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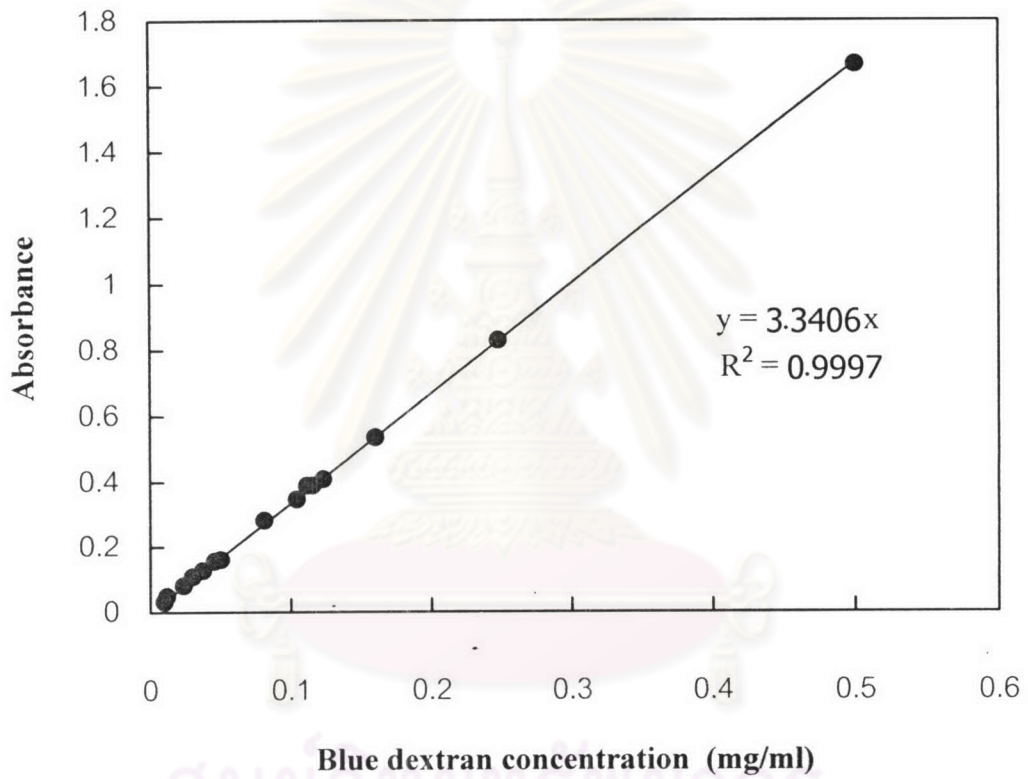
APPENDICES

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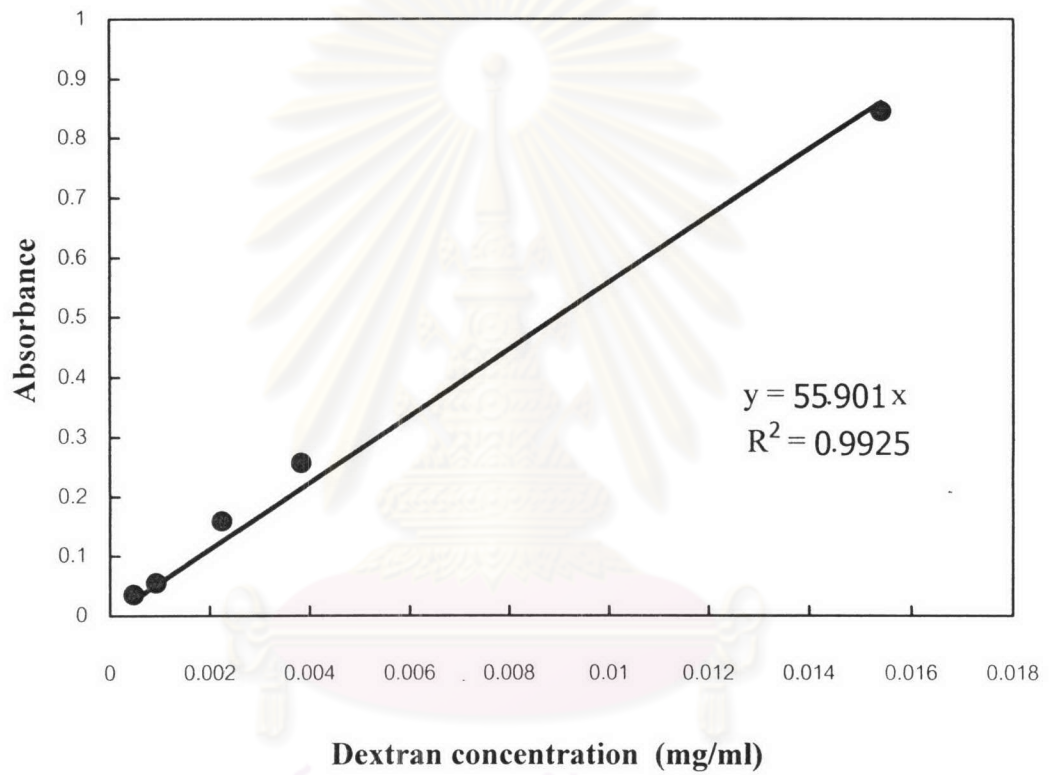
APPENDIX A

STANDARD CURVES

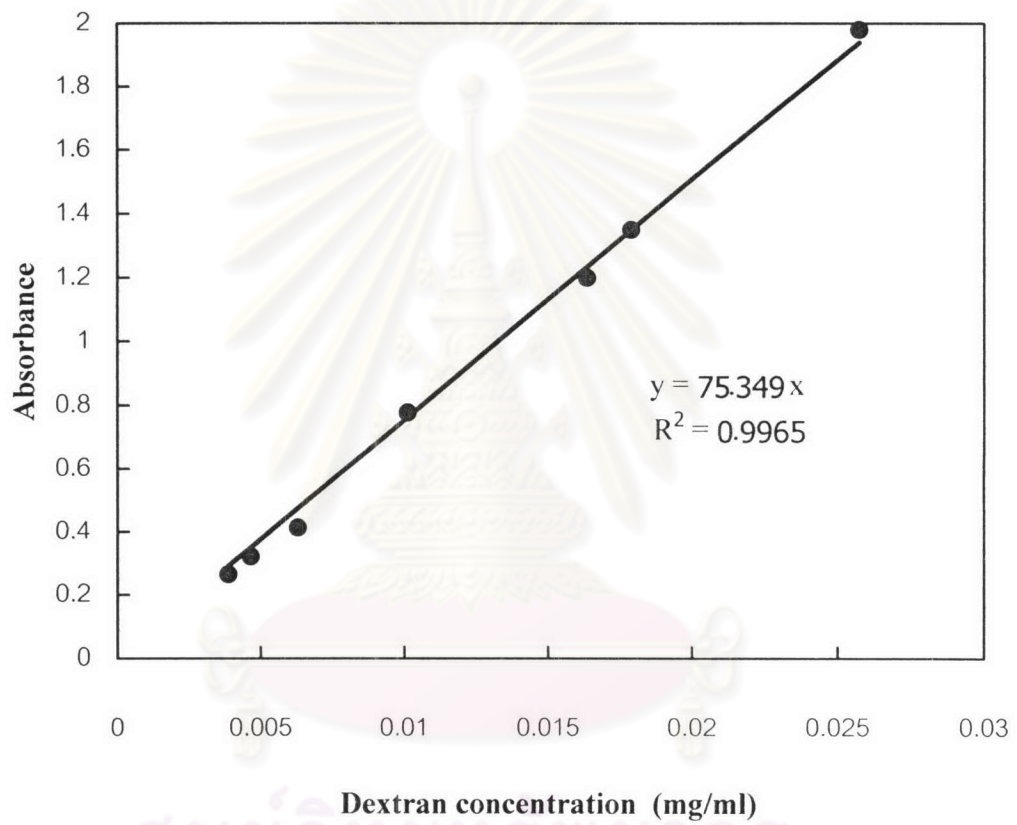
Blue dextran standard curve



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จุฬาลงกรณ์มหาวิทยาลัย

Dextran standard curve (M.W. 9,000)

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Dextran standard curve (M.W. 100,000)

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APPENDIX B

RAW DATA

Table B.1 LiCl

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	Cs' (%w/w)
0.50	200	3	2.08	100.0	59.2	42.6	0.75	0.11
0.50	200	3	5.00	100.0	61.5	41.0	0.78	0.03
0.50	200	3	3.08	100.0	58.6	43.5	0.80	0.05
0.50	200	3	2.00	120.0	71.7	50.5	0.72	0.16
0.50	600	3	5.00	100.0	58.0	43.9	0.83	0.03
0.50	600	3	3.02	100.0	59.2	42.6	0.79	0.04
0.50	1000	3	2.00	200.0	152.0	50.2	0.61	0.07
2.50	200	3	2.00	100.0	63.0	37.0	2.77	1.02
2.50	200	3	2.13	110.0	67.0	43.0	2.83	1.18
2.50	200	3	3.25	100.0	72.0	28.9	2.99	0.88
2.50	600	3	3.00	100.0	78.9	23.4	2.77	0.63
2.50	600	3	2.33	120.0	93.0	27.0	2.52	0.59
2.50	600	3	3.00	100.0	77.6	23.6	2.87	0.75
2.50	600	3	3.00	100.0	74.0	26.9	2.97	0.69
2.50	1000	3	3.75	150.0	123.5	25.8	2.80	0.66
2.50	1000	3	2.25	200.0	180.0	22.2	2.61	0.74
4.00	200	3	3.77	110.0	79.0	30.0	4.44	2.20
4.00	200	3	1.77	120.0	94.0	28.0	4.29	2.30
4.00	600	3	5.18	100.0	76.0	20.0	4.61	1.84
4.00	600	3	3.28	110.0	88.0	24.0	4.54	1.63
4.00	1000	3	4.46	120.0	107.0	12.0	4.34	1.19
4.00	1000	3	2.53	120.0	103.0	19.0	4.30	1.69
4.00	1000	3	1.47	120.0	106.0	15.0	4.16	1.73

C_0 : Initial concentration

N_r : Stirring speed

V_0 : Initial solution volume

V_L : Solution volume in liquid phase

V_{sa} : Solution volume in ice phase

C_L : Solute concentration in liquid phase

Cs' : Solute concentration in ice phase (including ice lining)

Table B.2 NaCl

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	$C_{s'}$ (%w/w)
0.5	200	3	1.92	100.0	48.4	53.3	0.86	0.11
0.5	200	3	2.25	100.0	51.0	46.0	1.16	0.13
0.5	200	3	1.67	120.0	81.0	39.0	0.83	0.11
0.5	200	3	2.00	100.0	61.8	40.0	0.69	0.05
0.5	600	3	2.00	120.0	88.9	33.5	0.65	0.02
0.5	600	3	1.39	120.0	94.8	26.7	0.60	0.04
0.5	600	3	2.00	150.0	110.4	41.4	0.65	0.03
0.5	600	3	2.58	120.0	74.0	46.0	0.97	0.04
0.5	600	3	1.43	120.0	89.0	30.0	0.79	0.06
0.5	1000	3	2.50	180.0	153.1	29.1	0.57	0.04
0.5	1000	3	2.00	200.0	171.3	30.5	0.57	0.03
0.5	1000	3	5.50	150.0	124.3	28.7	0.60	0.02
2.5	200	3	2.00	200.0	168.6	31.1	2.73	0.91
2.5	200	3	2.50	180.0	150.0	30.5	2.77	0.75
2.5	600	3	1.29	110.0	81.0	30.0	3.84	0.86
2.5	600	3	4.10	100.0	62.0	38.0	4.44	0.45
2.5	600	3	2.35	100.0	66.0	34.0	4.28	0.75
2.5	600	3	2.83	120.0	96.5	26.0	2.91	0.56
2.5	1000	3	4.50	170.0	129.8	42.4	3.07	0.40
2.5	1000	3	2.00	200.0	177.4	24.0	2.69	0.60
2.5	1000	3	5.25	150.0	133.8	19.2	2.72	0.34
2.5	1000	3	2.50	180.0	157.7	24.3	2.73	0.54
10.0	200	3	3.00	140.0	101.5	40.6	11.41	4.88
10.0	200	3	4.50	100.0	77.9	24.4	11.17	3.45
10.0	1000	3	6.00	150.0	130.2	21.6	10.93	2.95

Table B.3 KCl

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_s' (%w/w)
0.5	200	3	5.00	100.0	55.3	46.6	0.85	0.01
0.5	200	3	2.00	100.0	58.5	42.5	0.79	0.03
0.5	200	3	2.75	100.0	59.1	42.7	0.79	0.03
0.5	600	3	3.67	100.0	66.0	34.0	0.75	0.00
0.5	600	3	2.08	110.0	73.0	37.0	0.75	0.02
0.5	1000	3	5.00	150.0	131.3	21.4	0.56	0.00
0.5	1000	3	2.03	200.0	173.2	29.5	0.56	0.02
2.5	200	3	2.00	100.0	64.9	37.3	3.33	0.72
2.5	200	3	2.00	100.0	65.0	36.9	3.35	0.82
2.5	200	3	2.00	100.0	56.0	44.0	3.59	1.02
2.5	200	3	1.97	100.0	45.0	57.0	3.93	1.23
2.5	600	3	2.67	110.0	87.0	24.0	3.02	0.25
2.5	600	3	2.27	120.0	70.0	32.0	3.30	0.44
2.5	600	3	1.67	110.0	78.0	32.0	3.32	0.57
2.5	1000	3	5.50	150.0	129.0	23.0	2.88	0.26
2.5	1000	3	2.00	180.0	154.6	27.2	2.79	0.41
2.5	1000	3	3.27	120.0	98.0	24.0	2.97	0.19
2.5	1000	3	2.07	120.0	96.0	24.0	3.01	0.28
2.5	1000	3	1.35	120.0	100.0	20.0	2.91	0.34
10.0	200	3	2.00	100.0	67.0	35.5	12.44	4.27
10.0	1000	3	5.50	150.0	124.6	29.4	11.46	1.98
10.0	1000	3	2.00	200.0	161.4	41.6	11.28	3.57
10.0	1000	3	2.50	180.0	142.3	40.5	11.48	3.44

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Table B.4 CsCl

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	Cs' (%w/w)
0.5	200	3	2.0	100.0	55.8	45.7	0.86	0.01
0.5	200	3	5.0	100.0	51.4	49.4	0.94	0.01
0.5	600	3	1.8	120.0	91.0	32.0	0.76	0.01
2.5	200	3	3.0	100.0	69.4	31.9	3.44	0.23
2.5	200	3	3.0	100.0	65.4	36.1	3.64	0.17
2.5	200	3	2.0	120.0	72.0	50.0	3.79	0.81
2.5	200	3	2.0	120.0	83.0	38.0	3.58	0.32
2.5	600	3	3.0	100.0	71.6	30.8	3.27	0.19
2.5	600	3	2.0	120.0	61.5	54.0	4.08	0.51
2.5	600	3	2.0	120.0	82.0	40.0	3.55	0.41
2.5	600	3	3.9	120.0	82.0	37.0	3.58	0.14
10.0	200	3	2.5	120.0	79.0	42.0	13.70	4.89
10.0	200	3	1.8	120.0	88.0	32.5	12.14	4.80
10.0	600	3	3.0	100.0	71.0	29.0	12.78	1.94
10.0	600	3	3.0	120.0	76.0	45.0	15.12	2.83
10.0	600	3	1.4	120.0	91.0	29.0	11.78	3.58
10.0	1000	3	2.5	180.0	141.7	41.2	12.03	2.38
10.0	1000	3	2.0	200.0	159.6	43.5	11.73	2.85
10.0	1000	3	5.7	150.0	107.0	45.5	13.29	1.30
10.0	1000	3	5.2	120.0	95.0	23.5	13.09	0.85
10.0	1000	3	1.2	120.0	99.0	20.5	11.31	1.91

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Table B.5 Ribose

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_s' (%w/w)
2.5	200	3	6.17	100.0	41.6	60.4	4.90	0.20
2.5	200	3	3.52	100.0	44.7	57.0	4.20	0.70
2.5	200	3	2.02	100.0	55.1	46.3	3.50	0.90
2.5	600	3	2.30	110.0	89.0	24.0	2.60	0.10
2.5	600	3	1.72	140.0	116.0	27.0	2.60	0.20
2.5	1000	3	2.00	98.0	78.0	21.2	2.80	0.20
2.5	1000	3	2.00	170.0	150.9	20.5	2.70	0.10
5.0	200	3	2.63	120.0	64.0	55.0	6.50	2.50
5.0	600	3	1.63	130.0	81.0	48.0	6.50	2.00
5.0	600	3	4.33	120.0	73.0	46.0	6.70	0.70
5.0	600	3	1.63	130.0	81.0	48.0	6.50	2.00
5.0	1000	3	3.22	120.0	82.0	35.0	6.00	0.60
5.0	1000	3	1.75	130.0	92.0	37.0	5.80	0.70
10.0	200	3	2.45	120.0	84.0	37.0	10.50	4.60
10.0	600	3	8.15	120.0	88.0	33.0	10.70	3.00
10.0	600	3	2.00	120.0	83.0	39.0	10.20	3.50
10.0	1000	3	5.15	140.0	114.0	27.0	10.60	1.30
10.0	1000	3	1.77	130.0	102.0	30.0	10.20	3.00
10.0	1000	3	2.42	130.0	102.0	30.0	10.50	2.80

ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Table B.6 Glucose

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	Cs' (%w/w)
2.5	200	3	1.67	120.0	58.0	64.0	3.60	1.00
2.5	200	3	2.17	150.0	109.0	43.0	2.90	0.60
2.5	200	3	2.25	100.0	58.0	42.0	3.50	1.00
2.5	600	3	3.27	160.0	48.0	72.0	5.00	0.75
2.5	600	3	2.17	135.0	92.0	45.0	3.50	0.40
2.5	1000	3	2.50	150.0	132.0	21.0	2.80	0.25
2.5	1000	3	1.75	120.0	90.0	31.0	2.70	0.40
5.0	200	3	2.00	120.0	81.0	40.0	6.10	2.20
5.0	200	3	1.32	110.0	65.0	35.0	6.00	2.70
5.0	600	3	4.83	120.0	80.0	43.0	7.00	0.90
5.0	600	3	2.28	120.0	80.0	40.0	6.50	1.50
5.0	600	3	1.60	120.0	82.0	38.0	6.50	1.60
5.0	1000	3	1.33	120.0	87.0	33.0	6.20	1.50
5.0	1000	3	2.55	120.0	85.0	33.0	6.50	1.00
5.0	1000	3	5.00	120.0	70.0	52.0	7.60	0.90
10.0	200	3	1.48	110.0	74.0	37.0	12.50	6.10
10.0	200	3	2.20	120.0	85.0	36.0	13.20	5.50
10.0	600	3	2.00	110.0	61.0	50.0	15.00	5.00
10.0	600	3	3.00	120.0	71.5	50.0	14.30	4.30
10.0	600	3	3.27	110.0	79.0	32.0	13.40	3.50
10.0	1000	3	1.38	130.0	111.0	22.0	11.70	3.90
10.0	1000	3	2.92	130.0	100.0	31.0	12.60	3.00
10.0	1000	3	3.67	120.0	105.0	16.0	11.80	2.10
20.0	200	3	1.50	110.0	77.0	32.0	22.00	12.00
20.0	200	3	1.23	120.0	96.0	24.0	20.80	7.90
20.0	600	3	4.60	120.0	91.0	30.0	23.00	7.30
20.0	600	3	2.00	120.0	91.0	30.0	22.70	8.00
20.0	600	3	1.23	110.0	89.0	22.0	21.50	9.50
20.0	1000	3	1.37	120.0	94.0	25.0	22.00	8.40
20.0	1000	3	2.00	120.0	91.0	31.0	22.40	8.00
20.0	1000	3	4.28	110.0	88.0	24.0	22.50	6.80

Table B.7 Fructose

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_1 (%w/w)
2.5	200	3	2.10	120.0	61.0	59.0	3.50	0.60
2.5	200	3	2.00	120.0	101.0	21.0	2.60	0.10
2.5	600	3	3.00	150.0	86.0	63.5	3.70	0.50
2.5	600	3	3.17	120.0	103.8	18.0	2.80	0.10
2.5	600	3	2.00	110.0	90.5	20.0	2.70	0.10
5.0	200	3	2.00	150.0	122.0	31.0	5.50	1.60
5.0	200	3	2.00	150.0	129.0	22.0	5.20	0.90
5.0	200	3	2.00	150.0	108.0	43.0	5.60	2.30
5.0	200	3	2.00	150.0	100.0	50.0	5.50	2.50
5.0	600	3	2.00	150.0	135.0	18.0	5.20	0.50
5.0	600	3	2.00	150.0	129.0	22.0	5.50	0.60
5.0	600	3	2.00	150.0	107.0	45.0	6.40	1.50
5.0	600	3	2.00	150.0	98.0	54.0	6.70	2.00
5.0	1000	3	2.00	150.0	140.0	13.0	4.90	0.60
5.0	1000	3	2.00	150.0	129.0	22.0	5.30	0.50
5.0	1000	3	2.00	150.0	113.0	36.0	5.60	0.80
5.0	1000	3	2.00	150.0	109.0	41.0	5.60	1.20
10.0	200	3	2.02	140.0	97.0	45.0	11.00	5.50
10.0	200	3	2.17	120.0	81.0	40.0	12.60	5.60
10.0	600	3	3.73	110.0	82.0	31.0	13.30	2.90
10.0	600	3	3.58	120.0	81.0	37.0	13.30	3.90
10.0	600	3	1.57	120.0	81.0	40.0	13.10	4.50
10.0	1000	3	4.92	120.0	90.0	33.0	14.30	2.50
10.0	1000	3	2.58	130.0	85.0	36.0	13.30	3.10
10.0	1000	3	1.50	120.0	91.0	29.0	12.40	3.90
20.0	200	3	2.33	110.0	64.0	46.0	26.50	15.10
20.0	200	3	1.53	110.0	65.0	44.0	26.00	16.00
20.0	600	3	4.55	120.0	93.0	27.0	25.40	9.50
20.0	600	3	2.53	120.0	84.0	37.0	26.80	10.90
20.0	600	3	2.22	120.0	72.0	48.0	27.50	12.50
20.0	1000	3	5.77	120.0	88.0	34.0	26.50	8.50
20.0	1000	3	2.07	120.0	99.0	22.0	24.60	9.70
20.0	1000	3	1.50	120.0	103.0	19.0	24.10	10.90

Table B.8 Sucrose

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	Cs' (%w/w)
2.5	200	3	1.50	120.0	98.0	31.0	3.10	0.50
2.5	200	3	3.08	120.0	58.0	63.0	4.00	0.60
2.5	600	3	1.68	120.0	85.0	36.0	3.20	0.50
2.5	1000	3	2.17	120.0	90.0	32.0	3.20	0.20
2.5	1000	3	3.50	120.0	116.0	7.0	2.70	0.10
5.0	200	3	2.02	120.0	76.0	44.0	6.20	2.20
5.0	200	3	1.47	110.0	63.0	49.0	6.00	2.60
5.0	600	3	6.20	120.0	55.0	65.0	9.00	0.90
5.0	600	3	2.52	120.0	78.0	41.0	6.50	1.00
5.0	600	3	1.37	120.0	81.0	40.0	6.40	1.50
5.0	1000	3	4.48	130.0	86.0	44.0	6.50	0.50
5.0	1000	3	2.88	120.0	70.0	53.0	7.30	0.90
5.0	1000	3	1.42	120.0	79.0	43.0	6.90	1.00
10.0	200	3	1.33	110.0	70.0	40.0	11.70	6.00
10.0	200	3	2.02	110.0	53.0	41.0	12.70	5.70
10.0	600	3	1.67	120.0	88.0	32.0	11.90	3.50
10.0	600	3	2.42	110.0	68.0	42.0	13.50	3.50
10.0	600	3	4.58	150.0	108.0	36.0	13.00	1.75
10.0	1000	3	1.55	130.0	103.0	27.0	11.50	2.50
10.0	1000	3	2.25	150.0	125.0	27.0	11.50	2.60
10.0	1000	3	4.38	150.0	126.0	24.0	11.50	2.80
20.0	200	3	1.58	90.0	64.0	28.0	22.50	11.70
20.0	200	3	5.93	120.0	70.0	52.0	24.80	11.70
20.0	200	3	0.83	70.0	44.0	28.0	22.60	13.30
20.0	600	3	3.80	120.0	93.0	27.0	22.00	7.20
20.0	600	3	1.58	100.0	71.0	31.0	23.20	9.60
20.0	600	3	1.02	80.0	58.0	24.0	22.20	9.10
20.0	1000	3	4.60	120.0	93.0	22.0	22.80	6.90
20.0	1000	3	1.85	120.0	89.0	31.0	23.00	7.50
20.0	1000	3	1.22	100.0	76.0	25.0	22.70	8.70

Table B.9 Lactose

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	$C_{s'}$ (%w/w)
2.5	200	3	1.67	120.0	85.0	37.0	3.20	0.70
2.5	600	3	4.12	120.0	78.0	41.0	3.50	0.10
2.5	600	3	1.58	120.0	79.0	39.0	3.40	0.40
2.5	1000	3	2.23	140.0	109.0	33.0	3.00	0.20
2.5	1000	3	1.48	120.0	90.0	31.0	3.10	0.40
5.0	200	3	3.10	120.0	90.0	30.0	6.10	0.50
5.0	200	3	1.10	120.0	100.0	21.0	5.50	0.60
5.0	600	3	2.00	110.0	62.0	44.0	7.10	1.20
5.0	600	3	4.35	120.0	71.0	50.0	7.50	0.70
5.0	600	3	4.58	120.0	88.0	36.0	6.50	0.30
5.0	1000	3	1.22	100.0	63.0	38.0	6.20	2.40
5.0	1000	3	1.52	110.0	72.0	37.0	6.00	2.30
5.0	1000	3	1.28	120.0	97.0	23.0	6.10	1.00
10.0	200	3	2.17	110.0	69.0	42.0	13.50	5.87
10.0	200	3	1.93	120.0	67.0	54.0	12.00	6.60
10.0	600	3	2.42	110.0	74.0	37.0	13.90	3.50
10.0	600	3	4.00	120.0	83.0	37.0	14.80	2.70
10.0	600	3	1.50	120.0	92.0	30.0	12.50	3.70
10.0	1000	3	2.50	120.0	84.0	34.0	13.20	3.40
10.0	1000	3	4.73	130.0	93.0	37.0	13.50	2.40
10.0	1000	3	1.60	130.0	97.0	33.0	12.50	3.60
20.0	200	3	1.85	120.0	97.0	22.0	20.20	6.60
20.0	200	3	1.05	120.0	105.0	15.0	19.30	7.00
20.0	600	3	1.57	100.0	70.0	30.0	21.70	7.50
20.0	600	3	5.77	120.0	83.0	35.0	22.30	6.30
20.0	600	3	3.00	100.0	74.0	23.0	21.60	6.10
20.0	1000	3	0.83	100.0	76.0	24.0	19.60	11.50
20.0	1000	3	1.17	100.0	76.0	25.0	19.50	11.30
20.0	1000	3	1.00	120.0	103.0	17.0	19.40	7.60

Table B.10 Blue dextran (M.W.=2,000,000)

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	Cs' (%w/w)
0.01	200	3	1.47	110.0	73.0	37.0	0.014	0.001
0.01	600	3	2.30	120.0	88.0	33.0	0.013	0.001
0.01	600	3	1.53	120.0	82.0	38.0	0.014	0.001
0.01	1000	3	4.27	120.0	87.0	35.0	0.013	0.001
0.01	1000	3	3.18	120.0	82.0	40.0	0.014	0.001
0.01	1000	3	1.52	120.0	89.0	31.0	0.013	0.001
0.05	200	3	2.12	110.0	62.0	50.0	0.084	0.006
0.05	200	3	1.52	110.0	72.0	40.0	0.072	0.008
0.05	600	3	4.32	120.0	78.0	45.0	0.079	0.002
0.05	600	3	2.57	120.0	78.0	43.0	0.074	0.002
0.05	600	3	1.90	120.0	73.0	48.0	0.080	0.003
0.05	1000	3	4.52	120.0	103.0	20.0	0.057	0.004
0.05	1000	3	2.12	130.0	100.0	31.0	0.067	0.002
0.05	1000	3	1.82	130.0	98.0	33.0	0.064	0.003
0.25	200	3	2.18	100.0	53.0	47.0	0.410	0.048
0.25	200	3	1.48	110.0	68.0	42.0	0.343	0.059
0.25	600	3	3.45	110.0	73.0	38.0	0.350	0.024
0.25	600	3	2.45	120.0	56.0	66.0	0.500	0.016
0.25	600	3	1.95	120.0	58.0	52.0	0.432	0.018
0.25	1000	3	4.55	120.0	82.0	40.0	0.349	0.013
0.25	1000	3	2.57	120.0	84.0	37.0	0.335	0.019
0.25	1000	3	1.27	120.0	83.0	36.0	0.334	0.011

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Table B.11 Dextran (M.W.=100,000)

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_s' (%w/w)
0.25	200	3.00	1.37	110.0	65.0	46.0	0.261	0.151
0.25	200	3.00	1.58	110.0	68.0	42.0	0.260	0.119
0.25	600	3.00	3.77	120.0	78.0	43.0	0.324	0.022
0.25	600	3.00	2.00	110.0	66.0	45.0	0.317	0.027
0.25	600	3.00	1.55	110.0	70.0	43.0	0.350	0.033
0.25	1000	3.00	4.08	120.0	78.0	43.0	0.265	0.010
0.25	1000	3.00	2.17	120.0	85.0	36.0	0.297	0.013
0.25	1000	3.00	1.95	120.0	78.0	43.0	0.306	0.016

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Table B.12 Dextran (M.W.=9,000)

C_0 (%w/w)	N_r (rpm)	Ice lining (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_s' (%w/w)
0.25	200	3.00	1.97	100.0	60.0	41.0	0.413	0.018
0.25	200	3.00	0.93	100.0	76.0	27.0	0.348	0.043
0.25	600	3.00	3.27	100.0	69.0	32.0	0.399	0.014
0.25	600	3.00	2.53	120.0	95.0	26.0	0.334	0.015
0.25	600	3.00	1.50	110.0	77.0	33.0	0.364	0.011
0.25	1000	3.00	3.98	120.0	94.0	22.0	0.351	0.018
0.25	1000	3.00	2.20	120.0	110.0	11.0	0.316	0.023
0.25	1000	3.00	1.27	120.0	103.0	18.0	0.305	0.035

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APPENDIX C

CALCULATION EXAMPLE

The data of LiCl from Table B.1 in Appendix B

C_0 (%w/w)	N_r (rpm)	V_{il} (ml)	Time (h)	V_0 (ml)	V_L (ml)	V_{sa} (ml)	C_L (%w/w)	C_s' (%w/w)
0.50	200	3	2.08	100.0	59.2	42.6	0.75	0.11

Calculation example

1. The advance rate of the ice front (u)

Following Eq. (3.1);

$$u = (V_{sa} - V_{il}) * 1.085 / (\pi r^2 \times t),$$

where, 1.085 is a ratio of water density and ice density

r is the inner radius of a sample vessel; 2.45 cm

therefore,

$$u = (42.6 - 3.0) * 1.085 / [\pi * (2.45)^2 * 2.08]$$
$$= 1.095 \text{ cm/h}$$

2. The effective partition coefficient (K)

Following Eq. (2.4);

$$K = C_S / C_L,$$

where, $C_S = C_S' * V_{sa} / V_s$

$$V_s = V_{sa} - V_{il}$$

Therefore,

$$\begin{aligned} K &= [(C_S' * V_{sa}) / (V_{sa} - V_{il})] / C_L \\ &= [(0.11 * 100) / (100 - 3)] / 0.75 \\ &= 0.163 \end{aligned}$$



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3. The limiting partition coefficient (K_0)

From Fig. 4.5, the linear relationship equation of LiCl at 0.5%(w/w) is

$$y = -6.4092x + 4.1949.$$

where, x or $(u/N_r^{0.2}) = 0$

$$y \text{ or } \ln[(1/K)-1] = 4.1949$$

therefore,

$$\begin{aligned} K_0 &= 1 / [\exp(4.1949) + 1] \\ &= 0.01485 \end{aligned}$$

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VITA

Mrs. Prapasri Theprugsa was born on August 15, 1968 in Bangkok, Thailand. She obtained a B.Sc. degree in Agricultural Industry from King Monkut's Institute of Technology Ladkrabang in 1989 and an M.Sc. degree in Food Technology from Chulalongkorn University in 1993. She started the first job as a lecturer at Faculty of Science, the University of Thai Chamber of Commerce (UTCC), Thailand during 1992-1994. Since 1994, she has worked for the Department of Food Science and Technology, Thammasat University. She was served as Head of the Department from 1995 to 1996. She was promoted to the rank of Assistant Professor in May 1998. At the age of 31, she received a full scholarship from the Royal Thai Government to further her Ph.D. studies at the Department of Food Technology, Chulalongkorn University. After being finished her Ph.D. degree, she will join the Department of Food Science and Technology at Thammasat University. Mrs. Prapasri Theprugsa was married to Mr. Sinnop Theprugsa in 1993, and has three children.

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