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APPENDIX A

Results from Varying Concentrations of Acetaldehyde and Antipolymerants

Table A-1 Relationship between the absorbance of the yellow color of the aldol product and time at 25°C in 1%wt NaOH solution.

Time (min)	Acetaldehyde : NaOH			
	1:1	0.75:1	0.5:1	0.25:1
0	0	0	0	0
5	0.001	0.001	0	0
10	0.003	0.003	0.001	0.001
15	0.014	0.010	0.003	0.002
20	0.035	0.021	0.009	0.003
25	0.066	0.037	0.016	0.004
30	0.108	0.055	0.025	0.005
35	0.162	0.078	0.036	0.007
40	0.245	0.100	0.048	0.009
45	0.359	0.126	0.061	0.012
50	0.497	0.155	0.074	0.015
55	0.678	0.189	0.087	0.018
60	0.845	0.223	0.100	0.021

Table A-2 Relationship between the absorbance of the yellow color of the aldol product and time at 35°C in 1%wt of NaOH solution.

Time (min)	Acetaldehyde : NaOH			
	1:1	0.75:1	0.5:1	0.25:1
0	0	0	0	0
5	0.005	0.003	0.003	0.002
10	0.033	0.019	0.011	0.004
15	0.096	0.057	0.032	0.008
20	0.173	0.107	0.058	0.016
25	0.283	0.165	0.091	0.026
30	0.455	0.242	0.124	0.037
35	0.712	0.371	0.161	0.049
40	1.091	0.543	0.202	0.063
45	1.444	0.747	0.253	0.076
50	1.774	0.958	0.319	0.089
55	1.992	1.168	0.395	0.103
60	1.999	1.339	0.478	0.118

Table A-3 Relationship between the absorbance of the yellow color of the aldol product and time at 50°C in 1%wt of NaOH solution.

Time (min)	Acetaldehyde : NaOH			
	1:1	0.75:1	0.5:1	0.25:1
0	0	0	0	0
5	0.044	0.022	0.021	0.006
10	0.219	0.166	0.121	0.033
15	0.705	0.499	0.260	0.072
20	1.595	1.232	0.564	0.114
25	1.999	1.936	1.072	0.160
30	-	1.999	1.543	0.213
35	-	-	1.900	0.296
40	-	-	1.999	0.403
45	-	-	-	0.535
50	-	-	-	0.679
55	-	-	-	0.847
60	-	-	-	1.024

Table A-4 Relationship between the absorbance of the yellow color of the aldol product from the addition of antipolymerants and time at 25°C in 1%wt NaOH solution with concentration ratio of acetaldehyde to NaOH 1:1.

Time (min)	Hydroxylamine HCl : Acetaldehyde			Hydroxylamine Sulfate : Acetaldehyde		
	1:1	0.5:1	0.25:1	1:1	0.5:1	0.25:1
0	0	0	0	0	0	0
5	0	0	0.001	0	0	0
10	0	0	0.008	0	0	0.000
15	0	0	0.027	0	0	0.001
20	0	0.001	0.049	0	0	0.003
25	0	0.002	0.071	0	0	0.006
30	0	0.003	0.091	0	0	0.010
35	0	0.005	0.110	0	0	0.015
40	0	0.007	0.128	0	0	0.020
45	0	0.010	0.145	0	0	0.025
50	0	0.013	0.160	0	0	0.030
55	0	0.016	0.175	0	0	0.036
60	0	0.019	0.187	0	0	0.042

Table A-5 Relationship between the absorbance of the yellow color of the aldol product from the addition of antipolymerants and time at 35°C in 1%wt NaOH solution with concentration ratio of acetaldehyde to NaOH 1:1.

Time (min)	Hydroxylamine HCl : Acetaldehyde			Hydroxylamine Sulfate : Acetaldehyde		
	1:1	0.5:1	0.25:1	1:1	0.5:1	0.25:1
0	0	0	0	0	0	0
5	0	0	0.007	0	0	0
10	0	0	0.088	0	0	0.003
15	0	0.005	0.149	0	0	0.013
20	0	0.013	0.194	0	0	0.025
25	0	0.024	0.229	0	0	0.039
30	0	0.035	0.264	0	0	0.056
35	0	0.049	0.294	0	0	0.074
40	0	0.063	0.325	0	0	0.091
45	0	0.077	0.355	0	0	0.108
50	0	0.093	0.384	0	0	0.125
55	0	0.108	0.413	0	0	0.143
60	0	0.123	0.443	0	0	0.154

Table A-6 Relationship between the absorbance of the yellow color of the aldol product from the addition of antipolymerants and time at 50°C in 1%wt NaOH solution with concentration ratio of acetaldehyde to NaOH 1:1.

Time (min)	Hydroxylamine HCl : Acetaldehyde			Hydroxylamine Sulfate : Acetaldehyde		
	1:1	0.5:1	0.25:1	1:1	0.5:1	0.25:1
0	0	0	0	0	0	0
5	0	0.008	0.118	0	0	0.009
10	0	0.061	0.235	0	0	0.072
15	0	0.119	0.308	0	0	0.142
20	0	0.154	0.379	0	0	0.183
25	0	0.177	0.453	0	0	0.203
30	0	0.190	0.529	0	0	0.218
35	0	0.205	0.625	0	0	0.231
40	0	0.223	0.738	0	0	0.244
45	0	0.237	0.865	0	0	0.256
50	0	0.253	1.000	0	0	0.268
55	0	0.268	1.140	0	0	0.280
60	0	0.283	1.270	0	0	0.292

Table A-7 Relationship between the absorbance of the yellow color of the aldol product from the addition of sodium sulfate and time at 25°C in 1%wt NaOH solution with concentration ratio of acetaldehyde to NaOH 1:1.

Time (min)	No antipolymerant	Sodium Sulfate : Acetaldehyde (by mole)	
		1:1	0.5:1
0	0.000	0	0
5	0.001	0.001	0.001
10	0.003	0.005	0.005
15	0.014	0.020	0.020
20	0.035	0.046	0.046
25	0.066	0.085	0.080
30	0.108	0.166	0.128
35	0.162	0.310	0.214
40	0.245	0.501	0.340
45	0.359	0.690	0.505
50	0.497	0.880	0.678
55	0.678	1.035	0.845
60	0.845	1.153	0.985

APPENDIX B

Reduction Efficiency by Adding Antipolymerants

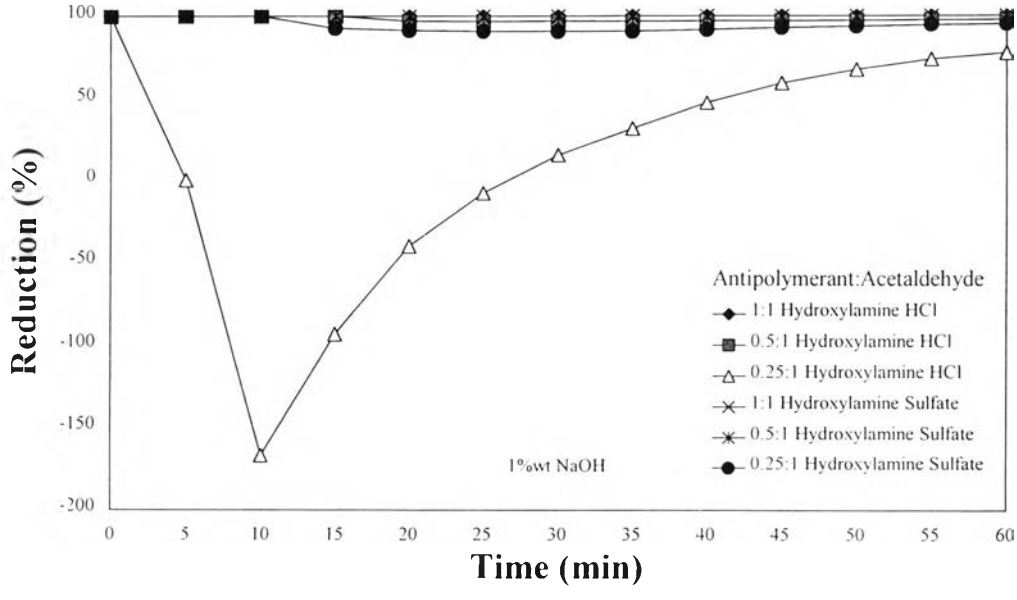

Figure B-1 Reduction efficiency of the antipolymerants at 25°C.

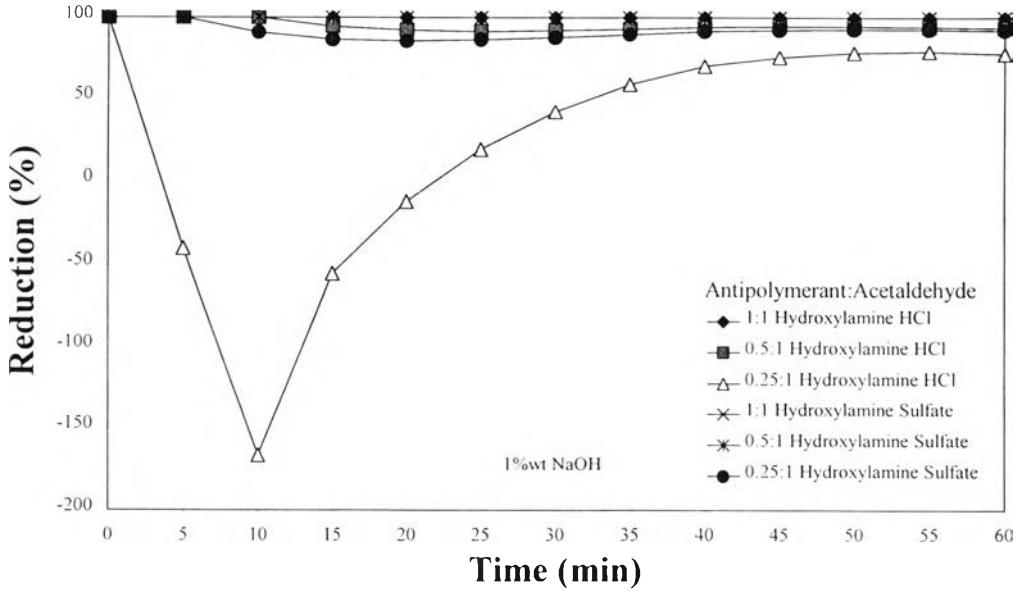

Figure B-2 Reduction efficiency of the antipolymerants at 35°C.

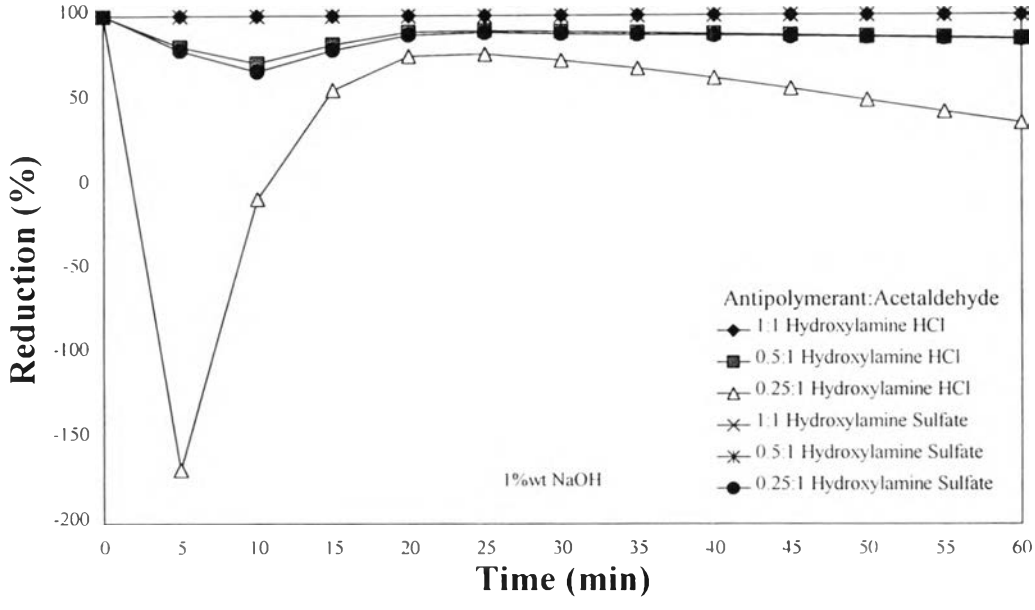

Figure B-3 Reduction efficiency of the antipolymerants at 50°C.

APPENDIX C

Aldol Condensation Empirical Model

Model:

$$\text{Absorbance} = k_2 e^{k_1 T(K)} \qquad \text{(C-1)}$$

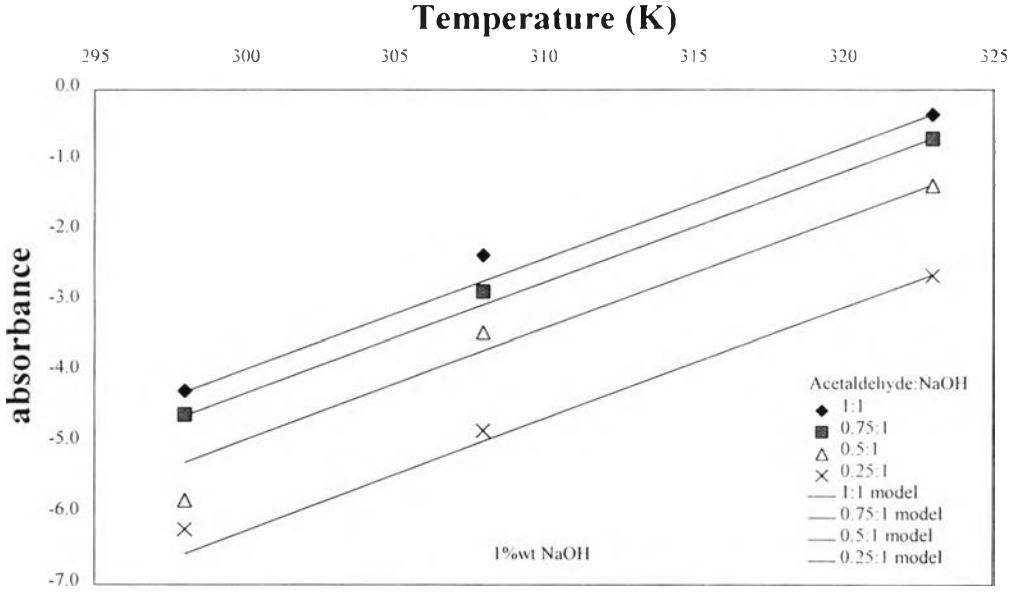

Figure C-1 Relationship between absorbance of the yellow color of the aldol product and temperature(K) in 1%wt NaOH solution at 15 minutes; k_1 = 0.157 (◆, ■, ▲, ×), k_2 = -51.174 (◆), -51.513 (■), -52.166 (▲), -53.448 (×).

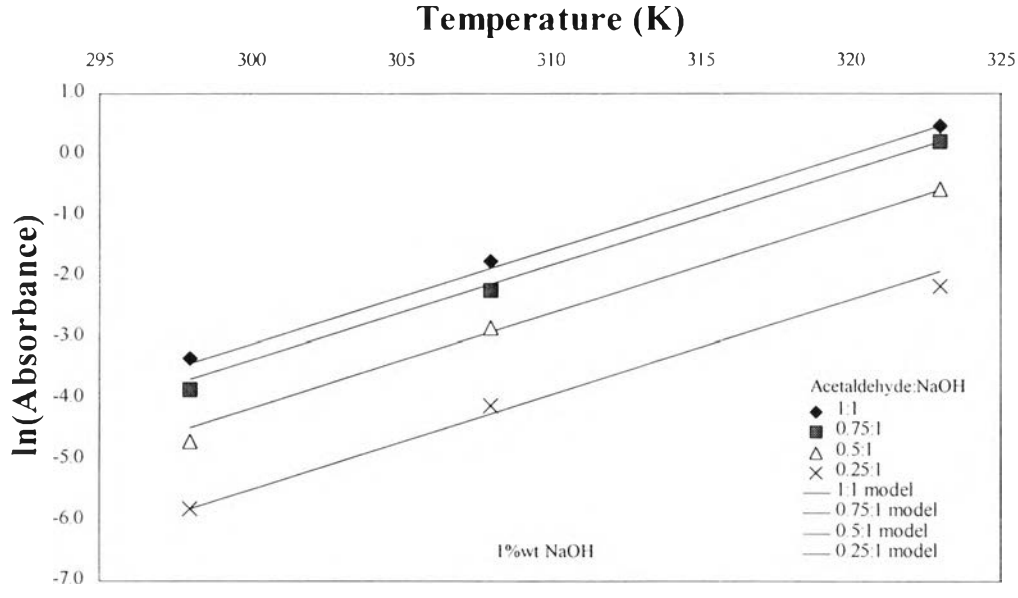

Figure C-2 Relationship between ln(absorbance) of the yellow color of the aldol product and temperature(K) in 1%wt NaOH solution at 20 minutes; k_1 = 0.156 (◆, ■, ▲, ×), k_2 = -49.929 (◆), -50.192 (■), -50.984 (▲), -52.313 (×).

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