	90.0
	3	87.0	88.0	90.6	83.0	84.2	86.0	89.0	86.1	89.8
	4	86.0	85.4	86.4	83.6	84.0	87.0	86.0	85.7	88.9
	5	85.0	80.1	85.4	80.4	81.0	85.0	83.4	89.5	91.2
	6	86.0	83.6	89.0	86.0	88.7	85.0	85.1	87.3	93.0
	7	84.0	83.4	82.0	86.0	88.8	86.0	85.7	90.4	80.0
	8	84.0	81.2	85.0	87.4	90.1	89.0	83.0	90.2	89.0
	9	86.0	84.0	85.3	85.2	80.4	87.0	87.0	82.1	85.6
	10	87.0	86.0	76.4	82.1	70.0	85.0	90.0	81.1	86.0
	11	86.0	83.0	93.9	83.7	80.0	83.0	80.0	84.6	89.2
	12	81.0	85.0	85.8	90.0	84.3	89.0	80.0	85.7	82.4
	13	86.0	86.4	89.6	90.0	83.7	80.0	79.0	87.4	88.6
	14	85.0	87.0	85.6	91.0	85.0	87.0	78.7	83.0	90.4
	15	86.0	83.6	87.8	92.0	82.0	89.0	95.0	87.0	80.0
	16	84.0	89.2	89.0	91.0	81.0	85.0	78.7	88.0	82.0
	17	82.0	83.7	80.4	86.6	83.0	88.0	77.7	80.0	90.0
	18	88.0	83.0	93.2	86.7	81.0	84.0	96.0	86.3	89.0
	19	70.0	82.0	93.2	86.3	82.0	83.0	89.0	80.2	85.7
	20	79.0	87.4	93.0	95.0	83.0	87.0	88.1	82.3	85.3
	21	87.0	83.6	81.0	95.0	84.0	86.0	88.3	84.5	84.6
	22	89.0	83.4	80.0	95.2	85.0	87.0	88.1	84.5	87.1
	23	81.0	81.7	80.0	81.5	87.0	87.0	89.5	82.0	84.6
	24	85.0	80.5	77.8	93.5	87.0	90.0	90.9	90.0	87.7
	25	80.0	83.1	79.9	90.1	79.0	81.0	90.0	89.8	89.3
Average zeta potential (-mV)		84.04	84.08	85.80	87.29	83.62	85.80	86.01	85.76	87.18

**Table A4** Data for zeta potential measurement of ferric oxide at pH 11 and variable MES at 30°C. Weight of ferric oxide = 1.5 mg.

MES Concentration (%w/v)		<b>0.002</b>	<b>0.005</b>	<b>0.008</b>	<b>0.011</b>	<b>0.014</b>	<b>0.017</b>	<b>0.02</b>	<b>0.05</b>	<b>0.075</b>
<b>Zeta potential (-mV)</b>	1	65.8	90.0	101.0	107.0	80.3	83.6	85.3	83.2	95.1
	2	62.8	84.0	85.0	98.0	80.1	81.7	84.2	84.2	95.3
	3	58.8	90.0	93.0	95.0	90.5	85.5	83.1	83.2	85.6
	4	69.5	88.0	100.0	81.0	85.4	85.6	82.4	85.4	85.3
	5	55.1	90.0	83.0	100.0	85.0	87.3	83.4	85.4	72.5
	6	68.7	79.0	89.0	98.0	82.0	90.4	84.1	83.1	85.4
	7	55.6	87.0	94.0	93.0	81.2	83.6	82.7	81.2	95.6
	8	62.9	77.0	106.0	95.3	81.2	80.2	81.6	83.6	96.6
	9	64.4	94.0	78.0	98.4	82.4	80.3	90.1	85.2	83.1
	10	62.3	77.0	85.0	98.3	82.6	83.7	85.0	81.0	81.3
	11	69.0	92.0	109.0	98.4	89.8	87.1	84.0	98.0	81.1
	12	56.3	72.0	96.0	98.1	88.7	87.1	82.3	98.0	85.5
	13	62.5	78.0	87.0	99.1	82.1	84.1	86.4	85.0	88.8
	14	68.5	85.0	90.0	99.1	86.0	83.6	82.1	83.0	88.9
	15	64.4	87.0	100.0	90.0	81.0	83.6	81.9	72.0	89.0
	16	62.8	84.0	92.0	95.0	82.0	80.0	82.9	95.0	90.0
	17	58.9	85.0	93.1	92.0	85.7	90.0	83.8	72.1	89.9
	18	59.0	84.0	88.6	98.0	85.3	90.0	83.0	77.8	90.1
	19	55.1	90.0	89.4	70.0	85.6	82.0	85.0	78.3	81.5
	20	62.3	84.0	89.5	110.0	80.0	86.4	80.0	87.5	95.3
	21	62.8	77.0	86.9	96.0	89.0	86.3	79.9	88.1	99.5
	22	65.9	79.0	84.0	100.0	80.0	87.8	79.8	79.8	99.8
	23	62.9	88.0	83.6	91.3	86.4	87.9	78.9	81.3	84.0
	24	64.4	77.0	87.5	91.8	88.7	81.2	79.8	70.0	85.0
	25	62.5	78.0	84.1	93.4	71.2	80.0	77.6	98.0	77.0
Average zeta potential (-mV)		62.53	83.84	90.99	95.45	83.69	84.76	82.77	83.98	88.05

Table A4 (Continue).

MES Concentration (%w/v)		0.1	0.12	0.14	0.16	0.18	0.2	0.25	0.3	0.4
Zeta potential (-mV)	1	77.0	77.1	76.4	91.0	94.1	89.1	74.1	86.4	87.0
	2	74.0	77.2	74.5	91.0	94.5	89.7	84.3	87.0	90.0
	3	80.0	79.1	83.2	93.0	79.9	89.3	87.1	88.0	100.0
	4	80.5	77.8	75.9	93.4	84.0	89.8	89.1	87.2	100.0
	5	80.3	76.3	91.2	93.6	94.0	98.8	87.1	87.3	100.0
	6	80.4	74.5	91.2	83.0	84.0	98.6	89.1	87.8	100.0
	7	83.2	80.0	95.2	81.0	95.0	98.1	81.0	86.9	98.3
	8	108.0	85.0	94.7	85.0	79.9	110.0	90.0	98.7	98.7
	9	100.0	98.0	95.3	82.0	87.0	87.2	109.0	97.1	97.8
	10	98.0	90.4	91.0	83.0	85.0	87.6	98.0	95.3	85.0
	11	95.1	8.6	78.0	85.0	83.0	89.0	95.0	95.6	87.0
	12	95.0	100.0	78.0	98.1	82.0	82.0	85.0	100.0	88.1
	13	90.0	98.1	82.0	98.1	81.0	85.0	89.0	99.9	88.6
	14	100.0	98.2	86.2	100.0	82.0	86.0	88.3	99.8	87.4
	15	108.0	80.4	83.4	98.3	74.0	80.1	90.0	99.9	89.0
	16	109.0	90.3	85.0	98.7	79.0	80.5	99.9	83.0	87.0
	17	88.0	90.5	99.0	70.0	79.0	80.7	91.0	89.0	85.0
	18	83.0	91.6	100.0	98.1	80.0	80.3	91.4	84.0	87.0
	19	80.3	93.1	108.0	98.1	87.6	80.6	96.0	85.0	82.0
	20	89.4	95.6	108.0	98.3	89.8	82.9	93.0	81.0	81.0
	21	83.7	89.7	75.0	99.9	87.6	88.7	95.0	70.0	89.0
	22	81.9	88.7	85.0	99.8	89.9	95.4	98.0	81.0	79.1
	23	87.4	96.4	100.0	100.0	99.1	95.3	88.6	70.5	79.3
	24	85.4	98.0	99.0	108.0	89.2	95.4	89.0	81.0	95.4
	25	80.1	99.0	99.0	110.0	88.9	83.0	81.3	98.0	93.9
Average zeta potential (-mV)		88.71	85.34	89.37	93.46	85.98	88.92	90.37	88.78	90.22

**Table A5** Data for zeta potential measurement of ferric oxide at pH 5 and variable AE at 30°C. Weight of ferric oxide = 1.5 mg.

<b>AE Concentration (%w/v)</b>	<b>0.002</b>	<b>0.014</b>	<b>0.02</b>	<b>0.1</b>	<b>0.16</b>	<b>0.18</b>	<b>0.2</b>	<b>0.25</b>	<b>0.3</b>	<b>0.4</b>
<b>Zeta potential (-mV) 1</b>	20.2	36.3	41.3	40.0	48.0	50.2	52.5	53.0	55.0	45.0
2	20.5	38.7	41.6	40.1	47.0	49.3	52.0	53.0	56.0	45.3
3	18.0	35.3	41.9	42.1	49.0	48.0	52.0	53.5	48.0	50.2
4	19.0	39.1	42.0	43.2	48.0	52.0	52.0	53.4	55.5	70.0
5	20.6	36.3	42.0	38.0	48.0	52.0	51.0	53.1	52.9	70.1
6	15.6	37.0	42.0	39.0	48.0	52.5	51.6	54.8	53.8	50.0
7	14.8	37.0	43.1	38.7	48.5	51.6	52.0	54.7	54.8	62.0
8	25.0	37.0	43.9	38.7	48.3	51.5	53.2	54.1	54.6	55.0
9	20.0	40.0	40.4	38.6	48.5	51.3	52.5	54.6	54.6	56.0
10	20.0	40.0	40.8	39.5	48.4	54.0	52.0	54.2	54.3	54.3
11	21.0	40.0	40.4	38.4	48.5	53.0	50.0	54.9	55.0	55.4
12	22.0	35.0	42.0	36.0	48.7	50.7	49.7	55.0	55.3	62.0
13	21.2	35.0	41.2	36.0	45.0	48.0	49.9	56.0	55.8	54.6
14	21.1	35.0	41.6	39.1	47.0	46.0	49.3	54.0	60.0	54.5
15	20.5	36.3	48.0	39.4	42.0	50.4	49.4	52.0	62.0	69.0
16	20.0	36.5	44.0	39.6	43.0	49.5	49.2	51.0	62.0	50.0
17	20.0	38.0	43.0	39.7	45.0	55.8	50.4	51.0	62.0	55.3
18	20.0	30.0	43.0	30.0	48.6	45.8	50.5	53.0	56.0	56.1
19	21.0	30.0	42.0	33.0	49.1	50.1	50.4	53.1	59.0	52.0
20	16.0	29.8	42.0	37.0	50.0	50.8	50.1	53.2	56.1	51.4
21	18.0	29.7	41.0	36.0	50.5	50.6	50.9	53.5	50.3	67.1
22	17.0	38.3	41.0	39.3	50.5	58.0	53.2	53.1	80.0	67.2
23	16.5	38.6	41.3	39.8	42.5	55.0	52.0	52.5	58.5	54.0
24	17.4	38.0	41.8	40.0	46.8	52.0	52.0	52.6	56.2	53.0
25	18.1	38.7	41.4	42.0	46.4	53.4	53.1	52.8	55.6	53.1
<b>Average zeta potential (-mV)</b>	<b>19.33</b>	<b>36.22</b>	<b>42.11</b>	<b>38.53</b>	<b>47.41</b>	<b>51.26</b>	<b>51.24</b>	<b>53.44</b>	<b>56.93</b>	<b>56.50</b>



**Table A6** Data for zeta potential measurement of ferric oxide at pH 7 and variable AE at 30°C. Weight of ferric oxide = 1.5 mg.

AE Concentration (%w/v)	0.002	0.014	0.02	0.1	0.16	0.18	0.2	0.25	0.3	0.4
Zeta potential (-mV) 1	22.0	36.0	45.0	40.0	50.0	53.0	53.0	54.0	57.0	54.0
2	25.0	37.3	46.0	42.0	53.0	53.1	55.6	60.0	56.0	56.0
3	24.0	40.0	43.0	40.1	52.0	53.5	55.1	70.0	54.0	53.0
4	25.1	48.0	47.0	40.3	59.0	53.6	55.3	73.0	69.0	54.0
5	26.0	43.0	42.0	40.4	39.0	54.5	55.0	77.0	60.0	55.0
6	24.2	44.0	48.0	40.3	30.0	54.6	55.0	44.0	60.0	56.0
7	22.4	42.1	46.0	40.4	60.0	54.8	55.0	48.0	59.1	53.0
8	21.5	36.0	44.0	40.1	33.0	67.0	55.0	33.0	58.5	53.5
9	24.0	47.0	43.2	40.1	36.0	54.4	54.0	58.0	58.4	56.0
10	25.4	30.0	44.8	40.4	50.0	54.5	54.0	59.0	58.3	53.6
11	25.0	30.0	40.0	41.0	53.0	54.1	54.3	52.0	58.6	50.1
12	28.0	29.0	40.0	41.5	52.0	54.8	54.5	55.3	58.4	50.5
13	20.0	43.0	46.0	41.5	50.2	54.3	54.1	56.4	59.0	60.0
14	26.1	41.0	43.0	41.3	50.5	52.0	54.1	56.3	59.0	58.0
15	25.4	41.0	44.1	41.3	50.1	52.3	54.3	65.0	59.0	58.6
16	25.2	42.3	43.2	42.0	50.3	52.4	54.6	56.0	54.0	58.4
17	24.0	40.4	44.0	42.0	50.8	52.5	54.8	56.4	54.5	58.3
18	22.0	40.3	48.0	42.0	50.6	53.0	55.0	56.3	56.0	70.0
19	22.5	40.7	47.0	43.2	50.4	53.6	58.0	57.0	56.5	60.1
20	26.1	49.0	39.0	43.4	50.8	55.0	59.0	57.1	56.3	60.1
21	24.0	38.0	50.0	43.7	50.4	55.0	59.0	50.0	65.0	72.0
22	28.0	40.6	46.0	39.0	51.0	55.4	59.0	50.0	56.3	77.0
23	24.1	40.1	48.0	38.0	51.4	55.4	60.0	60.4	55.0	48.5
24	27.0	40.0	48.1	39.5	51.6	55.8	50.0	60.0	40.0	47.4
25	20.0	40.0	47.4	39.4	51.2	55.3	69.0	68.0	40.0	60.4
Average zeta potential (-mV)	24.28	39.95	44.91	40.92	49.05	54.56	55.87	57.29	56.72	57.34

**Table A7** Data for zeta potential measurement of ferric oxide at pH 9 and variable AE at 30°C. Weight of ferric oxide = 1.5 mg.

AE Concentration (%w/v)	0.002	0.014	0.02	0.1	0.16	0.18	0.2	0.25	0.3	0.4	
<b>Zeta potential (-mV)</b>	<b>1</b>	35.0	40.0	46.0	43.0	47.9	56.3	57.3	60.3	60.0	62.5
	2	35.0	40.3	47.0	43.5	52.3	58.0	58.0	60.0	60.0	63.2
	3	36.0	43.0	48.0	43.5	52.3	56.3	58.0	60.5	60.2	64.6
	4	37.0	43.2	48.0	67.0	52.5	56.3	35.0	64.0	60.3	65.3
	5	37.0	43.6	47.0	70.0	52.5	58.0	72.0	59.3	60.1	67.2
	6	37.1	43.9	48.0	38.1	52.6	58.0	70.3	58.0	62.3	69.0
	7	37.3	43.6	48.3	43.5	53.3	57.5	45.0	57.3	69.0	80.0
	8	37.2	43.4	46.0	43.2	53.5	57.3	40.0	57.8	67.0	80.0
	9	37.6	44.0	46.3	47.0	55.0	57.1	61.2	59.0	67.0	83.0
	10	37.5	44.3	47.4	40.0	56.0	59.2	61.3	59.6	66.3	36.0
	11	37.6	44.2	47.8	38.0	59.7	60.1	62.0	59.4	65.0	66.0
	12	37.4	47.0	47.3	34.1	55.2	60.0	62.5	59.0	65.3	62.0
	13	35.2	40.5	47.4	45.3	50.9	60.2	66.0	63.0	60.3	63.0
	14	35.3	43.0	48.2	45.4	56.6	57.3	65.4	62.5	50.0	60.0
	15	36.0	40.0	48.6	45.3	53.8	69.6	55.8	62.6	50.5	65.0
	16	40.0	36.0	48.3	47.3	58.1	57.0	67.6	63.4	55.0	64.0
	17	32.0	38.0	48.4	47.4	62.1	40.0	67.9	63.5	56.0	62.5
	18	36.3	36.0	48.3	47.4	53.0	40.0	67.9	67.0	58.4	66.3
	19	38.2	38.2	48.3	44.0	53.3	45.0	45.0	63.0	59.3	62.0
	20	43.0	35.3	48.7	45.3	52.0	45.3	50.2	63.6	62.0	60.0
	21	35.2	35.7	45.3	45.5	55.4	70.3	58.6	63.4	62.3	56.0
	22	33.2	35.3	48.6	48.0	53.6	59.5	59.0	64.0	62.5	55.3
	23	35.6	36.0	44.0	48.0	53.0	58.1	43.0	60.5	63.6	58.5
	24	35.0	37.0	45.1	43.0	52.5	58.6	70.0	60.3	65.0	70.3
	25	37.0	33.2	45.1	44.2	52.5	59.1	70.0	60.0	80.0	71.2
Average zeta potential (-mV)		36.55	40.19	47.26	45.88	53.98	56.56	58.76	61.24	61.90	64.52

**Table A8** Data for zeta potential measurement of ferric oxide at pH 11 and variable AE at 30°C. Weight of ferric oxide = 1.5 mg.

AE Concentration (%w/v)	0.002	0.014	0.02	0.1	0.16	0.18	0.2	0.25	0.3	0.4
<b>Zeta potential (-mV)</b> 1	40.0	43.0	50.0	50.0	55.0	60.0	63.0	63.0	70.0	65.0
2	43.0	46.0	50.3	50.0	56.3	60.0	62.0	63.5	70.2	66.3
3	43.2	46.0	50.1	50.3	56.5	60.0	62.5	63.5	69.0	64.3
4	43.2	46.3	52.0	59.0	56.5	60.1	62.5	63.5	66.0	69.0
5	43.6	46.2	50.5	60.0	56.5	61.0	62.1	63.5	62.5	69.7
6	44.2	46.8	49.8	50.3	60.0	61.0	60.0	64.0	64.3	69.8
7	44.3	46.9	48.3	51.0	60.2	62.0	60.0	64.7	66.0	68.5
8	46.5	46.9	48.2	51.2	63.0	62.5	60.0	65.3	65.0	68.4
9	46.4	46.9	48.1	52.3	60.2	60.3	60.0	65.4	64.3	64.3
10	40.0	46.9	48.6	51.5	60.3	60.1	63.0	65.6	65.1	63.5
11	40.2	45.4	48.4	51.3	65.0	60.3	60.5	65.5	65.1	66.0
12	40.3	45.3	48.7	50.5	61.0	60.6	62.4	67.0	65.7	67.0
13	41.0	45.7	48.3	50.5	61.2	60.9	61.2	59.9	65.3	64.0
14	42.0	45.4	42.0	51.3	61.1	60.9	61.7	60.1	63.0	58.0
15	41.1	45.2	42.3	50.0	58.0	62.0	61.9	60.3	59.0	59.9
16	41.2	46.0	42.7	49.8	58.3	62.0	61.6	60.5	59.9	59.9
17	40.3	48.0	42.4	45.0	55.0	55.0	67.0	63.1	59.8	59.9
18	40.3	48.1	46.0	48.3	59.0	58.0	70.0	64.6	59.9	69.0
19	40.1	48.4	46.3	48.3	60.0	70.0	65.5	64.7	66.5	67.0
20	40.3	40.0	49.0	48.5	56.3	60.0	61.3	64.6	66.3	68.6
21	44.0	43.0	60.0	60.0	58.5	78.0	66.0	64.5	58.0	65.0
22	37.0	42.0	50.0	70.0	58.4	48.3	66.0	65.0	70.0	71.3
23	37.0	42.0	53.0	55.0	57.6	49.0	70.0	66.5	66.0	71.1
24	42.0	42.1	58.0	61.0	57.3	70.0	70.0	67.0	67.0	71.2
25	40.0	42.7	65.0	66.0	58.0	70.3	60.4	66.3	64.6	63.0
Average zeta potential (-mV)	41.65	45.25	49.52	53.24	58.77	61.29	63.22	64.06	64.74	65.99

**Table A9** Data for zeta potential measurement of cotton fiber at 30°C. Weight of cotton fiber= 0.1 mg, Volume of suspension = 25 ml

pH solution	1.50	2.10	3.03	4.10	5.01	6.30	7.05	8.01	9.02	10.10	11.02
Zeta potential (-mV)											
1	8.0	5.8	-3.7	-7.5	-13.4	-15.1	-21.2	-21.0	-23.5	-22.7	-24.7
2	7.2	5.9	-3.7	-7.8	-13.5	-15.2	-20.2	-21.0	-23.4	-25.3	-24.9
3	7.1	4.0	-3.8	-7.4	-13.2	-14.7	-18.2	-22.7	-23.0	-24.5	-24.2
4	6.9	4.5	-3.9	-7.7	-13.5	-14.5	-18.5	-21.3	-23.0	-24.5	-24.2
5	7.5	5.0	-3.4	-7.0	-13.0	-15.3	-18.2	-21.3	-23.8	-23.5	-24.9
Average zeta potential (-mV)	7.3	5.0	-3.7	-7.5	-13.3	-15.0	-19.3	-21.5	-23.3	-24.1	-24.6

**Table A10** Data for zeta potential measurement of blended cotton/polyester fiber at 30°C. Weight of cotton fiber= 0.1 mg,

Volume of suspension = 25 ml.

pH solution	1.50	2.10	3.03	4.10	5.01	6.15	7.05	8.01	9.02	10.10	11.02
Zeta potential (-mV)											
1	3.4	1.2	-8.9	-17.5	-25.1	-30.0	-44.5	-49.7	-51.3	-49.3	-50.3
2	3.0	1.3	-8.5	-18.9	-25.0	-31.2	-44.5	-48.6	-51.4	-47.3	-50.1
3	3.0	1.5	-7.3	-18.8	-25.5	-31.3	-44.3	-46.0	-51.9	-49.3	-50.0
4	2.8	1.3	-7.0	-17.9	-25.8	-31.1	-44.3	-52.3	-52.0	-50.3	-49.5
5	4.0	1.4	-7.0	-19.0	-24.5	-31.1	-44.3	-50.0	-48.9	-50.8	-50.3
Average zeta potential (-mV)	3.2	1.3	-7.7	-18.4	-25.2	-30.9	-44.4	-49.3	-51.1	-49.4	-50.0

**Table A11** Data for zeta potential measurement of polyester fiber at 30°C. Weight of cotton fiber= 0.1 mg,

Volume of suspension = 25 ml.

pH solution	1.5	2.03	3.00	4.09	5.15	6.03	7.30	8.01	9.02	10.10	11.02
Zeta potential (-mV)											
1	2.2	1.1	-11.1	-31.2	-50.04	-59.8	-64.3	-66.5	-68.1	-69.3	-69.9
2	2.0	1.2	-11.0	-31.0	-50.06	-59.9	-64.3	-66.5	-68.1	-69.0	-69.9
3	1.9	1.0	-11.1	-31.0	-50.03	-59.9	-64.4	-66.4	-68.2	-69.1	-69.9
4	2.7	1.1	-11.3	-29.9	-50.02	-59.9	-64.2	-66.6	-68.0	-69.2	-69.8
5	1.5	1.2	-11.0	-31.4	-50.02	-60.0	-64.5	-66.8	-68.3	-69.1	-69.8
Average zeta potential (-mV)	2.1	1.1	-11.1	-30.9	-50.0	-59.9	-64.3	-66.6	-68.1	-69.1	-69.9

## Appendix B Adsorption Isotherm Experiment

**Table B1** Data for MES adsorption on cotton fabric at surfactant solution pH 5 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.000530	0.135922
0.005	0.002554	0.226167
0.008	0.003858	0.382987
0.011	0.005106	0.544984
0.014	0.007068	0.640962
0.017	0.008802	0.758021
0.020	0.009522	0.968840
0.050	0.033680	1.509015
0.075	0.058746	1.502913
0.100	0.083672	1.509755
0.120	0.103626	1.514008
0.140	0.123186	1.554693
0.160	0.143606	1.515858
0.180	0.163446	1.530652
0.200	0.183291	1.544984
0.250	0.233723	1.505068
0.300	0.283560	1.520092
0.400	0.383201	1.553269

**Table B2** Data for MES adsorption on cotton fabric at surfactant solution pH 7 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.000558	0.133333
0.005	0.002680	0.214517
0.008	0.004008	0.369117
0.011	0.005040	0.551086
0.014	0.007374	0.612668
0.017	0.009016	0.738234
0.020	0.011090	0.823856
0.050	0.036069	1.288118
0.075	0.060406	1.349422
0.100	0.085820	1.311142
0.120	0.106186	1.277300
0.140	0.125326	1.356819
0.160	0.145166	1.371613
0.180	0.166046	1.290245
0.200	0.186008	1.293759
0.250	0.235211	1.367456
0.300	0.285291	1.360059
0.400	0.384659	1.418496

**Table B3** Data for MES adsorption on cotton fabric at surfactant solution pH 9 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.000554	0.133703
0.005	0.002664	0.215996
0.008	0.004552	0.318816
0.011	0.005392	0.518539
0.014	0.007208	0.628017
0.017	0.009672	0.677577
0.020	0.011794	0.758761
0.050	0.038672	1.047434
0.075	0.063666	1.047989
0.100	0.088670	1.047619
0.120	0.108966	1.020250
0.140	0.128806	1.035044
0.160	0.148586	1.055386
0.180	0.169146	1.003606
0.200	0.188466	1.066482
0.250	0.238983	1.018641
0.300	0.288632	1.051123
0.400	0.388731	1.041953



**Table B4** Data for MES adsorption on cotton fabric at surfactant solution pH 11 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.000576	0.131632
0.005	0.002772	0.206010
0.008	0.004786	0.297180
0.011	0.005742	0.486177
0.014	0.008048	0.550347
0.017	0.009926	0.654092
0.020	0.012506	0.692926
0.050	0.041857	0.752936
0.075	0.067126	0.728063
0.100	0.092382	0.704374
0.120	0.112226	0.718816
0.140	0.131906	0.748405
0.160	0.152046	0.735460
0.180	0.172086	0.731761
0.200	0.192229	0.718539
0.250	0.242058	0.734392
0.300	0.292003	0.739421
0.400	0.392053	0.734844

**Table B5** Data for MES adsorption on blend polyester/cotton fabric at surfactant solution pH 5 and 30°C. Weight of blend polyester/cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001140	0.110080
0.005	0.003738	0.161536
0.008	0.005457	0.325504
0.011	0.006795	0.538240
0.014	0.008510	0.702720
0.017	0.010659	0.811648
0.020	0.012498	0.960256
0.050	0.039799	1.305728
0.075	0.064312	1.368064
0.100	0.089554	1.337088
0.120	0.109027	1.404544
0.140	0.129076	1.398272
0.160	0.149437	1.352064
0.180	0.169223	1.379456
0.200	0.189087	1.396864
0.250	0.239465	1.348480
0.300	0.289073	1.398656
0.400	0.389082	1.397504

**Table B6** Data for MES adsorption on blend polyester/cotton fabric at surfactant solution pH 7 and 30°C. Weight of blend polyester/cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001130	0.111360
0.005	0.003808	0.152602
0.008	0.005255	0.351360
0.011	0.006657	0.555904
0.014	0.009210	0.613120
0.017	0.011312	0.728064
0.020	0.013190	0.871680
0.050	0.040340	1.236480
0.075	0.065771	1.181312
0.100	0.090242	1.249024
0.120	0.110335	1.237120
0.140	0.130340	1.236480
0.160	0.150470	1.219840
0.180	0.169810	1.304320
0.200	0.190179	1.257088
0.250	0.240080	1.269760
0.300	0.290450	1.222400
0.400	0.390001	1.279872

**Table B7** Data for MES adsorption on blend polyester/cotton fabric at surfactant solution pH 9 and 30°C. Weight of blend polyester/cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001140	0.110080
0.005	0.003854	0.146688
0.008	0.004956	0.389632
0.011	0.007457	0.453504
0.014	0.009145	0.621440
0.017	0.011832	0.661504
0.020	0.013420	0.842240
0.050	0.042341	0.980352
0.075	0.067001	1.023872
0.100	0.092070	1.015040
0.120	0.112018	1.021696
0.140	0.131836	1.044992
0.160	0.152045	1.018240
0.180	0.171920	1.034240
0.200	0.191601	1.075072
0.250	0.241325	1.110464
0.300	0.291345	1.107840
0.400	0.391459	1.093312

**Table B8** Data for MES adsorption on blend polyester/cotton fabric at surfactant solution pH 11 and 30°C. Weight of blend polyester/cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001310	0.088320
0.005	0.003856	0.146432
0.008	0.006136	0.238592
0.011	0.008273	0.349056
0.014	0.010351	0.467072
0.017	0.012875	0.528000
0.020	0.015404	0.588288
0.050	0.044621	0.688512
0.075	0.069750	0.672000
0.100	0.094459	0.709248
0.120	0.114595	0.691840
0.140	0.134681	0.680832
0.160	0.154230	0.738560
0.180	0.174638	0.686336
0.200	0.194571	0.694886
0.250	0.244320	0.727040
0.300	0.294348	0.723456
0.400	0.394601	0.691072

**Table B9** Data for MES adsorption on polyester fabric at surfactant solution pH 5 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001540	0.0736
0.005	0.004476	0.0838
0.008	0.007224	0.1242
0.011	0.009068	0.3091
0.014	0.011414	0.4138
0.017	0.013828	0.5075
0.020	0.015748	0.6803
0.050	0.043400	1.0560
0.075	0.068200	1.0880
0.100	0.092980	1.1232
0.120	0.112720	1.1648
0.140	0.132610	1.1824
0.160	0.152640	1.1776
0.180	0.172640	1.1776
0.200	0.192760	1.1584
0.250	0.242801	1.1519
0.300	0.292509	1.1986
0.400	0.392727	1.1637

**Table B10** Data for MES adsorption on polyester fabric at surfactant solution pH 7 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001500	0.0800
0.005	0.004696	0.0486
0.008	0.007290	0.1136
0.011	0.009296	0.2726
0.014	0.011680	0.3712
0.017	0.014016	0.4774
0.020	0.016080	0.6272
0.050	0.044280	0.9152
0.075	0.068980	0.9632
0.100	0.094020	0.9568
0.120	0.113960	0.9664
0.140	0.133740	1.0016
0.160	0.153560	1.0304
0.180	0.173920	0.9728
0.200	0.193620	1.0208
0.250	0.243572	1.0284
0.300	0.293456	1.0470
0.400	0.393764	0.9977

**Table B11** Data for MES adsorption on polyester fabric at surfactant solution pH 9 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001480	0.0832
0.005	0.004766	0.0374
0.008	0.007550	0.0720
0.011	0.009348	0.2643
0.014	0.011096	0.4646
0.017	0.014666	0.3734
0.020	0.016720	0.5248
0.050	0.044953	0.8075
0.075	0.069540	0.8736
0.100	0.094710	0.8464
0.120	0.114760	0.8384
0.140	0.134640	0.8576
0.160	0.154755	0.8392
0.180	0.174580	0.8672
0.200	0.194619	0.8610
0.250	0.244730	0.8433
0.300	0.294889	0.8177
0.400	0.394678	0.8516



**Table B12** Data for MES adsorption on polyester fabric at surfactant solution pH 11 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001416	0.0934
0.005	0.004902	0.0157
0.008	0.007506	0.0790
0.011	0.009580	0.2272
0.014	0.011978	0.3235
0.017	0.014320	0.4288
0.020	0.017360	0.4224
0.050	0.046600	0.5440
0.075	0.071540	0.5536
0.100	0.096722	0.5245
0.120	0.116820	0.5088
0.140	0.136711	0.5262
0.160	0.156814	0.5098
0.180	0.176716	0.5254
0.200	0.196580	0.5472
0.250	0.246888	0.4979
0.300	0.296716	0.5254
0.400	0.396599	0.5442

**Table B13** Data for MES adsorption on ferric oxide at surfactant solution pH 5 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001738	0.015012
0.005	0.004108	0.051228
0.008	0.006346	0.094989
0.011	0.007692	0.189978
0.014	0.007276	0.386159
0.017	0.009582	0.426016
0.020	0.011004	0.516640
0.050	0.028840	1.215219
0.075	0.052420	1.296770
0.100	0.074980	1.436899
0.120	0.092820	1.560948
0.140	0.111000	1.665470
0.160	0.129880	1.729792
0.180	0.150260	1.707968
0.200	0.169860	1.730940
0.250	0.219600	1.745872

**Table B14** Data for MES adsorption on ferric oxide at surfactant solution pH 7 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001840	0.009154
0.005	0.004252	0.042923
0.008	0.006072	0.110725
0.011	0.007462	0.203187
0.014	0.008338	0.325169
0.017	0.009464	0.432793
0.020	0.010490	0.546159
0.050	0.029280	1.189950
0.075	0.052160	1.311701
0.100	0.074960	1.438047
0.120	0.095580	1.402441
0.140	0.113280	1.534530
0.160	0.133200	1.539124
0.180	0.152840	1.559799
0.200	0.172940	1.554056
0.250	0.223200	1.539124

**Table B15** Data for MES adsorption on ferric oxide at surfactant solution pH 9 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0014062	0.034102
0.005	0.0040946	0.051997
0.008	0.006562	0.082584
0.011	0.007358	0.209160
0.014	0.006496	0.430955
0.017	0.008376	0.495276
0.020	0.009636	0.595205
0.050	0.029420	1.181910
0.075	0.051660	1.340416
0.100	0.074040	1.490883
0.120	0.094060	1.489734
0.140	0.113460	1.524192
0.160	0.132040	1.605743
0.180	0.151900	1.613783
0.200	0.171860	1.616080
0.250	0.223100	1.544867

**Table B16** Data for MES adsorption on ferric oxide at surfactant solution pH 11 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0019656	0.001976
0.005	0.004802	0.011371
0.008	0.0074488	0.031655
0.011	0.009554	0.083044
0.014	0.010972	0.173898
0.017	0.01278	0.242355
0.020	0.01506	0.283704
0.050	0.039820	0.584637
0.075	0.060800	0.815506
0.100	0.084460	0.892462
0.120	0.105260	0.846518
0.140	0.123880	0.925772
0.160	0.141320	1.072793
0.180	0.162420	1.009620
0.200	0.183480	0.948744
0.250	0.232200	1.022254

**Table B17** Data for AE adsorption on ferric oxide at surfactant solution pH 5 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0016356	0.041855
0.005	0.0042690	0.083963
0.008	0.0070210	0.112448
0.011	0.0094230	0.181134
0.014	0.0107950	0.368126
0.017	0.0117150	0.607035
0.020	0.0134210	0.755664
0.050	0.0390600	1.256569
0.075	0.0636950	1.298492
0.100	0.0887900	1.287581
0.200	0.1887000	1.297918
0.300	0.2881223	1.364273
0.400	0.3890640	1.256109

**Table B18** Data for AE adsorption on ferric oxide at surfactant solution pH 7 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0019970	0.000345
0.005	0.0047046	0.033930
0.008	0.0074157	0.067113
0.011	0.0092170	0.204795
0.014	0.0103330	0.421192
0.017	0.0115240	0.628973
0.020	0.0131770	0.783690
0.050	0.0398750	1.162958
0.075	0.0647300	1.179612
0.100	0.0900550	1.142283
0.200	0.1896500	1.188801
0.300	0.2900540	1.142398
0.400	0.3901270	1.134013

**Table B19** Data for AE adsorption on ferric oxide at surfactant solution pH 9 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0019808	0.002205
0.005	0.0046995	0.034515
0.008	0.0074286	0.065631
0.011	0.0087480	0.258665
0.014	0.0104880	0.403388
0.017	0.0117860	0.598880
0.020	0.0132690	0.773123
0.050	0.0402000	1.125628
0.075	0.0652300	1.122182
0.100	0.0905600	1.084279
0.200	0.1900800	1.139411
0.300	0.2904578	1.096017
0.400	0.3904765	1.093869

**Table B20** Data for AE adsorption on ferric oxide at surfactant solution pH 11 and 30°C. Weight of ferric oxide = 0.25g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0019840	0.001838
0.005	0.0046792	0.036847
0.008	0.0064220	0.181249
0.011	0.0085950	0.276238
0.014	0.0094780	0.519397
0.017	0.0115820	0.622312
0.020	0.0125300	0.858004
0.050	0.0415000	0.976310
0.075	0.0662950	0.999856
0.100	0.0913650	0.991816
0.200	0.1910500	1.027997
0.300	0.2909741	1.036715
0.400	0.3911761	1.013513

**Table B21** Data for AE adsorption on cotton fabric at surfactant solution pH 5 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001850	0.0240
0.005	0.002787	0.3541
0.008	0.003419	0.7330
0.011	0.004602	1.0237
0.014	0.006937	1.1301
0.017	0.009552	1.1917
0.020	0.012533	1.1947
0.050	0.042501	1.1998
0.100	0.092541	1.1934
0.200	0.192626	1.1798
0.300	0.292534	1.1946
0.400	0.392562	1.1901

**Table B22** Data for AE adsorption on cotton fabric at surfactant solution pH 7 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001896	0.0166
0.005	0.002832	0.3469
0.008	0.003535	0.7144
0.011	0.005058	0.9507
0.014	0.007671	1.0126
0.017	0.010543	1.0331
0.020	0.013545	1.0328
0.050	0.043578	1.0275
0.100	0.093612	1.0221
0.200	0.193622	1.0205
0.300	0.293851	0.9838
0.400	0.393546	1.0326



**Table B23** Data for AE adsorption on cotton fabric at surfactant solution pH 9 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001911	0.0142
0.005	0.002878	0.3395
0.008	0.004041	0.6334
0.011	0.006497	0.7205
0.014	0.009114	0.7818
0.017	0.011998	0.8003
0.020	0.015107	0.7829
0.050	0.044915	0.8136
0.100	0.094896	0.8166
0.200	0.194799	0.8322
0.300	0.294782	0.8349
0.400	0.394887	0.8181

**Table B24** Data for AE adsorption on cotton fabric at surfactant solution pH 11 and 30°C. Weight of cotton fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001954	0.0074
0.005	0.002889	0.3378
0.008	0.005231	0.4430
0.011	0.007945	0.4888
0.014	0.010823	0.5083
0.017	0.013768	0.5171
0.020	0.016662	0.5341
0.050	0.046716	0.5254
0.100	0.096682	0.5309
0.200	0.196737	0.5221
0.300	0.296563	0.5499
0.400	0.396727	0.5237

**Table B25** Data for AE adsorption on Blend cotton/polyester fabric at surfactant solution pH 5 and 30°C. Weight of Blend cotton/polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.0018635	0.017477
0.005	0.0036357	0.174628
0.008	0.0060231	0.253041
0.011	0.0078520	0.402944
0.014	0.0102370	0.481664
0.017	0.0130470	0.505984
0.020	0.0162450	0.480640
0.050	0.0460730	0.502662
0.100	0.0961388	0.494235
0.200	0.1959045	0.524224
0.300	0.2958570	0.530304
0.400	0.3959849	0.513928

**Table B26** Data for AE adsorption on blend cotton/polyester fabric at surfactant solution pH 7 and 30°C. Weight of blend cotton/polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.00183191	0.021516
0.005	0.00377123	0.157283
0.008	0.00623241	0.226252
0.011	0.00832332	0.342615
0.014	0.01096931	0.387928
0.017	0.01373754	0.417595
0.020	0.01684356	0.404024
0.050	0.04655978	0.440348
0.100	0.09656926	0.439135
0.200	0.19648421	0.450021
0.300	0.29660231	0.434904
0.400	0.39632174	0.470817

**Table B27** Data for AE adsorption on blend cotton/polyester fabric at surfactant solution pH 9 and 30°C. Weight of blend cotton/polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001834810	0.021144
0.005	0.004098732	0.115362
0.008	0.006300131	0.217583
0.011	0.008576512	0.310206
0.014	0.011298023	0.345853
0.017	0.014284023	0.347645
0.020	0.017045903	0.378124
0.050	0.047048105	0.377843
0.100	0.096912947	0.395143
0.200	0.196748013	0.416254
0.300	0.296828741	0.405921
0.400	0.396823475	0.406595

**Table B28** Data for AE adsorption on blend cotton/polyester fabric at surfactant solution pH 11 and 30°C. Weight of blend cotton/polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001874052	0.016121
0.005	0.003941240	0.135521
0.008	0.006482950	0.194182
0.011	0.009030323	0.252119
0.014	0.011848562	0.275384
0.017	0.014534882	0.315535
0.020	0.017449242	0.326497
0.050	0.047103480	0.370755
0.100	0.097092305	0.372185
0.200	0.197102200	0.370918
0.300	0.297024110	0.380914
0.400	0.397012740	0.382369

**Table B29** Data for AE adsorption on polyester fabric at surfactant solution pH 5 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001956	0.004068
0.005	0.003543	0.134720
0.008	0.005647	0.217568
0.011	0.008137	0.264725
0.014	0.011101	0.268054
0.017	0.014032	0.274434
0.020	0.016981	0.279149
0.050	0.046820	0.294036
0.100	0.096764	0.299214
0.200	0.196784	0.297365
0.300	0.296773	0.298373
0.400	0.396752	0.300324

**Table B30** Data for AE adsorption on polyester fabric at surfactant solution pH 7 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001943	0.005270
0.005	0.003562	0.132963
0.008	0.005692	0.213407
0.011	0.008507	0.230513
0.014	0.011446	0.236153
0.017	0.014441	0.236616
0.020	0.017340	0.245955
0.050	0.047381	0.242164
0.100	0.097373	0.242903
0.200	0.197327	0.247157
0.300	0.297373	0.242894
0.400	0.397345	0.245492

**Table B31** Data for AE adsorption on polyester fabric at surfactant solution pH 9 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001995	0.000462
0.005	0.003516	0.137217
0.008	0.005770	0.206195
0.011	0.008729	0.209986
0.014	0.011741	0.208877
0.017	0.014753	0.207767
0.020	0.017684	0.214147
0.050	0.047760	0.207120
0.100	0.097662	0.216181
0.200	0.197692	0.213407
0.300	0.297773	0.205908
0.400	0.397745	0.208507

**Table B32** Data for AE adsorption on polyester fabric at surfactant solution pH 11 and 30°C. Weight of polyester fabric = 0.5g, Volume of solution 20 ml.

Initial Concentration (%w/v)	Equilibrium Concentration (%w/v)	Adsorption density mg/m <sup>2</sup>
0.002	0.001913	0.008044
0.005	0.003576	0.131669
0.008	0.005981	0.186667
0.011	0.008916	0.192695
0.014	0.011975	0.187240
0.017	0.014879	0.196117
0.020	0.017922	0.192141
0.050	0.048038	0.181415
0.100	0.098104	0.175312
0.200	0.198042	0.181045
0.300	0.297969	0.187795
0.400	0.398035	0.181692

### Appendix C Surface tension Measurement

**Table C1** Surface tension of MES.

Concentration (%w/v)	IFT(mN/m)			average
0.001	42.78	42.75	42.74	42.76
0.002	41.59	41.62	41.64	41.62
0.004	40.79	40.74	40.81	40.78
0.006	39.85	39.90	39.87	39.87
0.008	38.39	38.36	38.40	38.38
0.010	37.80	37.77	37.75	37.77
0.020	37.52	37.55	37.61	37.56
0.040	37.20	37.19	37.15	37.18
0.060	37.01	37.04	37.05	37.03
0.080	36.89	36.91	36.88	36.89
0.100	36.71	36.79	36.75	36.75
0.200	36.45	36.51	36.55	36.50
0.400	36.15	36.19	36.21	36.18
0.600	35.97	36.01	35.95	35.98
0.800	35.79	35.82	35.74	35.78
1.000	35.51	35.6	35.52	35.54

**Table C2** Surface tension of AE.

Concentration (%w/v)	IFT (mN/m)			average
0.001	70.59	70.36	70.65	70.464
0.002	65.81	65.51	64.54	65.29
0.003	57.34	56.35	57.85	57.18
0.004	46.37	46.88	45.55	46.27
0.005	44.23	43.66	43.23	43.71
0.006	41.42	41.29	40.20	40.97
0.007	38.75	37.03	38.81	38.20
0.008	37.39	37.2	37.37	37.32
0.009	36.3	35.92	36.03	36.08
0.010	34.64	33.89	33.6	33.00
0.020	32.84	32.89	33.28	32.69
0.030	32.75	32.75	32.58	32.19
0.040	31.85	32.44	32.28	32.46
0.050	32.26	32.63	32.49	30.99
1.000	31.01	31.39	30.58	30.99

## Appendix D Detergency Experiment

Appendix D1 %Detergency from cotton by using MES surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.0300	1	77.34	75.92	86.70	13.1725	13.2547
	2	78.87	77.89	86.79	11.0112	
	3	78.44	76.91	86.73	15.5804	
0.0750	1	78.56	75.48	89.10	22.6138	22.0938
	2	79.00	75.12	88.83	28.3005	
	3	77.18	75.17	88.25	15.3670	
0.2000	1	81.08	76.39	88.26	39.5114	38.5021
	2	81.13	76.45	88.71	38.1729	
	3	80.87	76.32	88.35	37.8221	
0.2500	1	81.18	76.1500	86.7800	47.3189	41.7072
	2	81.72	76.3700	86.7900	51.3436	
	3	79.23	76.5100	86.7900	26.4591	
0.5000	1	81.42	76.3300	88.5700	41.5850	41.3570
	2	81.56	76.2800	89.5000	39.9395	
	3	81.51	76.0300	88.9100	42.5466	

**Table D2** %Detergency from cotton by using MES surfactant at different surfactant concentration at pH 5.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	77.40	76.76	87.83	5.7814	8.5390
	2	73.93	72.70	87.70	8.2000	
	3	77.08	75.70	87.56	11.6358	
0.0100	1	78.02	76.26	88.60	14.2626	11.7099
	2	77.85	76.44	89.07	11.1639	
	3	78.89	78.04	86.80	9.7032	
0.0300	1	77.08	75.92	86.67	10.7907	12.6156
	2	79.03	77.79	86.88	13.6414	
	3	78.23	76.91	86.75	13.4146	
0.0750	1	78.16	75.68	89.20	18.3432	23.0254
	2	79.35	75.42	88.73	29.5267	
	3	76.58	73.17	89.25	21.2065	
0.2500	1	80.28	76.05	86.78	39.4222	40.1995
	2	81.72	76.87	86.79	48.8911	
	3	77.23	72.61	86.92	32.2851	
0.5000	1	80.32	76.43	86.57	38.3629	40.0230
	2	82.06	77.18	88.50	43.1095	
	3	80.31	75.03	88.71	38.5965	



**Table D3** %Detergency from cotton by using MES surfactant at different surfactant concentration at pH 7.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.0100	1	79.15	77.65	86.6	16.7598	23.4226
	2	79.76	77.82	86.98	21.1790	
	3	80.82	78.03	86.66	32.3291	
0.0300	1	79.32	76.62	86.05	28.6320	23.8357
	2	77.62	74.92	86.13	24.0856	
	3	77.92	75.84	86.91	18.7895	
0.0750	1	81.13	76.39	89.18	37.0602	39.0424
	2	81.09	75.41	88.56	43.1939	
	3	79.61	73.95	89.30	36.8730	
0.2500	1	80.47	74.79	86.4800	48.5885	46.0218
	2	81.26	77.00	87.1500	41.9704	
	3	80.84	75.22	87.0500	47.5063	
0.5000	1	82.89	77.82	89.2600	44.3182	47.6897
	2	81.72	76.04	88.6400	45.0794	
	3	82.86	75.77	88.9800	53.6715	

**Table D4** %Detergency from cotton by using MES surfactant at different surfactant concentration at pH 9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	75.98	74.17	87.81	13.2698	14.1198
	2	77.09	75.69	87.94	11.4286	
	3	77.37	75.12	87.86	17.6609	
0.0100	1	79.37	77.35	86.49	22.1007	16.2988
	2	78.68	77.08	86.50	16.9851	
	3	78.54	77.66	86.63	9.8105	
0.0300	1	78.08	75.28	86.66	24.6046	24.2856
	2	78.98	77.21	86.49	19.0733	
	3	79.68	76.73	86.84	29.1790	
0.0750	1	79.79	73.31	89.22	40.7291	44.7075
	2	81.74	76.35	88.93	42.8458	
	3	82.50	76.04	88.82	50.5477	
0.2500	1	83.14	75.30	87.68	63.3279	61.0460
	2	82.94	75.45	87.75	60.8943	
	3	82.26	74.00	88.02	58.9158	
0.5000	1	84.54	77.79	88.81	61.2523	61.5167
	2	82.65	74.40	88.47	58.6354	
	3	83.57	73.03	89.33	64.6626	

**Table D5** %Detergency from cotton by using MES surfactant at different surfactant concentration at pH 11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	79.56	78.53	88.37	10.4675	13.9051
	2	76.61	74.65	87.19	15.6300	
	3	81.59	80.25	88.83	15.6177	
0.0100	1	80.08	78.35	86.49	21.2531	28.9000
	2	79.91	75.57	86.86	38.4411	
	3	79.51	76.75	86.97	27.0059	
0.0300	1	78.65	75.84	86.40	26.6098	28.1078
	2	76.80	74.43	86.53	19.5868	
	3	80.88	75.71	89.27	38.1268	
0.0750	1	80.51	74.48	87.02	48.0861	50.9534
	2	81.77	74.67	86.89	58.1015	
	3	81.18	75.92	87.19	46.6726	
0.2500	1	81.51	73.68	86.68	60.2308	62.7679
	2	82.02	73.74	87.92	58.3921	
	3	83.31	74.14	87.30	69.6809	
0.5000	1	83.95	75.75	88.79	62.8834	63.2548
	2	83.75	74.82	89.19	62.1434	
	3	84.32	75.93	88.89	64.7377	

**Table D6** %Detergency from blend polyester/cotton by using MES surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.0300	1	74.38	72.21	85.53	16.2913	19.5876
	2	74.85	71.61	85.39	23.5123	
	3	74.38	71.83	85.28	18.9591	
0.0750	1	75.87	72.14	85.88	27.1470	28.9234
	2	75.03	69.79	85.47	33.4184	
	3	75.86	72.38	85.66	26.2048	
0.2000	1	75.07	70.25	85.63	31.3394	37.0106
	2	76.03	71.41	85.32	33.2135	
	3	77.47	70.54	85.45	46.4789	
0.2500	1	76.92	70.08	85.03	45.7525	41.5747
	2	76.53	70.81	85.34	39.3668	
	3	76.52	70.71	85.38	39.6046	
0.5000	1	77.15	71.76	85.29	39.8374	42.7635
	2	78.34	71.09	85.72	49.5557	
	3	77.05	71.97	85.03	38.8974	

**Table D7** %Detergency from blend polyester/cotton by using MES surfactant at different surfactant concentration at pH 5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	16	72.58	69.78	85.10	18.2768	17.6461
	17	72.6	70.41	85.41	14.6000	
	18	72.68	69.42	85.67	20.0615	
0.0300	61	73.31	71.81	86.13	10.4749	19.6686
	62	74.24	71.65	86.73	17.1751	
	63	74.89	70.08	85.42	31.3559	
0.0750	64	74.87	70.08	85.92	30.2399	27.7534
	65	75.36	70.12	85.32	34.4737	
	66	74.65	71.97	86.42	18.5467	
0.2500	67	77.93	71.87	85.12	45.7358	36.5180
	68	76.74	72.00	85.72	34.5481	
	69	75.34	71.09	85.61	29.2700	
0.5000	70	76.32	71.09	86.59	33.7419	37.0488
	71	76.27	71.12	86.19	34.1739	
	72	78.21	71.76	86.68	43.2306	

**Table D8** %Detergency from blend polyester/cotton by using MES surfactant at different surfactant concentration at pH 7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.0300	49	75.56	72.12	85.00	26.7081	23.3687
	50	75.23	73.20	86.32	15.4726	
	51	75.21	71.32	85.25	27.9253	
0.0750	52	76.74	71.24	85.43	38.7597	29.5700
	53	74.87	72.30	85.68	19.2078	
	54	75.67	71.24	85.65	30.7425	
0.2500	55	76.98	71.45	85.14	40.3944	41.8743
	56	76.94	71.35	84.89	41.2851	
	57	78.01	73.04	84.35	43.9434	
0.5000	58	78.05	72.47	85.12	44.1107	42.2781
	59	77.34	72.46	84.49	40.5653	
	60	77.26	71.83	84.71	42.1584	

**Table D9** %Detergency from blend polyester/cotton by using MES surfactant at different surfactant concentration at pH 9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	19	72.80	70.31	85.59	16.2958	17.6690
	20	73.19	70.72	85.38	16.8486	
	21	70.77	67.30	84.77	19.8626	
0.0300	37	74.78	70.08	85.56	30.3618	20.9499
	38	74.14	72.35	85.32	13.8011	
	39	73.85	71.26	85.12	18.6869	
0.0750	40	75.37	67.21	86.24	42.8797	32.1155
	41	75.21	70.34	85.55	32.0184	
	42	75.42	72.34	86.70	21.4485	
0.2500	43	78.80	71.35	87.01	47.5734	50.4625
	44	78.92	72.27	84.98	52.3210	
	45	78.74	72.36	84.75	51.4931	
0.5000	46	79.57	72.46	85.33	55.2448	52.7591
	47	80.05	72.57	85.51	57.8053	
	48	78.56	72.59	85.79	45.2273	

**Table D10** %Detergency from blend polyester/cotton by using MES surfactant at different surfactant concentration at pH 11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	22	73.34	69.53	85.91	23.2601	19.6222
	23	72.20	69.69	85.80	15.5804	
	24	72.89	69.82	85.15	20.0261	
0.0300	28	73.27	68.49	85.38	28.3008	28.6564
	29	74.32	70.25	85.43	26.8116	
	30	74.87	70.26	85.20	30.8568	
0.0750	31	75.45	69.21	85.65	37.9562	36.3317
	32	76.03	69.95	86.45	36.8485	
	33	74.98	69.13	86.24	34.1905	
0.2500	34	78.86	70.40	86.01	54.1960	56.9746
	35	79.02	69.99	86.31	55.3309	
	36	79.46	69.79	85.54	61.3968	
0.5000	25	78.26	68.93	85.97	54.7535	56.9849
	26	78.24	68.63	85.39	57.3389	
	27	78.74	67.98	86.26	58.8621	



**Table D11** %Detergency from polyester by using MES surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing (A)	Soiled swatch before washing (B)	unsoiled swatch (C0)	%Detergency	Average %Detergency
0	1	73.61	70.15	84.93	23.4100	17.6994
	2	72.78	70.41	83.95	17.5037	
	3	72.31	70.62	84.49	12.1846	
0.0300	1	74.45	72.21	85.53	16.8168	20.8768
	2	74.87	71.61	85.39	23.6575	
	3	74.81	71.83	85.28	22.1561	
0.0750	1	75.67	72.14	85.88	25.6914	29.1812
	2	75.84	69.79	85.47	38.5842	
	3	75.47	72.38	85.66	23.2681	
0.2000	1	76.58	70.23	86.57	38.8617	38.4373
	2	76.31	70.14	86.45	37.8296	
	3	76.14	70.54	85.04	38.6207	
0.2500	1	76.83	70.08	85.03	45.1505	41.8308
	2	76.64	70.81	85.34	40.1239	
	3	76.61	70.71	85.38	40.2181	
0.5000	1	77.52	71.76	85.29	42.5721	41.9706
	2	78.04	71.09	85.72	47.5051	
	3	76.65	71.97	85.03	35.8346	

**Table D12** %Detergency from polyester by using MES surfactant at different surfactant concentration at pH 5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.27	70.59	84.60	19.1292	17.3290
	2	73.13	70.96	84.75	15.7360	
	3	72.39	70.07	83.62	17.1218	
0.0300	1	73.41	70.97	84.49	18.0473	19.9397
	2	74.54	71.77	84.51	21.7425	
	3	73.69	70.96	84.59	20.0293	
0.0750	1	74.56	70.61	84.99	27.4687	28.8140
	2	74.62	70.13	84.37	31.5309	
	3	74.57	70.75	84.67	27.4425	
0.2500	1	77.82	71.90	84.58	46.6877	37.7268
	2	75.74	71.23	84.81	33.2106	
	3	75.34	71.02	84.00	33.2820	
0.5000	1	75.82	71.27	83.00	38.7894	37.1819
	2	76.71	71.90	84.39	38.5108	
	3	76.13	72.00	84.06	34.2454	

**Table D13** %Detergency from polyester by using MES surfactant at different surfactant concentration at pH 7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.72	71.61	83.00	18.5250	17.0222
	2	73.18	71.71	84.37	11.6114	
	3	74.12	71.24	85.00	20.9302	
0.0300	1	74.34	70.80	84.81	25.2677	24.2454
	2	73.26	70.45	84.26	20.3476	
	3	74.48	70.74	84.53	27.1211	
0.0750	1	75.09	71.50	83.97	28.7891	30.9839
	2	75.04	70.68	83.78	33.2824	
	3	75.14	71.07	84.25	30.8801	
0.2500	1	76.94	71.54	83.94	43.5484	41.4869
	2	76.42	71.72	84.51	36.7475	
	3	77.02	71.23	84.34	44.1648	
0.5000	1	76.58	69.89	84.07	47.1791	41.2105
	2	76.23	70.08	84.53	42.5606	
	3	76.16	71.71	84.84	33.8919	

**Table D14** %Detergency from polyester by using MES surfactant at different surfactant concentration at pH 9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.56	70.89	84.99	11.8440	18.2917
	2	73.84	70.86	84.20	22.3388	
	3	73.46	70.65	84.23	20.6922	
0.0300	1	74.67	70.33	84.18	31.3357	24.3875
	2	74.01	70.52	84.11	25.6806	
	3	73.68	71.56	84.69	16.1462	
0.0750	1	75.15	70.04	84.00	36.6046	32.8809
	2	75.01	70.41	83.84	34.2517	
	3	74.52	70.93	83.85	27.7864	
0.2500	1	78.76	71.74	83.73	58.5488	51.2175
	2	76.81	71.61	83.21	44.8276	
	3	77.63	71.26	83.93	50.2762	
0.5000	1	78.57	71.14	84.48	55.6972	51.5800
	2	77.97	72.18	84.53	46.8826	
	3	78.64	72.00	84.73	52.1603	

**Table D15** %Detergency from polyester by using MES surfactant at different surfactant concentration at pH 11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.32	71.53	85.85	19.4832	20.0329
	2	75.27	71.59	85.83	25.8427	
	3	73.90	71.95	85.15	14.7727	
0.0300	1	74.97	72.03	83.08	26.6063	28.6089
	2	75.70	72.08	84.16	29.9669	
	3	75.53	72.16	83.68	29.2535	
0.0750	1	76.76	71.43	84.62	40.4094	37.9383
	2	76.42	71.06	84.05	41.2625	
	3	75.69	71.28	85.00	32.1429	
0.2500	1	78.75	70.28	85.12	57.0755	57.6620
	2	78.54	71.26	84.09	56.7420	
	3	78.76	70.79	84.26	59.1685	
0.5000	1	79.35	71.24	84.89	59.4139	57.6911
	2	78.23	71.31	84.24	53.5189	
	3	78.89	72.04	83.43	60.1405	

**Table D16** %Detergency from cotton by using AE surfactant at different surfactant concentration.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
1.0000	1	79.51	77.73	88.36	16.7451	16.1878
	2	76.20	73.84	88.11	16.5382	
	3	79.48	77.79	88.85	15.2803	
2.0100	1	79.00	75.28	88.58	27.9699	19.8120
	2	78.37	76.26	88.32	17.4959	
	3	75.39	73.24	88.63	13.9701	
3.0100	1	78.53	74.90	88.29	27.1098	28.9129
	2	80.35	77.04	87.77	30.8481	
	3	80.61	77.47	88.38	28.7809	
5.0100	1	79.33	75.07	88.51	31.6964	30.0112
	2	80.20	77.38	88.08	26.3551	
	3	79.72	75.46	88.78	31.9820	

**Table D17** %Detergency from cotton by using AE surfactant at different surfactant concentration at pH 5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	77.40	76.76	87.83	5.7814	8.5390
	2	73.93	72.70	87.70	8.2000	
	3	77.08	75.70	87.56	11.6358	
0.0100	1	77.65	76.63	87.98	8.9868	9.8821
	2	77.57	76.37	87.80	10.4987	
	3	76.86	75.66	87.47	10.1609	
0.0500	1	74.68	72.12	88.86	15.2927	15.0124
	2	76.55	74.97	88.49	11.6864	
	3	75.36	72.44	88.61	18.0581	
0.0750	1	76.8	74.91	89.01	13.4043	15.3489
	2	74.71	71.97	89.10	15.9953	
	3	74.84	72.02	88.96	16.6470	
1.0000	1	77.65	75.58	87.56	17.2788	21.7530
	2	77.64	74.54	87.32	24.2567	
	3	77.12	74.10	86.83	23.7235	
2.0400	1	76.91	74.28	86.59	21.3647	21.9562
	2	76.56	75.31	87.23	10.4866	
	3	76.61	71.47	86.58	34.0172	
3.5000	1	79.57	77.29	87.88	21.5297	24.0908
	2	81.31	78.86	87.81	27.3743	
	3	78.95	76.05	88.46	23.3683	
5.0000	1	79.59	75.75	88.07	31.1688	24.0662
	2	80.33	78.20	87.96	21.8238	
	3	80.44	78.65	87.97	19.2060	

**Table D18** %Detergency from cotton by using AE surfactant at different surfactant concentration at pH 7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.0100	1	77.28	76.36	87.72	8.0986	11.5337
	2	77.10	74.71	87.43	18.7893	
	3	77.47	76.62	87.64	7.7132	
0.0500	1	77.44	75.66	88.68	13.6713	15.8493
	2	74.56	71.69	89.30	16.2976	
	3	75.40	72.51	88.95	17.5791	
0.0750	1	75.87	74.00	89.15	12.3432	15.7851
	2	75.85	72.92	89.16	18.0419	
	3	74.95	72.06	89.09	16.9701	
1.0000	1	76.87	74.93	87.45	15.4952	16.8014
	2	77.78	76.51	87.61	11.4414	
	3	78.77	76.32	86.76	23.4674	
2.0400	1	77.04	73.88	85.40	27.4306	26.4771
	2	75.86	73.49	86.96	17.5947	
	3	80.70	77.60	86.61	34.4062	
3.5000	1	79.13	76.30	88.11	23.9627	27.5521
	2	80.41	77.01	88.28	30.1686	
	3	79.11	75.61	87.88	28.5249	
5.0000	1	79.51	77.59	87.43	19.5122	29.0000
	2	81.36	78.69	87.37	30.7604	
	3	78.28	73.05	87.29	36.7275	



**Table D19** %Detergency from cotton by using AE surfactant at different surfactant concentration at pH 9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	75.98	74.17	87.81	13.2698	14.1198
	2	77.09	75.69	87.94	11.4286	
	3	77.37	75.12	87.86	17.6609	
0.0100	1	76.31	73.99	85.37	20.3866	17.7506
	2	77.39	75.20	87.26	18.1592	
	3	78.10	76.60	86.8	14.7059	
0.0500	1	77.92	75.24	89.21	19.1840	18.8761
	2	76.87	73.56	89.21	21.1502	
	3	77.25	74.99	88.86	16.2942	
0.0750	1	81.87	80.59	88.31	16.5803	19.2803
	2	82.27	80.39	88.39	23.5000	
	3	82.03	80.65	88.42	17.7606	
1.0000	1	76.47	74.76	87.06	13.9024	21.4651
	2	77.47	73.62	86.07	30.9237	
	3	77.32	75.23	85.91	19.5693	
2.0400	1	80.01	74.70	87.04	43.0308	31.5843
	2	80.48	79.23	87.66	14.8280	
	3	81.18	77.07	88.21	36.8941	
3.5000	1	81.14	77.42	87.76	35.9768	33.3424
	2	81.07	78.21	88.17	28.7149	
	3	81.16	77.16	88.48	35.3357	
5.0000	1	80.07	76.25	86.92	35.8013	35.0837
	2	82.24	79.58	87.65	32.9616	
	3	81.67	78.74	86.77	36.4882	

**Table D20** %Detergency from cotton by using AE surfactant at different surfactant concentration at pH 11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	79.56	78.53	88.37	10.4675	13.9051
	2	76.61	74.65	87.19	15.6300	
	3	81.59	80.25	88.83	15.6177	
0.0100	1	77.48	73.71	86.71	29.0000	21.5474
	2	77.50	75.96	88.51	12.2709	
	3	76.97	73.49	88.38	23.3714	
0.0500	1	79.27	76.67	89.39	20.4403	21.8365
	2	78.59	74.32	88.99	29.1070	
	3	77.63	75.44	89.16	15.9621	
0.0750	1	82.07	80.48	88.57	19.6539	22.3871
	2	82.24	80.39	88.37	23.1830	
	3	83.84	82.22	88.88	24.3243	
1.0000	1	77.28	74.16	86.27	25.7638	22.0683
	2	77.22	75.12	85.83	19.6078	
	3	76.95	74.40	86.64	20.8333	
2.0400	1	81.24	77.69	86.90	38.5451	38.5030
	2	79.77	74.92	88.00	37.0795	
	3	82.68	79.23	87.88	39.8844	
3.5000	1	81.83	77.48	87.85	41.9479	40.6387
	2	81.78	76.65	88.36	43.8087	
	3	80.96	76.61	88.64	36.1596	
5.0000	1	81.52	78.01	87.69	36.2603	41.4851
	2	82.62	79.03	87.25	43.6740	
	3	81.64	76.48	88.07	44.5211	

**Table D21** %Detergency from blend polyester/cotton by using AE surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
1.0000	1	74.91	71.71	85.36	23.4432	17.5543
	2	74.20	71.73	86.11	17.1766	
	3	73.48	71.80	85.75	12.0430	
2.0000	1	73.12	69.38	85.85	22.7080	19.3869
	2	72.17	69.36	85.33	17.5955	
	3	72.19	69.34	85.30	17.8571	
3.0000	1	74.65	69.90	85.31	30.8241	29.0296
	2	74.16	70.03	85.77	26.2389	
	3	74.53	69.87	85.39	30.0258	
5.0000	1	74.83	70.07	85.52	30.8091	30.4775
	2	74.90	69.47	85.08	34.7854	
	3	73.72	69.48	85.89	25.8379	

**Table D22** %Detergency from blend polyester/cotton by using AE surfactant at different surfactant concentration at pH5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.58	69.78	85.10	18.2768	17.6461
	2	72.60	70.41	85.41	14.6000	
	3	72.68	69.42	85.67	20.0615	
0.075	1	74.87	73.00	85.04	15.5316	19.2997
	2	74.15	71.92	85.98	15.8606	
	3	74.15	70.06	85.49	26.5068	
1.0000	1	74.37	72.93	85.52	11.4376	19.6338
	2	73.28	70.51	85.27	18.7669	
	3	75.67	71.42	86.23	28.6968	
2.0000	1	75.04	70.78	85.40	29.1382	24.6299
	2	74.26	70.49	86.96	22.8901	
	3	74.10	70.60	86.61	21.8613	
3.5000	1	74.13	70.30	85.27	25.5845	24.4570
	2	74.01	70.11	85.16	25.9136	
	3	73.81	70.61	85.24	21.8729	
5.0000	1	75.51	71.49	86.51	26.7643	24.4323
	2	74.76	70.39	86.04	27.9233	
	3	73.78	71.05	85.72	18.6094	

**Table D23** %Detergency from blend polyester/cotton by using AE surfactant at different surfactant concentration at pH7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.0750	1	74.81	71.97	85.01	21.7791	18.8310
	2	73.81	71.97	84.10	15.1690	
	3	74.94	72.02	86.96	19.5448	
1.0000	1	74.75	71.00	85.56	25.7555	19.9366
	2	74.44	72.53	85.32	14.9335	
	3	75.14	72.40	86.73	19.1207	
2.0000	1	75.31	72.48	86.59	20.0567	28.3566
	2	76.40	72.32	85.66	30.5847	
	3	76.60	71.36	86.58	34.4284	
3.5000	1	75.57	71.89	86.00	26.0808	28.6525
	2	76.51	71.87	85.43	34.2183	
	3	74.95	71.54	84.83	25.6584	
5.0000	1	75.59	71.58	85.16	29.5287	29.3286
	2	75.23	71.26	85.82	27.2665	
	3	75.81	71.54	85.23	31.1907	

**Table D24** %Detergency from blend polyester/cotton by using AE surfactant at different surfactant concentration at pH9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.80	70.31	85.59	16.2958	17.6690
	2	73.19	70.72	85.38	16.8486	
	3	70.77	67.30	84.77	19.8626	
0.0750	1	74.17	70.59	85.93	23.3377	19.6605
	2	73.47	70.39	85.24	20.7407	
	3	73.03	70.65	86.62	14.9029	
1.0000	1	74.67	71.76	85.06	21.8797	22.4800
	2	75.27	72.62	85.39	20.7518	
	3	74.12	70.23	85.91	24.8087	
2.0000	1	76.41	70.70	86.00	37.3203	32.7763
	2	75.38	70.23	85.00	34.8680	
	3	74.08	70.07	85.41	26.1408	
3.5000	1	76.04	71.42	85.35	33.1658	34.9081
	2	75.07	70.21	85.28	32.2495	
	3	76.26	70.23	85.57	39.3090	
5.0000	1	76.07	70.80	85.13	36.7760	34.4132
	2	75.42	70.53	85.80	32.0236	
	3	75.46	70.17	85.53	34.4401	

**Table D25** %Detergency from blend polyester/cotton by using AE surfactant at different surfactant concentration at pH11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.34	69.53	85.91	23.2601	19.6222
	2	72.20	69.69	85.80	15.5804	
	3	72.89	69.82	85.15	20.0261	
0.0750	1	75.07	71.77	85.57	23.9130	23.1228
	2	75.14	73.00	85.36	17.3139	
	3	75.74	72.00	85.29	28.1415	
1.0000	1	75.28	71.85	84.39	27.3525	24.8561
	2	75.62	72.78	85.83	21.7625	
	3	75.95	72.30	86.64	25.4533	
2.0000	1	77.04	72.51	86.90	31.4802	37.3176
	2	77.57	72.09	85.94	39.5668	
	3	78.00	72.13	86.48	40.9059	
3.5000	1	76.00	69.36	86.47	38.8077	38.5827
	2	76.35	69.21	86.36	41.6327	
	3	75.32	69.24	86.46	35.3078	
5.0000	1	76.02	69.97	85.36	39.3112	38.8404
	2	75.84	69.54	85.87	38.5793	
	3	75.85	69.53	85.89	38.6308	

**Table D26** %Detergency from polyester by using AE surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.72	71.61	83.00	18.5250	17.0222
	2	73.18	71.71	84.37	11.6114	
	3	74.12	71.24	85.00	20.9302	
1.0000	1	73.25	71.21	85.32	14.4578	17.1309
	2	73.70	70.70	85.64	20.0803	
	3	73.17	70.63	85.70	16.8547	
2.0000	1	73.88	70.64	85.80	21.3720	20.7359
	2	73.15	70.56	85.55	17.2782	
	3	74.45	70.98	85.71	23.5574	
3.0000	1	74.52	70.00	85.41	29.3316	30.0847
	2	75.42	70.95	85.58	30.5537	
	3	74.96	70.76	84.59	30.3688	
5.0000	1	75.06	70.75	84.91	30.4379	30.3475
	2	74.23	70.19	84.54	28.1533	
	3	75.09	70.43	84.79	32.4513	



**Table D27** %Detergency from polyester by using AE surfactant at different surfactant concentration at pH5.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	73.27	70.59	84.60	19.1292	17.3290
	2	73.13	70.96	84.75	15.7360	
	3	72.39	70.07	83.62	17.1218	
0.075	1	74.35	70.63	84.16	27.4945	20.1609
	2	73.04	70.90	84.06	16.2614	
	3	73.01	70.69	84.56	16.7267	
1.0000	1	74.32	70.59	84.76	26.3232	21.7286
	2	72.28	70.46	84.69	12.7899	
	3	74.72	71.56	83.68	26.0726	
2.0000	1	73.03	70.43	83.89	19.3165	24.8897
	2	74.06	70.52	83.13	28.0730	
	3	74.21	70.59	83.86	27.2796	
3.5000	1	73.45	70.54	83.45	22.5407	24.9717
	2	74.04	70.40	83.36	28.0864	
	3	73.72	70.65	83.29	24.2880	
5.0000	1	75.21	70.83	83.43	34.7619	25.1978
	2	73.36	70.74	83.21	21.0104	
	3	73.28	70.62	84.04	19.8212	

**Table D28** %Detergency from polyester by using AE surfactant at different surfactant concentration at pH7.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	73.72	71.61	83.00	18.5250	17.0222
	2	73.18	71.71	84.37	11.6114	
	3	74.12	71.24	85.00	20.9302	
0.075	1	74.21	71.62	85.12	19.1852	18.9299
	2	73.82	71.96	85.23	14.0090	
	3	74.48	71.12	85.36	23.5955	
1.0000	1	74.25	71.48	85.64	19.5621	20.5429
	2	74.54	71.98	85.73	18.6182	
	3	74.41	71.01	85.51	23.4483	
2.0000	1	74.34	71.58	84.67	21.0848	27.1790
	2	75.04	71.02	84.47	29.8885	
	3	75.23	71.00	84.84	30.5636	
3.5000	1	74.71	71.87	84.08	23.2596	28.3439
	2	75.41	71.91	83.45	30.3293	
	3	75.58	71.20	85.13	31.4429	
5.0000	1	75.71	71.21	85.20	32.1658	29.3768
	2	75.30	71.81	85.47	25.5490	
	3	75.69	71.59	85.07	30.4154	

**Table D29** %Detergency from polyester by using AE surfactant at different surfactant concentration at pH9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.56	70.89	84.99	11.8440	18.2917
	2	73.84	70.86	84.20	22.3388	
	3	73.46	70.65	84.23	20.6922	
0.075	1	73.07	70.46	84.76	18.2517	19.2212
	2	73.12	70.05	84.46	21.3046	
	3	73.30	70.87	84.29	18.1073	
1.0000	1	74.14	70.51	85.13	24.8290	23.1977
	2	74.53	70.84	85.24	25.6250	
	3	73.05	70.16	85.26	19.1391	
2.0000	1	76.40	70.54	85.74	38.5526	32.7293
	2	75.16	70.44	85.01	32.3953	
	3	74.01	70.24	84.08	27.2399	
3.5000	1	76.14	70.64	84.58	39.4548	34.5790
	2	75.80	71.15	84.95	33.6957	
	3	75.55	71.43	84.90	30.5865	
5.0000	1	76.05	71.84	84.60	32.9937	34.8426
	2	75.83	71.79	84.36	32.1400	
	3	76.50	71.56	84.10	39.3939	

**Table D30** %Detergency from polyester by using AE surfactant at different surfactant concentration at pH11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.32	71.53	85.85	19.4832	20.0329
	2	75.27	71.59	85.83	25.8427	
	3	73.90	71.95	85.15	14.7727	
0.075	1	75.03	71.90	84.39	25.0600	22.7330
	2	74.15	71.32	84.90	20.8395	
	3	74.08	71.19	84.15	22.2994	
1.0000	1	75.15	71.75	84.25	27.2000	25.7167
	2	75.18	71.89	84.34	26.4257	
	3	75.08	72.33	84.02	23.5244	
2.0000	1	77.03	72.21	85.03	37.5975	38.3555
	2	77.27	72.13	85.06	39.7525	
	3	77.24	72.45	85.15	37.7165	
3.5000	1	76.79	72.05	85.49	35.2679	39.8800
	2	77.65	72.89	85.78	36.9279	
	3	77.24	70.00	85.26	47.4443	
5.0000	1	76.05	70.13	85.14	39.4404	39.3977
	2	76.14	70.93	84.93	37.2143	
	3	76.10	70.43	84.08	41.5385	

**Table D31** %Detergency from cotton by using LAS surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.1016	1	78.64	76.87	87.66	16.4041	26.6870
	2	77.94	73.07	87.33	34.1515	
	3	78.72	75.02	87.56	29.5056	
0.3014	1	77.32	73.06	86.86	30.8696	30.4933
	2	77.69	73.56	87.61	29.3950	
	3	78.36	74.43	87.02	31.2153	
0.5000	1	79.87	74.25	87.93	41.0819	32.0015
	2	78.51	75.69	87.57	23.7374	
	3	79.46	75.54	88.11	31.1854	
1.0000	1	79.85	75.39	88.17	34.8983	33.4627
	2	80.81	77.44	87.92	32.1565	
	3	80.42	76.51	88.24	33.3333	
2.0000	1	78.34	75.21	87.11	26.3025	33.4747
	2	80.55	76.08	87.85	37.9779	
	3	79.87	74.34	89.64	36.1438	
3.0000	1	77.34	74.01	87.73	24.2711	34.0860
	2	78.87	75.43	87.28	29.0295	
	3	82.18	77.72	86.83	48.9572	
4.0000	1	76.67	72.15	86.86	30.7274	33.7375
	2	81.18	74.04	88.05	50.9636	
	3	79.25	77.21	87.66	19.5215	

**Table D32** %Detergency from cotton by using LAS surfactant at different surfactant concentration at pH5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	77.40	76.76	87.83	5.7814	8.5390
	2	73.93	72.70	87.70	8.2000	
	3	77.08	75.70	87.56	11.6358	
0.0400	1	82.16	79.78	88.80	26.3858	23.6955
	2	83.57	82.34	88.96	18.5801	
	3	83.85	82.16	88.63	26.1206	
0.1000	1	82.82	79.94	88.67	32.9897	26.3185
	2	83.67	82.46	88.42	20.3020	
	3	78.26	74.78	88.34	25.6637	
0.3000	1	76.34	73.13	88.55	20.8171	28.2743
	2	78.67	72.20	88.62	39.4032	
	3	76.96	73.09	88.82	24.6027	
0.5000	1	76.47	73.69	87.30	20.4262	28.2521
	2	77.18	72.24	87.20	33.0214	
	3	76.24	71.24	87.21	31.3087	

**Table D33** %Detergency from cotton by using LAS surfactant at different surfactant concentration at pH7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0.0000	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.0400	1	80.03	78.88	88.43	12.0419	24.8979
	2	83.75	81.23	89.11	31.9797	
	3	82.03	79.11	88.63	30.6723	
0.1000	1	78.35	75.34	88.18	23.4424	28.8378
	2	77.93	72.79	87.30	35.4238	
	3	78.67	74.91	88.51	27.6471	
0.3000	1	77.67	73.62	88.74	26.7857	30.4854
	2	78.19	74.49	88.34	26.7148	
	3	79.25	73.42	88.78	37.9557	
0.5000	1	76.54	72.71	87.50	25.8959	30.4098
	2	77.96	73.71	87.54	30.7303	
	3	78.78	74.42	87.02	34.6032	

**Table D34** %Detergency from cotton by using LAS surfactant at different surfactant concentration at pH9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	75.98	74.17	87.81	13.2698	14.1198
	2	77.09	75.69	87.94	11.4286	
	3	77.37	75.12	87.86	17.6609	
0.0400	1	81.51	79.25	88.34	24.8625	25.9966
	2	82.40	78.84	88.67	36.2157	
	3	82.00	80.62	88.78	16.9118	
0.1000	1	78.05	74.06	88.20	28.2178	32.7381
	2	78.02	73.40	88.13	31.3646	
	3	79.17	73.07	88.86	38.6320	
0.3000	1	79.81	75.5	88.38	33.4627	32.9717
	2	78.66	73.02	88.56	36.2934	
	3	76.90	72.22	88.27	29.1589	
0.5000	1	78.13	74.54	87.56	27.5730	32.5651
	2	78.37	72.72	88.15	36.6170	
	3	77.17	71.98	87.47	33.5055	



**Table D35** %Detergency from cotton by using LAS surfactant at different surfactant concentration at pH11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	79.56	78.53	88.37	10.4675	13.9051
	2	76.61	74.65	87.19	15.6300	
	3	81.59	80.25	88.83	15.6177	
0.0400	1	83.80	80.55	88.51	40.8291	30.7637
	2	82.02	80.40	88.85	19.1716	
	3	83.09	80.51	88.50	32.2904	
0.1000	1	80.85	76.53	88.45	36.2416	38.7839
	2	79.74	73.19	88.31	43.3201	
	3	78.58	72.62	88.82	36.7901	
0.3000	1	79.36	72.83	88.67	41.2247	38.6488
	2	79.44	74.52	86.90	39.7415	
	3	79.34	74.95	87.50	34.9801	
0.5000	1	79.10	72.88	87.63	42.1695	39.0205
	2	78.85	73.73	87.50	37.1823	
	3	76.62	70.10	87.39	37.7097	

**Table D36** %Detergency from blend polyester/cotton by using LAS surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.100	1	76.00	71.13	85.23	34.5390	28.1139
	2	75.02	71.25	85.48	26.4933	
	3	75.09	71.85	85.75	23.3094	
0.300	1	75.80	71.47	85.12	31.7216	31.6242
	2	75.34	71.36	85.46	28.2270	
	3	76.05	71.00	85.46	34.9239	
0.500	1	76.13	71.12	85.65	34.4804	32.1360
	2	75.12	71.24	85.23	27.7341	
	3	76.03	71.26	85.21	34.1935	
1.000	1	76.41	72.01	85.35	32.9835	32.0093
	2	76.71	72.03	85.75	34.1108	
	3	75.94	72.06	85.47	28.9336	
2.000	1	76.87	72.89	85.41	31.7891	33.8258
	2	77.00	71.45	86.45	37.0000	
	3	76.97	72.41	86.36	32.6882	
3.000	1	76.16	70.06	86.00	38.2685	32.3644
	2	75.30	70.01	86.39	32.2955	
	3	74.70	70.45	86.47	26.5293	
4.000	1	76.42	70.46	86.12	38.0587	33.5120
	2	75.31	70.47	86.00	31.1655	
	3	75.26	70.82	85.00	31.3117	

**Table D37** %Detergency from blend polyester/cotton by using LAS surfactant at different surfactant concentration at pH5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.58	69.78	85.10	18.2768	17.6461
	2	72.6	70.41	85.41	14.6000	
	3	72.68	69.42	85.67	20.0615	
0.0400	1	74.16	72.45	86.12	12.5091	23.1186
	2	75.57	71.87	85.35	27.4481	
	3	75.85	71.89	85.36	29.3987	
0.1000	1	76.82	71.84	85.23	37.1919	26.0696
	2	75.67	71.85	85.45	28.0882	
	3	74.26	72.45	86.45	12.9286	
0.3000	1	76.34	72.48	85.34	30.0156	28.9078
	2	75.97	72.50	86.23	25.2731	
	3	76.96	72.60	86.47	31.4348	
0.5000	1	76.07	72.36	86.45	26.3307	28.3173
	2	77.08	72.25	86.15	34.7482	
	3	76.04	72.81	86.34	23.8729	

**Table D38** %Detergency from blend polyester/cotton by using LAS surfactant at different surfactant concentration at pH7.

<b>Surfactant Conc. (%w/v)</b>	<b>Sample No.</b>	<b>Soiled swatch after washing</b>	<b>Soiled swatch before washing</b>	<b>unsoiled swatch</b>	<b>%Detergency</b>	<b>Average %Detergency</b>
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.0400	1	74.93	72.45	85.94	18.3840	24.7755
	2	75.75	72.36	85.97	24.9082	
	3	76.63	72.58	85.63	31.0345	
0.1000	1	76.35	72.49	85.78	29.0444	28.9450
	2	76.93	72.56	85.48	33.8235	
	3	75.67	72.48	85.79	23.9669	
0.3000	1	77.67	73.62	85.16	35.0953	31.2386
	2	76.19	71.06	85.45	35.6498	
	3	76.25	73.42	85.74	22.9708	
0.5000	1	76.14	72.71	85.72	26.3643	31.3414
	2	77.36	73.71	85.73	30.3661	
	3	76.48	71.05	85.61	37.2940	

**Table D39** %Detergency from blend polyester/cotton by using LAS surfactant at different surfactant concentration at pH9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.80	70.31	85.59	16.2958	17.6690
	2	73.19	70.72	85.38	16.8486	
	3	70.77	67.30	84.77	19.8626	
0.0400	1	76.51	71.89	86.74	31.1111	26.2028
	2	75.4	72.14	86.53	22.6546	
	3	76.00	72.45	86.74	24.8425	
0.1000	1	77.05	72.41	86.55	32.8147	31.1946
	2	77.02	72.48	86.13	33.2601	
	3	76.17	72.36	86.21	27.5090	
0.3000	1	76.91	72.69	86.32	30.9611	33.3301
	2	77.66	73.09	86.34	34.4906	
	3	77.24	72.56	86.11	34.5387	
0.5000	1	77.13	73.00	85.49	33.0665	33.0813
	2	76.37	71.48	85.46	34.9785	
	3	76.17	71.98	85.41	31.1988	

**Table D40** %Detergency from blend polyester/cotton by using LAS surfactant at different surfactant concentration at pH11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.34	69.53	85.91	23.2601	19.6222
	2	72.20	69.69	85.80	15.5804	
	3	72.89	69.82	85.15	20.0261	
0.0400	1	74.8	70.55	84.87	29.6788	29.1134
	2	74.05	70.40	84.78	25.3825	
	3	75.09	70.60	84.51	32.2789	
0.1000	1	77.85	72.30	84.56	45.2692	36.5673
	2	75.74	72.19	85.53	26.6117	
	3	77.48	72.62	85.47	37.8210	
0.3000	1	77.36	72.83	85.46	35.8670	36.0387
	2	77.44	72.52	85.13	39.0167	
	3	77.34	72.95	86.16	33.2324	
0.5000	1	76.90	72.88	84.11	35.7970	36.5267
	2	77.75	73.10	84.35	41.3333	
	3	75.12	70.10	85.57	32.4499	

**Table D41** %Detergency from polyester by using LAS surfactant at different surfactant concentration.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	72.93	85.39	10.6742	14.1760
	2	73.97	71.37	85.76	18.0681	
	3	73.42	71.49	85.49	13.7857	
0.1000	1	76.65	72.90	85.19	30.5126	29.7756
	2	76.56	72.33	85.63	31.8045	
	3	76.30	72.94	85.38	27.0096	
0.3000	1	76.30	72.16	85.64	30.7122	31.6387
	2	76.92	72.70	85.97	31.8011	
	3	76.90	72.14	86.83	32.4030	
0.5000	1	76.11	72.65	86.92	24.2467	31.9461
	2	77.14	72.23	86.08	35.4513	
	3	77.36	72.21	86.46	36.1404	
1.0000	1	75.89	72.35	86.08	25.7830	31.9730
	2	76.67	71.75	86.86	32.5612	
	3	77.11	71.47	86.48	37.5750	

**Table D42** %Detergency from polyester by using LAS surfactant at different surfactant concentration at pH5.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	73.27	70.59	84.60	19.1292	17.3290
	2	73.13	70.96	84.75	15.7360	
	3	72.39	70.07	83.62	17.1218	
0.0400	1	75.00	71.24	85.98	25.5088	27.8143
	2	75.50	71.89	84.56	28.4925	
	3	75.90	71.84	85.63	29.4416	
0.1000	1	76.83	71.74	85.56	36.8307	28.9548
	2	75.47	71.45	87.00	25.8521	
	3	74.65	71.03	86.00	24.1817	
0.3000	1	76.31	71.85	86.00	31.5194	32.5641
	2	76.65	71.84	86.13	33.6599	
	3	76.03	71.01	86.45	32.5130	
0.5000	1	76.54	72.06	85.46	33.4328	32.5376
	2	76.43	72.54	85.32	30.4382	
	3	77.01	72.88	85.12	33.7418	



**Table D43** %Detergency from polyester by using LAS surfactant at different surfactant concentration at pH7.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing (A)	Soiled swatch before washing (B)	unsoiled swatch (C0)	%Detergency	Average %Detergency
0	1	73.72	71.61	83.00	18.5250	17.0222
	2	73.18	71.71	84.37	11.6114	
	3	74.12	71.24	85.00	20.9302	
0.0400	1	75.67	72.41	84.96	25.9761	26.2508
	2	75.79	72.48	84.96	26.5224	
	3	75.60	72.25	85.01	26.2539	
0.1000	1	76.47	72.15	85.03	33.5404	31.1652
	2	76.39	72.22	85.02	32.5781	
	3	76.17	72.83	85.03	27.3770	
0.3000	1	77.28	72.42	85.16	38.1476	34.5071
	2	76.25	71.78	85.42	32.7713	
	3	76.25	71.64	85.78	32.6025	
0.5000	1	76.30	71.39	85.74	34.2160	34.8611
	2	76.47	71.40	85.23	36.6594	
	3	76.02	71.22	85.46	33.7079	

**Table D44** %Detergency from polyester by using LAS surfactant at different surfactant concentration at pH9.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	72.56	70.89	84.99	11.8440	18.2917
	2	73.84	70.86	84.20	22.3388	
	3	73.46	70.65	84.23	20.6922	
0.0400	1	76.14	71.79	85.14	32.5843	28.6650
	2	75.61	71.65	85.25	29.1176	
	3	75.02	71.67	85.46	24.2930	
0.1000	1	75.86	71.25	85.37	32.6487	31.5156
	2	77.01	72.99	85.19	32.9508	
	3	75.96	72.22	85.14	28.9474	
0.3000	1	76.94	72.28	85.74	34.6211	34.6615
	2	76.84	72.37	85.36	34.4111	
	3	77.09	72.34	85.93	34.9522	
0.5000	1	77.03	72.78	85.13	34.4130	34.3395
	2	76.87	72.36	85.23	35.0427	
	3	76.47	72.08	85.16	33.5627	

**Table D45** %Detergency from polyester by using LAS surfactant at different surfactant concentration at pH11.

Surfactant Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.32	71.53	85.85	19.4832	20.0329
	2	75.27	71.59	85.83	25.8427	
	3	73.90	71.95	85.15	14.7727	
0.0400	1	75.71	71.10	85.42	32.1927	29.2882
	2	75.56	71.38	85.32	29.9857	
	3	74.78	71.13	85.34	25.6861	
0.1000	1	77.08	71.77	85.32	39.1882	36.4668
	2	75.40	71.03	86.56	28.1391	
	3	77.92	71.71	86.47	42.0732	
0.3000	1	76.47	71.69	86.71	31.8242	37.5791
	2	77.13	71.27	85.98	39.8368	
	3	77.71	71.68	86.36	41.0763	
0.5000	1	77.12	71.34	86.67	37.7038	37.8833
	2	77.05	71.46	86.48	37.2170	
	3	77.08	71.29	86.24	38.7291	

**Table D46** %Detergency from cotton by using commercial detergent surfactant at different surfactant concentration.

Detergent Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	78.48	76.89	88.14	14.1333	10.1429
	2	75.64	74.80	87.65	6.5370	
	3	79.20	78.23	88.17	9.7586	
0.0570	1	81.37	76.70	89.01	37.9366	36.0404
	2	82.28	78.06	88.32	41.1306	
	3	79.64	75.77	89.09	29.0541	
0.1000	1	82.09	77.35	87.74	45.6208	37.3541
	2	81.26	77.91	87.61	34.5361	
	3	79.89	75.57	89.11	31.9055	
0.4850	1	82.63	77.16	88.08	50.0916	53.0652
	2	82.82	76.48	87.95	55.2746	
	3	83.60	78.68	87.82	53.8293	
0.9940	1	81.61	75.88	87.36	49.9129	53.0761
	2	82.97	77.22	87.21	57.5576	
	3	82.62	77.32	87.56	51.7578	
2.5400	1	83.89	78.53	87.72	58.3243	53.2645
	2	81.64	76.12	87.83	47.1392	
	3	82.69	76.73	87.70	54.3300	
3.6350	1	82.01	76.45	85.90	58.8360	55.1046
	2	84.05	78.03	88.34	58.3899	
	3	81.42	75.51	87.80	48.0879	

**Table D47** %Detergency from blend polyester/cotton by using commercial detergent surfactant at different surfactant concentration.

Detergent Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.26	71.42	85.39	20.3293	17.0793
	2	73.97	71.71	84.97	17.0437	
	3	73.42	71.49	85.41	13.8649	
0.0500	1	75.78	73.00	85.34	22.5284	34.5410
	2	78.12	72.14	85.67	44.1981	
	3	77.53	73.25	84.85	36.8966	
0.1000	1	77.98	72.10	87.01	39.4366	39.9918
	2	78.97	73.10	86.50	43.8060	
	3	78.31	74.24	85.32	36.7329	
0.5000	1	78.89	72.14	85.14	51.9231	50.9974
	2	78.64	71.06	85.32	53.1557	
	3	78.32	71.89	85.31	47.9136	
1.0000	1	79.12	71.65	85.31	54.6852	50.4017
	2	78.25	71.85	85.35	47.4074	
	3	78.01	71.37	84.89	49.1124	
2.5000	1	79.61	71.54	84.67	61.4623	50.5143
	2	79.12	72.89	84.53	53.5223	
	3	77.27	73.00	84.68	36.5582	
3.6500	1	79.24	71.04	85.13	58.1973	50.9601
	2	77.32	69.78	85.51	47.9339	
	3	77.08	69.89	85.27	46.7490	

**Table D48** %Detergency from polyester by using commercial detergent surfactant at different surfactant concentration.

Detergent Conc. (%w/v)	Sample No.	Soiled swatch after washing	Soiled swatch before washing	unsoiled swatch	%Detergency	Average %Detergency
0	1	74.16	71.67	84.39	19.5755	17.4650
	2	73.17	71.15	84.37	15.2799	
	3	74.02	71.81	84.41	17.5397	
0.0500	1	75.88	71.83	84.32	32.4259	35.0458
	2	76.12	71.49	84.13	36.6297	
	3	75.73	71.31	83.56	36.0816	
0.1000	1	76.78	71.77	84.59	39.0796	40.1954
	2	76.87	71.98	84.74	38.3229	
	3	77.61	72.32	84.57	43.1837	
0.5000	1	78.19	72.66	85.15	44.2754	50.2836
	2	78.74	72.39	84.57	52.1346	
	3	78.82	72.20	84.36	54.4408	
1.0000	1	79.22	72.77	84.52	54.8936	49.5273
	2	77.25	71.32	83.32	49.4167	
	3	77.01	71.60	83.82	44.2717	
2.5000	1	78.31	71.85	83.73	54.3771	51.5451
	2	77.12	71.59	84.23	43.7500	
	3	78.57	71.32	84.15	56.5082	
3.6500	1	78.24	71.04	83.89	56.0311	51.1344
	2	75.32	69.78	83.39	40.7054	
	3	78.68	71.20	84.40	56.6667	

## Appendix E Contact angle Measurement

**Table E1** Data for contact angle of MES on blended cotton/polyester fabric at 30°C.

MES Concentration (% w/v)	pH 5	pH 7	pH 9	pH 11
	Contact angle (degree)			
0.001	51.02	51.56	53.31	53.18
0.002	49.65	50.53	51.02	51.63
0.005	43.57	44.26	45.37	46.87
0.008	30.25	31.13	32.14	32.44
0.011	23.45	24.49	25.62	26.46
0.014	19.63	20.07	21.45	22.65
0.017	19.59	20.66	21.72	22.56
0.02	19.72	20.58	21.67	22.13
0.05	19.67	19.79	21.09	21.07
0.1	18.74	18.89	19.87	20.26
0.2	18.63	18.71	19.37	19.56

**Table E2** Data for contact angle of MES on polyester fabric at 30°C.

MES Concentration (% w/v)	pH 5	pH 7	pH 9	pH 11
	Contact angle (degree)			
0.001	51.72	52.26	53.07	53.89
0.002	50.34	51.23	52.73	53.24
0.005	44.26	44.87	46.07	47.58
0.008	30.74	31.86	32.82	33.15
0.011	24.15	25.16	26.31	27.27
0.014	20.32	20.77	22.16	23.26
0.017	20.27	21.39	22.43	23.27
0.020	20.43	21.27	22.38	22.84
0.050	20.36	20.53	21.83	21.78
0.100	19.46	19.64	20.59	21.07
0.200	19.37	19.42	20.08	20.47



**Table E3** Data for contact angle of AE on blended cotton/polyester fabric at 30°C.

AE Concentration (% w/v)	pH 5	pH 7	pH 9	pH 11
	Contact angle (degree)			
0.002	51.14	52.02	65.51	67.13
0.005	45.06	45.45	46.89	48.37
0.008	41.76	42.60	43.63	43.94
0.011	34.26	36.47	39.08	40.36
0.014	32.84	33.35	33.46	34.07
0.017	30.28	30.77	31.22	32.11
0.020	28.55	28.74	29.08	29.74
0.050	24.96	25.92	27.12	27.96
0.100	21.11	21.53	22.93	24.14
0.200	21.08	22.13	23.22	24.06
0.300	21.23	22.07	23.18	23.63
0.400	21.22	21.76	22.87	23.54

**Table E4** Data for contact angle of AE on polyester fabric at 30°C.

AE Concentration (% w/v)	pH 5	pH 7	pH 9	pH 11
	Contact angle (degree)			
0.002	61.47	62.83	65.34	65.45
0.005	52.59	54.94	57.32	60.06
0.008	47.45	48.15	48.69	51.23
0.011	42.28	44.24	45.99	46.25
0.014	40.67	40.91	41.43	41.71
0.017	36.36	37.68	38.25	39.55
0.02	31.88	34.14	34.57	34.96
0.05	29.34	29.62	29.61	29.98
0.1	23.94	24.78	25.62	26.42
0.2	23.13	24.05	24.95	25.87
0.3	23.82	24.14	24.81	26.35
0.4	23.52	24.06	24.09	25.76

**CIRRICULUM VITAE**

**Name:** Mr. Phumphattanapong Sang-in

**Date of Birth:** January 11, 1984

**Nationality:** Thai

**University Education:**

2003-2007 Bachelor Degree of Engineering in Petrochemical and Polymeric Material, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakornprathom, Thailand.

**Working Experience:**

2003	Position:	Student trainee
	Company name:	Thai Oil Public Company Limited