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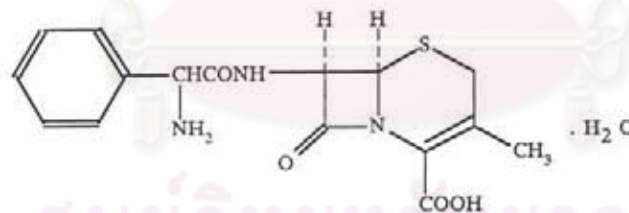
## Appendix I

### CEPHALEXIN

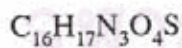
(Griffith and Black, 1968 ; Budavari, 1989 ; Gerald, 1992 ; Reynolds, 1993)

Cephalexin was first developed by Glaxo Co. Ltd.. Cephalexin was modified from cephaloglycin in which the acetoxy group was replaced by a simple hydrogen atom, gave a compound with improved oral absorption and better stability characteristics. Cephalexin is the one of the cephalosporin which is absorbed to the greatest extent after oral administration whilst retaining broad spectrum antibacterial activity.

#### Formula



#### Molecular formular



#### Molecular weight

347.40

### Chemical name

7-[(Aminophenyl acetyl) amino]-3-methyl-8-oxo-5-thia-1-azabicyclo [4.2.0] oct-2-ene-2-carboxylic acid monohydrate.

### Appearance

Cephalexin occurs as a white to off-white, crystalline powder with a faint characteristic odour.

### Solubility

Cephalexin is slightly soluble in water, which is 1 g in 100 g of water, practically insoluble in alcohol, chloroform and ether.

### Dissociation constant

$$pK_{a1} = 5.2, pK_{a2} = 7.3$$

### Stability

Cephalexin should be stored in tight container at a temperature less than 40°C, preferably between 15-30°C.

### Pharmacological action

Cephalexin, like other cephalosporins, is usually bactericidal in action. The antibacterial activity results from 1-oxa-β-lactams and cephamycin inhibit the mucopeptide synthesis in the bacterial cell wall. Although the exact mechanisms of action have not been fully elucidated, β-lactam antibiotics bind to several enzymes in the bacterial cytoplasmic membrane (e.g., carboxypeptidase, endopeptidase, and transpeptidases) that are involved in cell-wall synthesis and cell division. It has been hypothesized that β-lactam antibiotics act as substrate analogs of acyl-D-alanyl-D-

alanine, the usual substrate for these enzymes. This interferes with cell wall synthesis and results in the formation of defective cell walls and osmotically unstable spheroplasts. Cell death following exposure to  $\beta$ -lactam antibiotics usually results from lysis, which appears to be mediated by bacterial autolysins such as peptidoglycan hydrolases.

The target enzymes of  $\beta$ -lactam antibiotics have been classified as penicillin-binding proteins (PBPs) and appear to vary substantially among bacterial species. The affinities of various  $\beta$ -lactam antibiotics for different PBPs appear to explain the differences in morphology that occur in susceptible organisms following exposure to different  $\beta$ -lactam antibiotics and may also explain differences in the spectrum of activity of  $\beta$ -lactam antibiotics that are not caused by the presence or absence of  $\beta$ -lactamases.

#### Spectrum of Action

Cephalexin is classified as a first generation cephalosporin. Like other first generation cephalosporins, cephalexin is active against many gram positive aerobic cocci but has limited activity against gram negative bacteria. Cephalexin is usually active against both penicillinase-producing and nonpenicillinase-producing gram positive cocci such as *S.aureus* and *S.epidermidis* ; group A  $\beta$ -hemolytic streptococci (*Streptococcus pyogenes*) ; group B Streptococci (*S.aggalactiae*) ; and *S. pneumoniae*, *Proteus* and *Shigella* may be inhibited by drug. Cephalexin is inactive against enterococci, methicillin-resistant staphylococci and others *Proteus*.

#### Pharmacokinetics

Cephalexin monohydrate is acid-stable and is rapidly and completely absorbed from the GI tract. Following oral administration of cephalexin in healthy, fasting adults



with normal renal function, peak serum cephalexin concentrations are attained within 1 hour and average 9  $\mu\text{g/ml}$  following a single 250-mg dose, 15-18  $\mu\text{g/ml}$  following a single 500-mg dose, and 32-39  $\mu\text{g/ml}$  following a single 1-g dose. Peak serum concentration are slightly lower and are attained later when cephalexin is administered with food, although the total amount of drug absorbed is unchanged. Following oral administration of cephalexin in fasting, healthy adults, serum concentrations 15 and 30 minutes after a single 500 mg dose averaged about 0.2 and 12  $\mu\text{g/ml}$ , respectively. Absorption of cephalexin is delayed in young children and may be decreased up to 50% in neonates. Peak serum concentrations of the drug have been reported to occur within 3 hours in infants younger than 6 months of age, within 2 hours in children 9-12 months of age, and within 1 hour in older children.

Following absorption, cephalexin is widely distributed to tissues and fluids including pleural fluid, synovial fluid, and bone. Cephalexin readily cross the placenta, and fetal serum concentrations may be 10% or more of maternal serum concentrations. Cephalexin is distributed in low concentrations into milk. An approximate degrees of protein binding is 6-15%. The serum half-life of cephalexin is 0.5-1.2 hours in adults with normal renal function.

Cephalexin is excreted unchanged in urine. More than 90% of a single 250-or 500-mg oral dose is excreted within 8 hours in adults with normal renal function. Cephalexin concentrations of 0.11-4 mg/ml have been reported in urine collected over a 6-hour period following a single 500-mg dose in adults with normal renal function. Peak urine concentrations of the drug averaging about 2 mg/ml occur 2 hours after a single 500-mg oral dose of cephalexin.

### Administration

Cephalexin are administered orally.

### Dosage

The usual adult dosage of cephalexin is 250 mg every 6 hours. For streptococcal pharyngitis, skin and skin structure infections, or uncomplicated cystitis in patients older than 15 years ago, 500 mg of cephalexin may be given every 12 hours. Therapy of cystitis should be continued for 7-14 days. For severe infections of those caused by less susceptible organism, higher dosages may be needed (up to 4 g daily in adults). The usual dosage of cephalexin for children is 25-50 mg/kg daily.



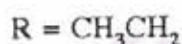
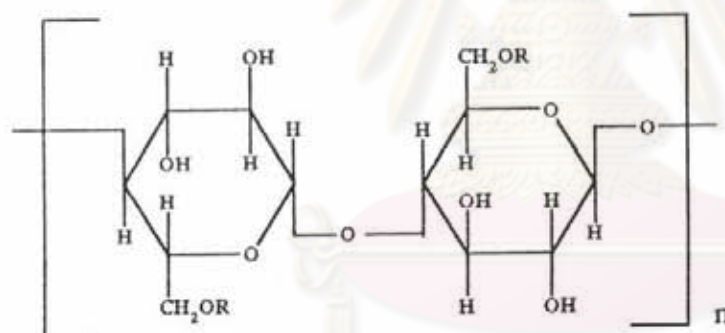
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## ETHYLCELLULOSE

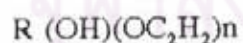
(Steuernagel, 1989 ; Gennaro, 1990)

Ethylcellulose represents one of a small number of approved polymers available for pharmaceutical applications. Ethylcellulose is probably the most widely used water-insoluble polymer in film coating due to its good film-forming properties that enable tough, flexible coatings to be produced. Ethylcellulose is a cellulose ether made by the reaction of ethyl chloride with alkali cellulose.

### Formula



### Molecular Formula



### Molecular weight

~ 100,000

### Chemical name

cellulose ethyl ether

**Appearance**

Free flowing, white to light tan powder is occurred.

**Solubility**

The medium type is freely soluble in tetrahydrofuran, methyl acetate, chloroform or mixtures of aromatic hydrocarbons with alcohol ; the standard type is freely soluble in alcohol, methanol, toluene, chloroform or ethyl acetate ; both types are insoluble in water, glycerin or propylene glycol.

**Melting point**

140°C



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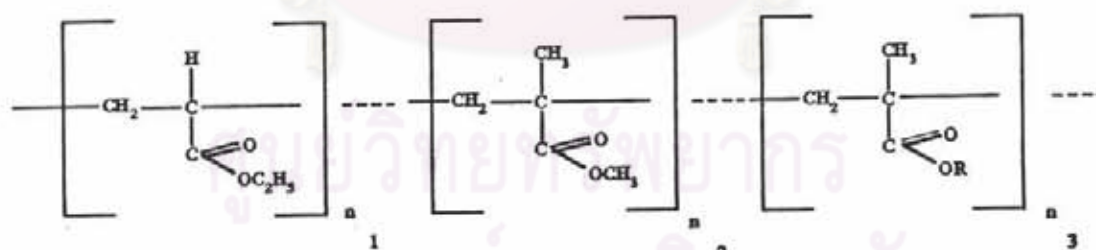


## EUDRAGIT RL 100<sup>®</sup> and RS 100<sup>®</sup>

(Lehmann, 1989)

Eudragit RL and RS are copolymers synthesized from acrylic and methacrylic acid esters with a low content of quaternary ammonium groups. The ammonium groups are present as salts and give rise to the permeability of the films. The distinguishing letters RL and RS relate to the initial letters of the German words "leichtdurchlassig" (freely permeable) and "schwerdurchlassig" (slightly permeable) respectively and refer to the permeability characteristics of these coating agents throughout entire digestive tract. They are mainly used in the production of orally administered pharmaceutical dosage forms, particularly tablets, pills, pellets and granules, with delayed drug release properties so called depot or retard preparations.

### Formula



Eudragit RL 100<sup>®</sup>  $n_1 : n_2 : n_3 = 1 : 2 : 0.2$

Eudragit RS 100<sup>®</sup>  $n_1 : n_2 : n_3 = 1 : 2 : 0.1$

### Molecular weight

150,000

**Chemical name**

Ammonio Methacrylate copolymer, Type A (Eudragit RL) and Type B (Eudragit RS)

**Appearance**

Solid in the form of white opaque granules with a slight amine-like odour.

**Solubility**

Eudragit RL and RS are insoluble in water and digestive fluids, but are capable of swelling and are permeable. In other solvents, 1 g of dry Eudragit dissolves in 7 g of methanol, ethanol and isopropanol containing small amounts of water or in acetone, ethyl acetate and methylene chloride to give clear to slightly opalescent solutions. The dry substances are practically insoluble in petroleum ether and 1 N sodium hydroxide.

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**Appendix II ,**

**Calibration curve data of cephalexin  
by ultraviolet spectrophotometry at 262 nm.**

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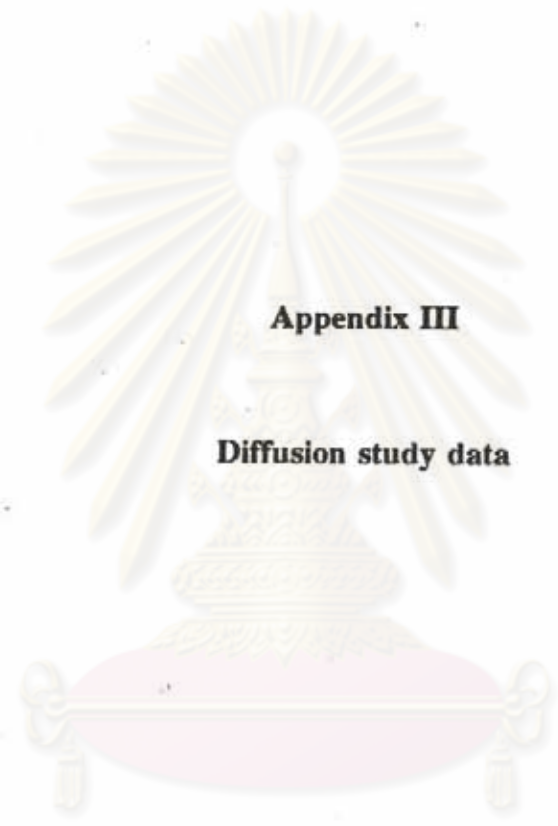
Table 11: Calibration curve data of cephalixin at  $\lambda_{\max}$  262 nm.

Concentration	Absorbance
5.05	0.114
10.1	0.222
20.2	0.437
30.3	0.651
40.4	0.873
50.5	1.093

$$y = 0.00352 + 0.022 x$$
$$r^2 = 0.99995$$

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**Appendix III**

**Diffusion study data**

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## Diffusion data of cephalexin through TAEC membrane

square root of time hr <sup>1/2</sup>	cumulative amount (mcg)			
	10%TA	20%TA	30%TA	40%TA
0.000	0.000	0.000	0.000	0.000
0.707	5.081	50.333	82.164	102.427
1.000	24.916	62.097	91.735	162.067
1.414	36.836	99.867	103.015	218.450
1.732	56.581	140.887	128.353	295.426
2.000	72.096	200.247	155.808	332.453
2.449	89.096	251.997	165.313	379.703
2.828	115.234	290.122	203.942	453.089
3.162	133.272	369.472	236.796	495.622

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## Calibration curve data

concentration (mcg)	0.111	0.222	0.444	0.888	1.110	1.665	2.775
PAR.	0.2780	0.4380	0.7810	1.3789	1.8830	2.8940	4.8850

$$y = 1.7384x - 0.0007, \quad r^2 = 0.9973$$

## Diffusion of cephalexin through 10% TAEC membranes.

square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg)	cumulative amount (mcg)	amount (mcg)	cumulative amount (mcg)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	4.780	4.780	5.382	5.382	5.081	0.426	8.378
1.000	2.730	7.510	36.940	42.322	24.916	24.616	98.795
1.414	1.010	8.520	22.830	65.152	36.836	40.045	108.711
1.732	18.210	26.730	21.280	86.432	56.581	42.216	74.611
2.000	15.370	42.100	15.660	102.092	72.096	42.421	58.839
2.449	14.990	57.090	19.010	121.102	89.096	45.263	50.803
2.828	14.230	71.320	38.046	159.148	115.234	62.104	53.894
3.162	3.370	74.690	32.705	191.853	133.272	82.847	62.164

## Calibration curve data

concentration (mcg)	0.100	0.200	0.400	0.800	1.000	1.500	2.500
PAR.	0.3375	0.6530	1.3318	2.0404	2.4476	3.2908	5.5964

$$y = 2.1157x + 0.2779, r^2 = 0.9947$$

Diffusion of cephalexin through 20% TAEC membranes.

square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg)	cumulative amount (mcg)	amount (mcg)	cumulative amount (mcg)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	31.065	31.065	69.600	69.600	50.333	27.248	54.137
1.000	19.428	50.493	4.100	73.700	62.097	16.410	26.426
1.414	67.580	118.073	7.960	81.660	99.867	25.748	25.782
1.732	54.560	172.633	27.480	109.140	140.887	44.896	31.867
2.000	66.030	238.663	52.690	161.830	200.247	54.329	27.131
2.449	38.290	276.953	65.210	227.040	251.997	35.294	14.006
2.828	28.900	305.853	47.350	274.390	290.122	22.248	7.668
3.162	78.560	384.413	80.140	354.530	369.472	21.130	5.719



## Calibration curve data

concentration (mcg)	0.101	0.202	0.404	0.808	1.010	1.515	2.525
PAR.	0.1170	0.3831	0.6014	1.4021	1.7835	2.9377	4.6550

$$y = 1.894x - 0.08, r^2 = 0.9973$$

## Diffusion of cephalexin through 30% TAEC membranes.

square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	121.146	121.146	43.182	43.182	82.164	55.129	67.096
1.000	3.777	124.923	15.365	58.547	91.735	46.935	51.164
1.414	0.000	124.923	22.560	81.107	103.015	30.983	30.076
1.732	29.116	154.039	21.560	102.667	128.353	36.325	28.301
2.000	2.125	156.164	52.785	155.452	155.808	0.503	0.323
2.449	0.000	156.164	19.010	174.462	165.313	12.939	7.827
2.828	39.212	195.376	38.046	212.508	203.942	12.114	5.940
3.162	35.450	230.826	30.258	242.766	236.796	8.443	3.565

## Calibration curve data

concentration (mcg)	0.102	0.240	0.408	0.816	1.020	1.530	2.550
PAR.	0.1860	0.3682	0.8120	1.5592	2.0058	2.8573	5.0931

$$y = 1.9947x - 0.0593, r^2 = 0.9982$$

## Diffusion of cephalixin through 40% TAEC membranes.

square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	44.563	44.563	160.290	160.290	102.427	81.831	79.893
1.000	51.740	96.303	67.540	227.830	162.067	93.0036	57.3861
1.414	53.389	149.692	59.377	287.207	218.450	97.2378	44.5127
1.732	59.874	209.566	94.078	381.285	295.426	121.424	41.1013
2.000	40.377	249.943	33.677	414.962	332.453	116.686	35.0986
2.449	54.526	304.469	39.974	454.936	379.703	106.396	28.0209
2.828	70.324	374.793	76.448	531.384	453.089	110.727	24.4382
3.162	57.642	432.435	27.424	558.808	495.622	89.3592	18.0297

## Diffusion data of cephalexin through TCEC membranes

square root of time (hr <sup>1/2</sup> )	cumulative amount (mcg)		
	10%TC	20%TC	30%TC
0.000	0.000	0.000	0.000
0.707	14.560	29.235	214.921
1.000	18.442	57.160	370.220
1.414	22.547	107.592	425.371
1.732	33.128	230.983	692.418
2.000	34.993	305.596	785.312
2.449	71.462	430.004	1086.934
2.828	152.063	531.514	1309.680
3.162	223.606	689.313	1465.854

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Calibration curve data

concentration (mcg/ml)	0.106	0.213	0.426	0.851	1.064	1.596	2.660
PAR.	0.1966	0.3215	0.7877	1.6260	1.7890	2.8600	5.1228

$$y = 1.914x - 0.077, r^2 = 0.9962$$

Diffusion of cephalexin through 10% TCEC membrane.

Square root of time  (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	16.017	16.017	13.103	13.103	14.560	2.061	14.152
1.000	5.749	21.766	2.014	15.117	18.442	4.702	25.494
1.414	6.517	28.283	1.694	16.811	22.547	8.112	35.978
1.732	10.695	38.978	10.466	27.277	33.128	8.274	24.976
2.000	2.233	41.211	1.498	28.775	34.993	8.794	25.130
2.449	42.570	83.781	30.367	59.142	71.462	17.422	24.380
2.828	71.445	155.226	89.757	148.899	152.063	4.474	2.942
3.162	59.026	214.252	84.061	232.960	223.606	13.229	5.916



## Calibration curve data

concentration (mcg/ml)	0.100	0.200	0.400	0.800	1.000	1.500	2.500
PAR.	0.2007	0.3571	0.7115	1.3431	1.7310	2.5460	4.3278

$$y = 1.713x + 0.014, r^2 = 0.9997$$

## Diffusion of cephalixin through 20% TCEC membrane.

Square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	34.210	34.210	24.259	24.259	29.235	7.036	24.069
1.000	41.680	75.890	14.171	38.430	57.160	26.488	46.340
1.414	40.788	116.678	60.075	98.505	107.592	12.850	11.944
1.732	136.581	253.259	110.201	208.706	230.983	31.504	13.639
2.000	81.512	334.771	67.715	276.421	305.596	41.260	13.501
2.449	150.774	485.545	98.042	374.463	430.004	78.547	18.267
2.828	74.291	559.836	128.729	503.192	531.514	40.053	7.536
3.162	23.342	583.178	292.255	795.447	689.313	150.097	21.775



## Calibration curve data

concentration (mcg/ml)	0.102	0.204	0.408	0.816	1.020	1.530	2.550
PAR.	0.2084	0.4252	0.8443	1.5307	1.8573	2.7234	4.7772

$$y = 1.9167x + 0.3349, r^2 = 0.9995$$

## Diffusion of cephalixin through 30% TCEC membrane.

Square root of time (hr <sup>1/2</sup> )	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.707	247.041	247.041	182.800	182.800	214.921	45.425	21.136
1.000	136.030	383.071	174.568	357.368	370.220	18.175	4.909
1.414	7.613	390.684	102.690	460.058	425.371	49.055	11.532
1.732	213.198	603.882	320.895	780.953	692.418	125.208	18.083
2.000	32.968	636.850	152.820	933.773	785.312	209.956	26.735
2.449	526.115	1162.965	77.130	1010.903	1086.934	107.524	9.892
2.828	198.989	1361.954	246.502	1257.405	1309.680	73.927	5.645
3.162	168.680	1530.634	143.669	1401.074	1465.854	91.613	6.250

Diffusion data of cephalexin through combination of ERL:RS membranes, in various ratios.

time (hr)	cumulative amount (mcg)					
	RL:RS 0:5	RL:RS1:4	RL:RS2:3	RL:RS3:2	RL:RS4:1	RL:RS 5:0
0.0	0.000	0.000	0.000	0.000	0.000	0.000
0.5	22.874	0.676	65.350	9.417	155.121	180.907
1.0	39.461	3.650	173.474	49.502	299.431	501.030
1.5	63.435	7.867	278.974	110.569	481.972	827.322
2.0	81.536	13.571	389.220	196.662	619.939	1232.007
3.0	103.619	24.877	584.367	418.751	887.955	1872.675
4.0	140.298	39.843	761.321	640.794	1224.232	2442.873
5.0	182.947	52.917	920.979	911.083	1558.309	3000.023
6.0	249.491	68.287	1060.781	1127.266	1863.516	3613.171
8.0	347.795	100.856	1316.395	1634.408	2630.049	4827.934
10.0	554.809	132.806	1544.640	2085.957	3243.952	5911.399

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Calibration curve data.

concentration (mcg)	0.101	0.202	0.405	0.810	1.012	1.518	2.530
PAR.	0.1772	0.3313	0.6794	1.4145	1.7526	2.6313	4.4675

$$y = 1.7682x - 0.025, r^2 = 0.9999$$

Diffusion of cephalixin through 5:0 ERL:RS membrane.

Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.00
0.5	238.278	238.278	123.536	123.536	180.907	81.135	44.85
1.0	388.712	626.990	251.534	375.069	501.030	178.135	35.55
1.5	343.347	970.337	309.237	684.306	827.322	202.255	24.45
2.0	479.856	1450.193	329.515	1013.820	1232.007	308.562	25.05
3.0	759.924	2210.117	521.413	1535.233	1872.675	477.215	25.48
4.0	641.027	2851.144	499.368	2034.601	2442.873	577.383	23.64
5.0	557.246	3408.390	557.055	2591.657	3000.023	577.517	19.25
6.0	616.792	4025.182	609.505	3201.161	3613.171	582.671	16.13
8.0	1228.132	5253.315	1201.392	4402.554	4827.934	601.579	12.46
10.0	909.471	6162.786	1257.458	5660.012	5911.399	355.515	6.01

## Calibration curve data.

concentration (mcg)	0.101	0.201	0.402	0.805	1.006	1.509	2.515
PAR.	0.1642	0.3264	0.8184	1.4897	1.7422	2.6897	5.3249

$$y = 2.0826x - 0.1363, r^2 = 0.9902$$

## Diffusion of cephalexin through 4:1 ERL:RS membrane.

Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.00
0.5	242.561	242.561	67.682	67.682	155.121	123.658	79.72
1.0	225.075	467.636	63.544	131.226	299.431	237.878	79.44
1.5	212.377	680.012	152.707	283.932	481.972	280.071	58.11
2.0	183.827	863.839	92.107	376.039	619.939	344.927	55.64
3.0	331.601	1195.440	204.430	580.469	887.955	434.850	48.97
4.0	402.795	1598.235	269.761	850.230	1224.232	528.919	43.20
5.0	384.775	1983.010	283.378	1133.607	1558.309	600.619	38.54
6.0	423.449	2406.459	186.965	1320.572	1863.516	767.838	41.20
8.0	896.640	3303.099	636.427	1956.999	2630.049	951.836	36.19
10.0	827.729	4130.827	400.078	2357.077	3243.952	1254.231	38.66



Calibration curve data.

concentration (mcg)	0.106	0.212	0.425	0.850	1.062	1.593	2.655
PAR.	0.1453	0.3415	0.7458	1.2551	1.5964	2.6252	4.2915

$$y = 1.6223x - 0.0283, r^2 = 0.9988$$

Diffusion of cephalexin through 3:2 ERL:RS membrane.

Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00
0.5	15.8626	15.8626	2.9704	2.9704	9.4165	9.1162	96.81
1.0	60.4756	76.3382	19.6955	22.6659	49.5021	37.9520	76.67
1.5	79.1020	155.4402	43.0325	65.6984	110.5693	63.4570	57.39
2.0	100.5560	255.9962	71.6301	137.3285	196.6623	83.9107	42.67
3.0	242.8348	498.8310	201.3419	338.6704	418.7507	113.2506	27.04
4.0	203.0674	701.8984	241.0191	579.6895	640.7939	86.4147	13.49
5.0	273.4946	975.3930	267.0844	846.7739	911.0834	90.9474	9.98
6.0	225.7882	1201.1810	206.5782	1053.3520	1127.2660	104.5309	9.27
8.0	485.2914	1683.4720	528.9932	1582.3450	1634.4080	71.5076	4.38
10.0	447.8969	2134.3690	455.2007	2037.5460	2085.9570	68.4642	3.28



Calibration curve data.

concentration (mcg)	0.106	0.212	0.425	0.850	1.062	1.593	1.655
PAR.	0.1131	0.3521	0.6446	1.2938	1.5575	2.3697	4.2440

$$y = 1.588x - 0.056, r^2 = 0.9977$$

Diffusion of cephalixin through 2:3 ERL:RS membrane.

Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.00
0.5	20.270	20.270	110.430	110.430	65.350	63.752	97.56
1.0	47.239	67.509	169.010	279.440	173.474	149.858	86.39
1.5	55.208	122.717	155.792	435.231	278.974	220.981	79.21
2.0	67.270	189.987	153.221	588.453	389.220	281.758	72.39
3.0	154.096	344.083	236.199	824.651	584.367	339.813	58.15
4.0	152.793	496.877	201.114	1025.765	761.321	373.981	49.12
5.0	148.548	645.425	170.769	1196.534	920.979	389.693	42.31
6.0	148.587	793.962	131.066	1327.600	1060.781	377.339	35.57
8.0	300.782	1094.744	210.447	1538.047	1316.395	313.463	23.81
10.0	290.487	1385.231	166.003	1704.050	1544.640	225.439	14.59

Calibration curve data.

concentration (mcg)	0.103	0.206	0.412	0.824	1.030	1.545	2.575
PAR.	0.1661	0.3170	0.7003	1.2212	1.7044	2.6496	4.3760

$$y = 1.714x - 0.0487, r^2 = 0.9980$$

Diffusion of cephalixin through 1:4 ERL:RS membrane.

Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.00
0.5	1.352	1.352	0.000	0.000	0.676	0.956	141.42
1.0	4.964	6.316	0.983	0.983	3.650	3.771	103.32
1.5	8.435	14.751	0.000	0.983	7.867	9.735	123.74
2.0	10.014	24.766	1.392	2.376	13.571	15.832	116.66
3.0	19.835	44.600	2.779	5.154	24.877	27.892	112.12
4.0	26.614	71.214	3.317	8.471	39.843	44.366	111.35
5.0	22.792	94.006	3.357	11.828	52.917	58.109	109.81
6.0	25.624	119.630	5.115	16.943	68.287	72.611	106.33
8.0	53.927	173.557	11.213	28.156	100.856	102.814	101.94
10.0	51.347	224.904	12.553	40.709	132.806	130.246	98.07

Calibration curve data.

concentration (mcg)	0.101	0.201	0.402	0.805	1.006	1.509	2.515
PAR.	0.2038	0.3806	0.7258	1.3477	1.6997	2.6722	4.5293

$$y = 1.7886x - 0.0195, r^2 = 0.9988$$

Diffusion of cephalexin through 0.5 ERL:RS membrane.

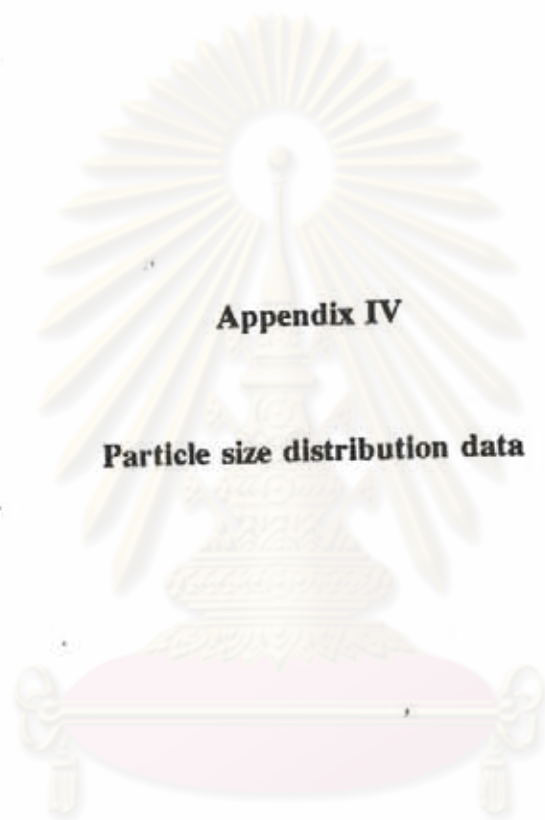
Time (hr.)	RUN 1		RUN 2		average	S.D.	%C.V.
	amount (mcg.)	cumulative amount (mcg.)	amount (mcg.)	cumulative amount (mcg.)			
0.0	0.000	0.000	0.000	0.000	0.000	0.000	0.00
0.5	25.023	25.023	20.725	20.725	22.874	3.039	13.29
1.0	13.943	38.966	19.230	39.955	39.461	0.699	1.77
1.5	26.472	65.438	21.478	61.433	63.435	2.832	4.46
2.0	16.042	81.480	20.158	81.591	81.536	0.078	0.10
3.0	17.425	98.905	26.742	108.333	103.619	6.667	6.43
4.0	42.761	141.666	30.598	138.931	140.298	1.934	1.38
5.0	34.273	175.939	51.025	189.956	182.947	9.912	5.42
6.0	67.841	243.779	65.247	255.203	249.491	8.078	3.24
8.0	95.597	339.376	101.011	356.214	347.795	11.906	3.42
10.0	211.714	551.090	202.314	558.528	554.809	5.260	0.95

Average thickness of polymer membranes used in diffusion studied.

☆ n = 24

Type of membranes	membrane thickness $\pm$ S.D. (mm) ☆
10% TAEC	0.0564 $\pm$ 0.0032
20% TAEC	0.0588 $\pm$ 0.0010
30% TAEC	0.0585 $\pm$ 0.0036
40% TAEC	0.0558 $\pm$ 0.0075
10% TCEC	0.0575 $\pm$ 0.0019
20% TCEC	0.0631 $\pm$ 0.0020
30% TCEC	0.0658 $\pm$ 0.0006
5:0 ERL:RS	0.0464 $\pm$ 0.0080
4:1 ERL:RS	0.0793 $\pm$ 0.0005
3:2 ERL:RS	0.0717 $\pm$ 0.0011
2:3 ERL:RS	0.0729 $\pm$ 0.0063
1:4 ERL:RS	0.0530 $\pm$ 0.0039
0:5 ERL:RS	0.0513 $\pm$ 0.0023

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



**Appendix IV**

**Particle size distribution data**

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Particle size distribution data of EC microcapsules prepared by coacervation technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 91.66	50.000	119	19.04	19.04
91.67 - 175	133.335	238	38.08	57.12
175 - 258.33	216.665	149	23.84	80.96
258.34 - 341.66	300.000	104	16.64	97.60
341.67 - 425	383.335	15	2.40	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by coacervation technique, core : wall ratio is 1:1.

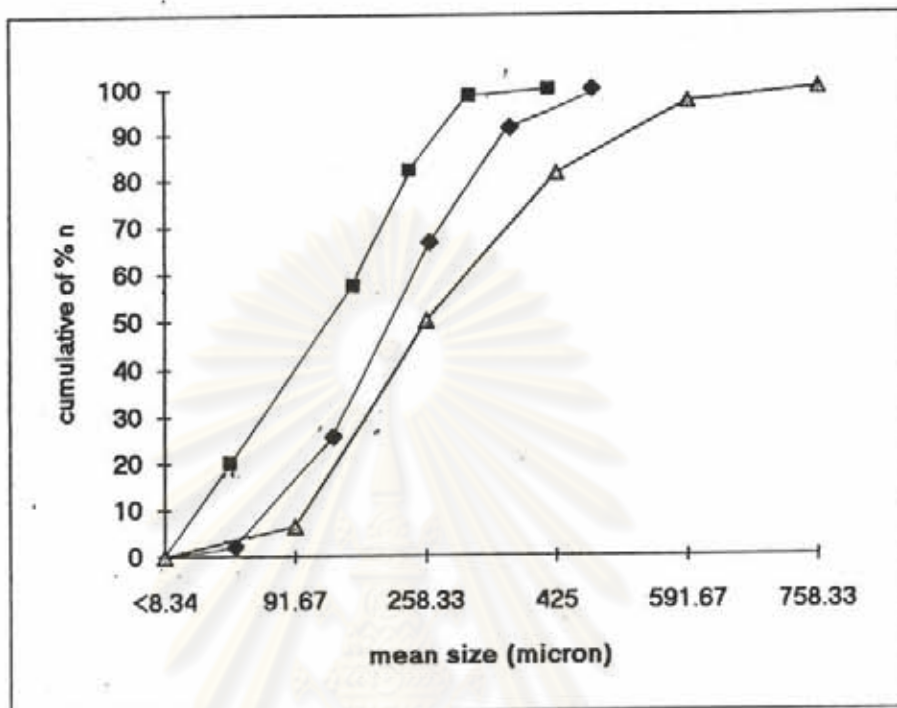
Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 175	91.670	39	6.24	6.24
175 - 314.66	258.330	274	43.84	50.08
314.67 - 508.33	425.000	196	31.36	81.44
508.34 - 675	591.670	97	15.52	96.96
675 - 841.66	758.330	19	3.04	100.00
Total	-	625	100.00	100.00

ศูนย์วิจัยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by coacervation technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 108.33	58.335	17	2.72	2.72
108.34 - 208.33	158.335	154	24.64	27.36
208.34 - 308.33	258.335	247	39.52	66.88
308.34 - 408.33	358.335	150	24.00	90.88
408.34 - 508.33	458.335	57	9.12	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Cumulative size frequency curves of microcapsules prepared by coacervation technique using EC as wall material.

core:wall

- ratio 2:1 mean = 174.70, median = 120.
- △— ratio 1:1 mean = 367.13, median = 260.
- ◆— ratio 1:2 mean = 270.50, median = 220.

จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 34	18	27	4.32	4.32
34 - 66	50	235	37.60	41.92
66 - 98	82	245	39.20	81.12
98 - 130	114	100	16.00	97.12
130 - 162	146	18	2.88	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Particle size distribution data of 3:2 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 1:1.

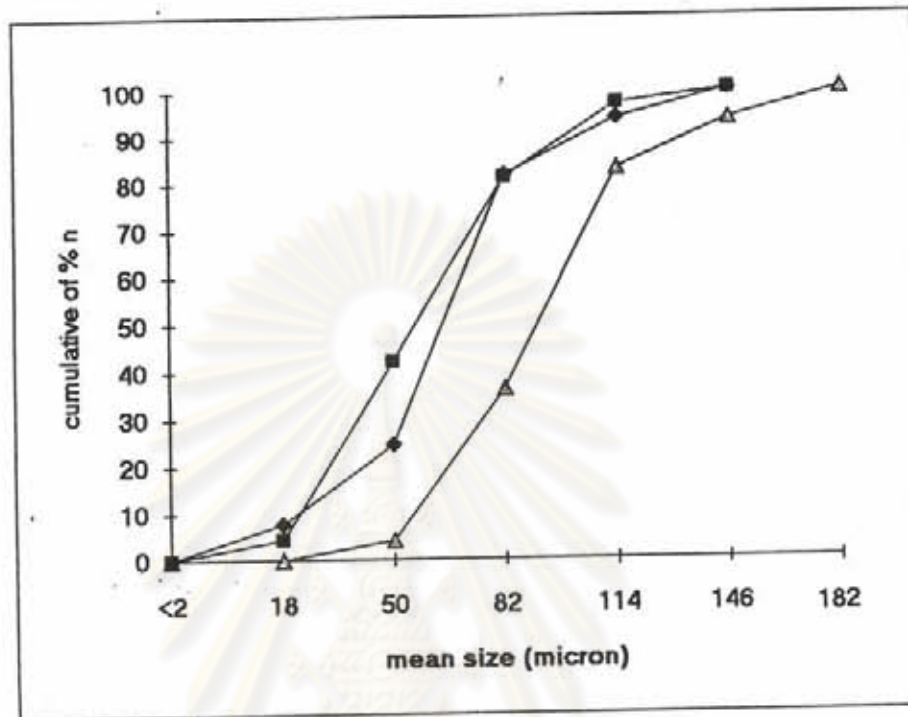
Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 42	22	26	4.16	4.16
42 - 82	82	200	32.00	36.16
82 - 122	102	292	46.72	82.88
122 - 162	142	97	10.72	93.60
162 - 202	182	40	6.40	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 34	18	48	7.68	7.68
34 - 66	50	105	16.80	24.48
66 - 98	82	357	57.12	81.60
98 - 130	114	76	12.16	93.76
130 - 162	146	39	6.24	100.00
Total	-	625	100.00	100.00

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Cumulative size frequency curves of microcapsules prepared by coacervation technique using 3:2 ERL:RS as wall material.

core:wall

- ratio 2:1 mean = 74.17, median = 56.
- △— ratio 1:1 mean = 95.28, median = 75.
- ◆— ratio 1:2 mean = 79.59, median = 65.

จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 91.66	50.000	203	32.48	32.48
91.67 - 175	133.335	247	39.52	72.00
175 - 258.33	216.665	138	22.08	94.08
258.34 - 341.66	300.000	29	4.64	98.72
341.67 - 425	383.335	8	1.28	100.00
Total	-	625	100.00	100.00

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จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 1:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 91.66	50.000	15	2.40	2.40
91.67 - 175	133.335	149	23.84	26.24
175 - 258.33	216.665	327	52.32	78.56
258.34 - 341.66	300.000	104	16.64	95.20
341.67 - 425	383.335	30	4.80	100.00
Total	-	625	100.00	100.00

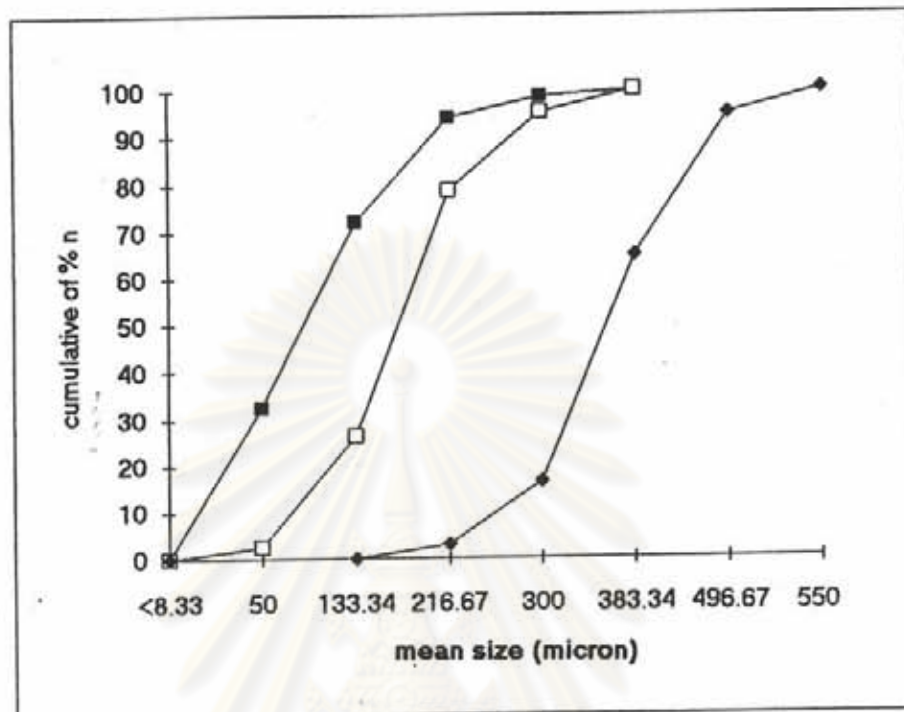
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Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
<175	-	0	0	0
175 - 258.33	216.665	18	2.88	2.88
258.34 - 341.66	300.000	84	13.44	16.32
314.67 - 425	383.335	321	51.36	67.68
425 - 568.33	496.665	169	27.04	94.72
508.37 - 591.66	550.000	33	5.28	100.00
Total	-	625	100.00	100.00

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Cumulative size frequency curves of microcapsules prepared by coacervation technique using 2:3 ERL:RS as wall material.

core:wall

- ratio 2:1 mean = 135.60, median = 90.
- ratio 1:1 mean = 214.66, median = 170.
- ratio 1:2 mean = 398.67, median = 354.

จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by fluidization technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 62	-	0	0	0
62 - 82	72	20	3.20	3.20
82 - 102	92	39	6.24	9.44
102 - 122	112	195	31.20	40.64
122 - 142	132	254	40.64	81.28
142 - 162	152	117	18.72	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by fluidization technique, core : wall ratio is 1:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
8.34 - 91.66	383.335	15	2.40	2.40
91.67 - 175	466.665	127	20.32	22.72
175 - 258.33	550.000	384	61.44	84.16
258.34 - 341.66	633.335	71	11.36	95.52
341.67 - 425	176.665	28	4.48	100.00
Total	-	625	100.00	100.00

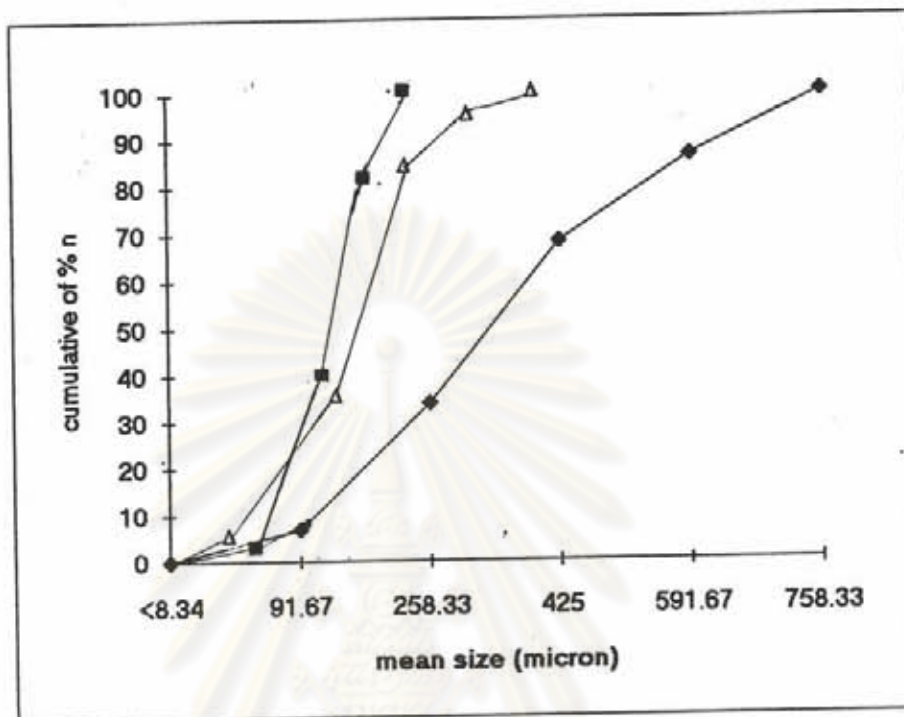
ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by fluidization technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 8.34	-	0	0	0
341.67 - 425	8	42	6.72	6.72
425 - 508.33	20	170	27.20	33.92
508.34 - 591.66	32	214	34.24	68.16
591.67 - 675	44	113	18.08	86.24
675 - 758.33	56	86	13.76	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย





Cumulative size frequency curves of microcapsules prepared by fluidization technique using EC as wall material.

core:wall

- ratio 2:1 mean = 125.09, median = 120.
- △— ratio 1:1 mean = 212.67, median = 210.
- ◆— ratio 1:2 mean = 554.13, median = 380.

จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 14	8	11	1.76	1.76
14 - 26	20	45	7.20	8.96
26 - 38	32	205	32.80	41.76
38 - 50	44	330	52.80	94.56
50 - 62	56	34	5.44	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 1:1.

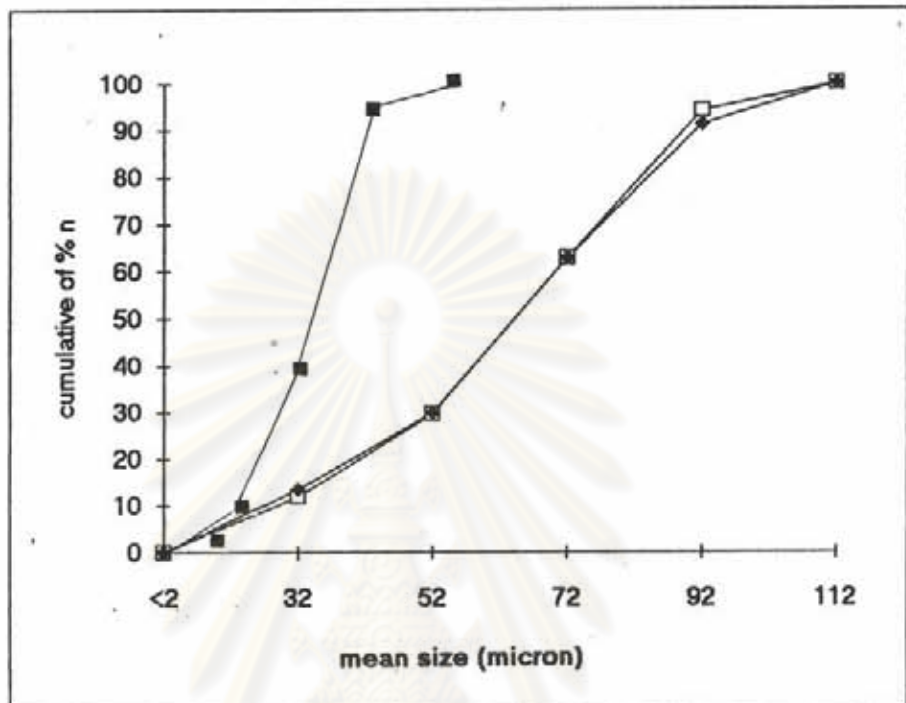
Particle size range	mean size (micron)	n	%n	cumulative of %n
< 22	-	0	0	0
22 - 42	32	74	11.84	11.84
42 - 62	52	110	17.60	29.44
62 - 82	72	208	33.28	62.72
82 - 102	92	196	31.36	94.08
102 - 122	112	37	5.92	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 22	-	0	0	0
22 - 42	32	84	13.44	13.44
42 - 62	52	102	16.32	29.76
62 - 82	72	206	32.96	62.72
82 - 102	92	177	28.32	91.04
102 - 122	112	56	8.96	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Cumulative size frequency curves of microcapsules prepared by fluidization technique using 3:2 ERL:RS as wall material.

core:wall

- ratio 2:1 mean = 38.36, median = 34.
- ratio 1:1 mean = 72.38, median = 65.
- ◆— ratio 1:2 mean = 72.61, median = 65.

จุฬาลงกรณ์มหาวิทยาลัย



Particle size distribution data of 2:3 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 22	-	0	0	0
22 - 42	32	28	4.48	4.48
42 - 62	52	222	35.52	40.00
62 - 82	72	241	38.56	78.56
82 - 102	92	115	18.40	96.96
102 - 122	112	19	30.4	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 1:1.

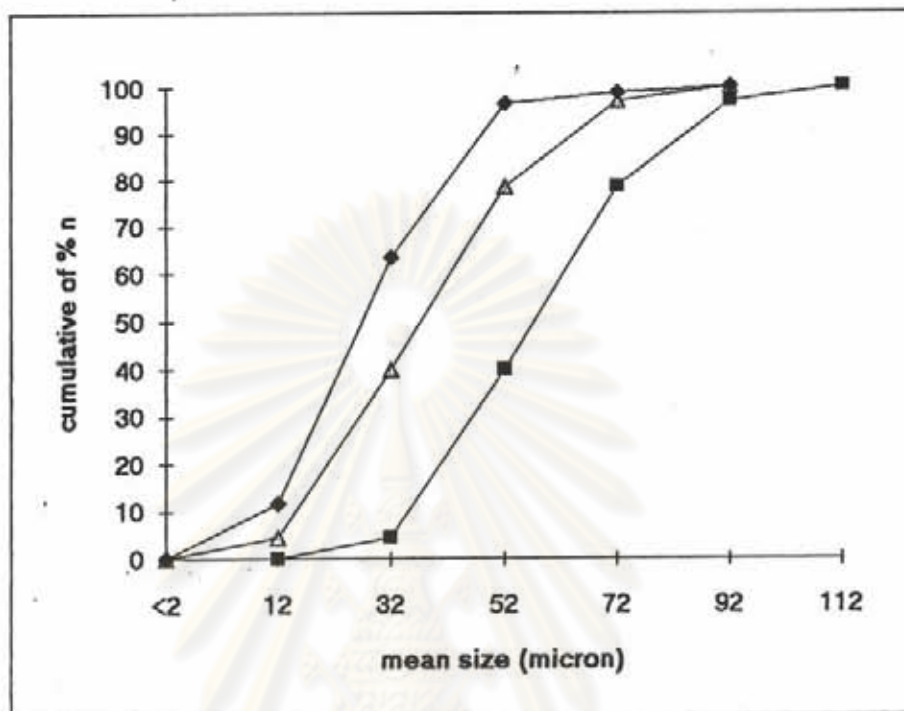
Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	62	4.48	4.48
22 - 42	32	309	35.52	40.00
42 - 62	52	173	38.56	78.56
62 - 82	72	68	18.40	96.96
82 - 102	92	13	3.04	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by fluidization technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	73	11.68	11.68
22 - 42	32	324	51.84	63.52
42 - 62	52	206	32.96	96.48
62 - 82	72	14	2.24	98.72
82 - 102	92	8	1.28	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Cumulative size frequency curves of microcapsules prepared by fluidization technique using 2:3 ERL:RS as wall material.

- core:wall
- ratio 2:1 mean = 52.61, median = 56.
  - △— ratio 1:1 mean = 63.06, median = 38.
  - ◆— ratio 1:2 mean = 73.84, median = 27.

Particle size distribution data of EC microcapsules prepared by spray-drying technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	81	12.96	12.96
22 - 42	32	235	37.60	50.56
42 - 62	52	228	36.48	87.04
62 - 82	72	52	8.32	95.36
82 - 102	92	29	4.64	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Particle size distribution data of EC microcapsules prepared by spray-drying technique, core : wall ratio is 1:1.

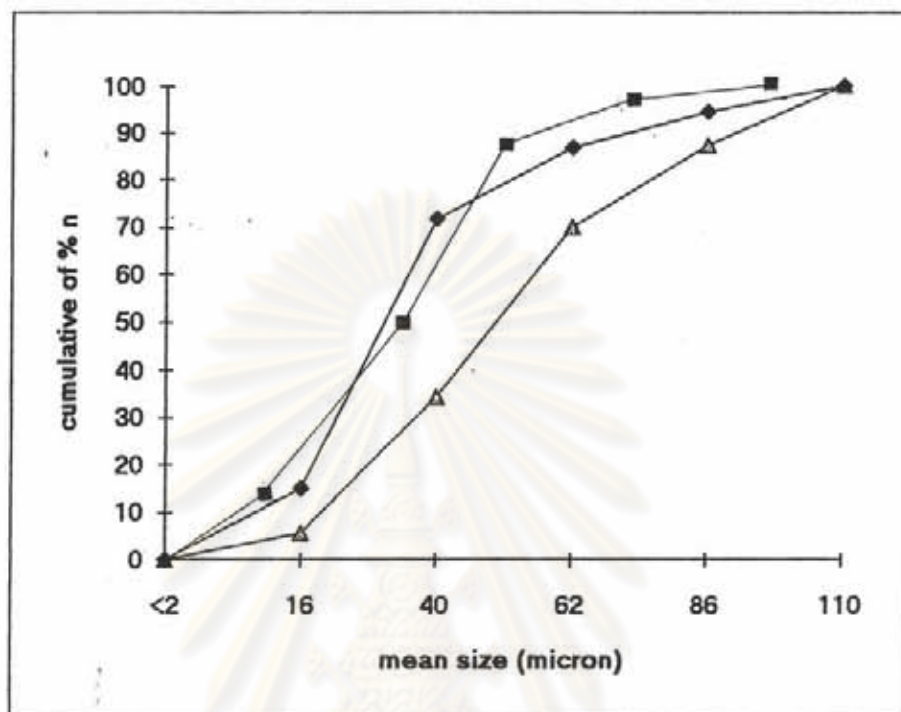
Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 30	16	36	5.76	5.76
30 - 50	40	179	28.64	34.40
50 - 74	62	223	35.68	70.08
74 - 98	86	107	17.12	87.20
98 - 122	110	80	12.80	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of EC microcapsules prepared by spray-drying technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 30	16	94	15.04	15.04
30 - 50	40	354	65.64	71.68
50 - 74	62	94	15.04	86.72
74 - 98	86	48	7.68	94.40
98 - 122	110	35	5.60	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Cumulative size frequency curves of microcapsules prepared by spray drying technique using EC as wall material.

- core:wall
- ratio 2:1 mean = 42.82, median = 32.
  - △— ratio 1:1 mean = 63.19, median = 50.
  - ◆— ratio 1:2 mean = 46.85, median = 30.

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by spray drying technique, core : wall ratio is 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 14	8	89	14.27	14.24
14 - 26	20	253	40.48	54.72
26 - 38	32	133	21.28	76.00
38 - 50	44	133	21.28	97.28
50 - 62	56	17	2.72	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 3:2 ERL:RS microcapsules prepared by spray drying technique, core : wall ratio is 1:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	78	12.48	12.48
22 - 42	32	130	20.80	33.28
42 - 62	52	287	45.92	79.20
62 - 82	72	104	16.64	95.84
82 - 102	92	26	4.16	100.00
Total	-	625	100.00	100.00

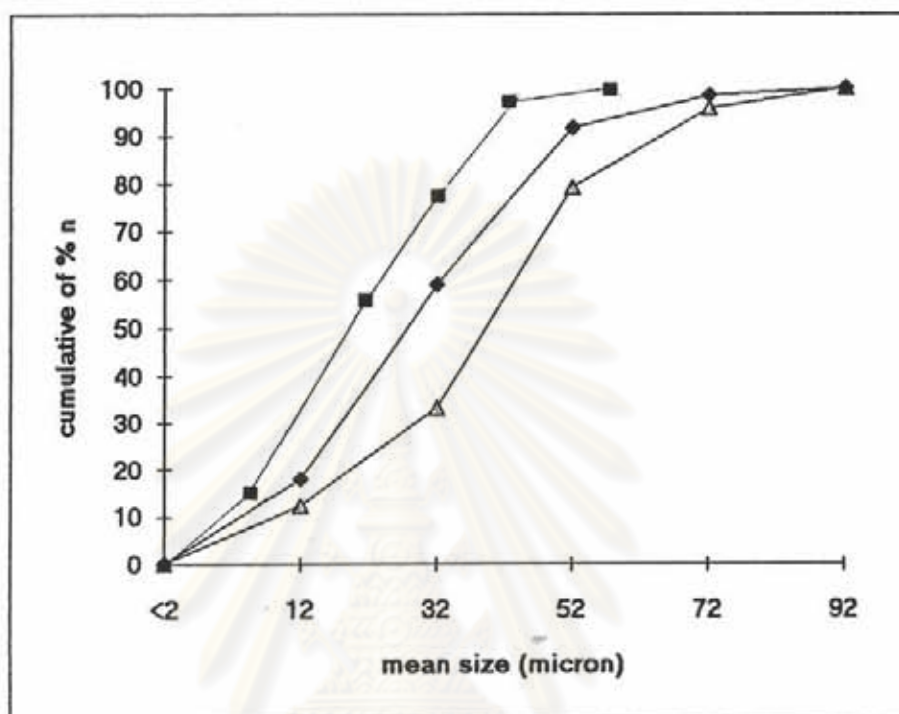
ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Particle size distribution data of 3:2 ERL:RS microcapsules prepared by spray drying technique, core : wall ratio is 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	113	18.08	18.08
22 - 42	32	256	40.96	59.04
42 - 62	52	205	32.80	91.84
62 - 82	72	41	6.56	98.40
82 - 102	92	10	1.60	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



: Cumulative size frequency curves of microcapsules prepared by spray drying technique using 3:2 ERL:RS as wall material.

- core:wall
- ratio 2:1 mean = 26.93, median = 19.
  - ▲— ratio 1:1 mean = 47.84, median = 28.
  - ◆— ratio 1:2 mean = 38.53, median = 38.

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio 2:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	112	17.92	17.92
22 - 42	32	200	32.00	49.92
42 - 62	52	280	44.80	94.72
62 - 82	72	22	3.52	98.24
82 - 102	92	11	1.76	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio 1:1.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	110	17.60	17.60
22 - 42	32	206	32.96	50.56
42 - 62	52	257	41.12	91.68
62 - 82	72	37	5.92	97.60
82 - 102	92	15	2.40	100.00
Total	-	625	100.00	100.00

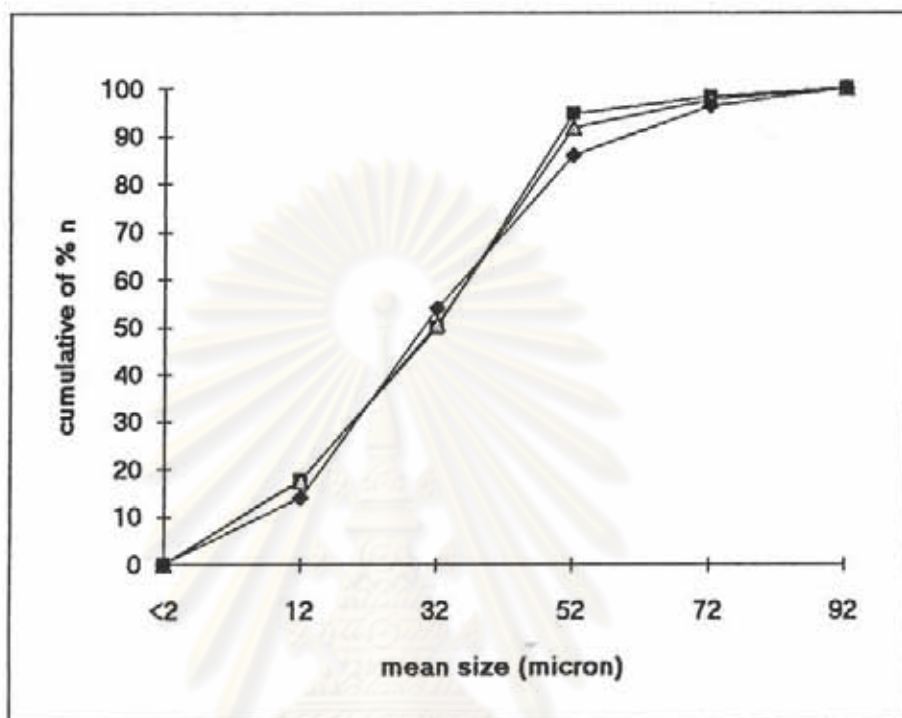
ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Particle size distribution data of 2:3 ERL:RS microcapsules prepared by coacervation technique, core : wall ratio 1:2.

Particle size range	mean size (micron)	n	%n	cumulative of %n
< 2	-	0	0	0
2 - 22	12	88	14.08	14.08
22 - 42	32	249	39.84	53.92
42 - 62	52	200	32.00	85.92
62 - 82	72	64	10.24	96.16
82 - 102	92	24	3.84	100.00
Total	-	625	100.00	100.00

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย





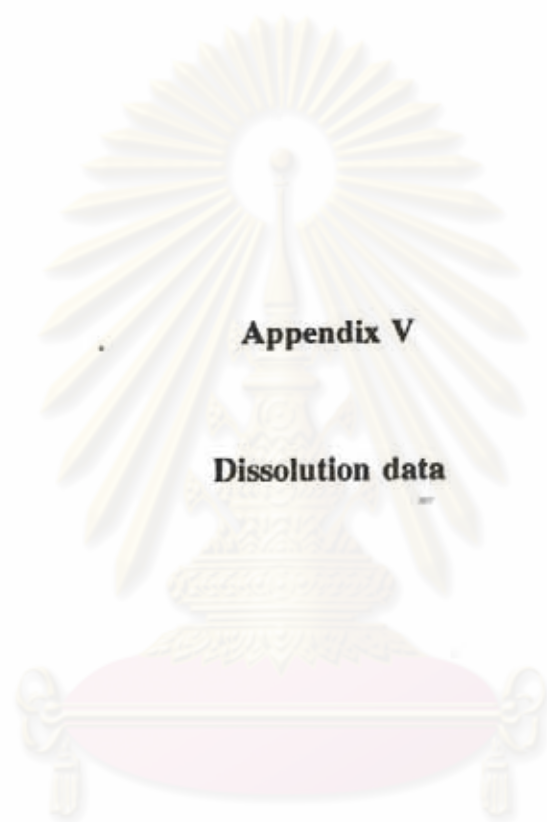
Cumulative size frequency curves of microcapsules prepared by spray drying technique using 2:3 ERL:RS as wall material.

core:wall

—■— ratio 2:1 mean = 39.84, median = 30.

—▲— ratio 1:1 mean = 40.51, median = 32.

—◆— ratio 1:2 mean = 41.98, median = 32.



**Appendix V**

**Dissolution data**

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of cephalexin and microcapsules prepared by  
coacervation technique, in different polymer and core:wall ratios.

Wall type	core:wall ratio	Percentage of cephalexin released at time (hr)											
		0.00	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.00
No wall		0.00	85.60	93.76	95.35	95.29	95.63	95.32	95.35	95.43	95.63	95.49	94.98
EC	2:1	0.00	33.99	43.01	47.74	50.79	61.15	66.55	73.70	79.13	82.77	87.66	91.46
EC	1:1	0.00	32.71	33.11	34.10	35.30	37.81	40.03	44.43	48.38	62.10	68.41	71.83
EC	1:2	0.00	20.51	26.34	29.57	32.91	35.34	38.18	40.66	42.17	45.15	48.05	48.44
3:2 ERL:RS	2:1	0.00	30.97	49.22	68.51	74.09	84.10	90.65	96.20	98.29	97.92	97.69	97.34
3:2 ERL:RS	1:1	0.00	30.03	44.60	59.48	64.97	72.01	75.30	77.90	81.05	82.39	84.51	86.83
3:2 ERL:RS	1:2	0.00	15.56	25.58	34.39	48.00	59.45	61.13	71.08	81.40	86.74	89.14	92.14
2:3 ERL:RS	2:1	0.00	29.36	47.70	57.25	66.49	75.65	79.24	84.39	87.03	85.97	85.69	82.94
2:3 ERL:RS	1:1	0.00	25.75	41.50	56.46	64.02	70.26	72.04	76.03	78.59	81.05	83.19	86.79
2:3 ERL:RS	1:2	0.00	13.28	18.91	21.52	26.56	31.81	48.95	65.47	74.62	82.84	86.16	88.13

จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of cephalexin and microcapsules prepared by fluidization technique, in different polymer and core:wall ratios.

Wall type	core:wall ratio	Percentage of cephalexin released at time (hr)											
		0.00	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.00
No wall		0.00	85.60	93.76	95.35	95.29	95.63	95.32	95.35	95.43	95.63	95.49	94.98
EC	2:1	0.00	57.49	72.51	84.41	92.79	95.20	93.61	91.60	92.62	92.88	91.43	91.92
EC	1:1	0.00	48.93	62.61	69.17	72.48	75.88	79.09	78.11	77.03	76.80	74.88	75.13
EC	1:2	0.00	2.03	6.54	13.06	24.93	33.50	48.57	61.46	70.08	73.29	74.01	74.33
3:2 ERL:RS	2:1	0.00	79.69	94.13	98.74	99.70	98.25	96.06	98.34	98.31	97.66	96.34	98.86
3:2 ERL:RS	1:1	0.00	72.06	85.33	88.90	92.70	98.49	99.00	98.73	99.03	99.00	98.80	99.08
3:2 ERL:RS	1:2	0.00	73.25	80.22	81.78	83.45	90.89	90.77	92.09	90.67	90.77	90.61	92.73
2:3 ERL:RS	2:1	0.00	53.34	80.51	90.53	94.86	97.64	98.00	98.29	98.58	96.72	97.32	98.34
2:3 ERL:RS	1:1	0.00	41.21	71.10	85.12	89.02	92.31	92.26	91.81	91.11	89.55	89.96	89.94
2:3 ERL:RS	1:2	0.00	42.31	70.16	83.90	86.16	84.71	84.57	82.43	81.17	80.17	80.31	80.45

จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of cephalexin and microcapsules prepared by  
spray drying technique, in different polymer and core:wall ratios.

Wall type	core:wall ratio	Percentage of cephalexin released at time (hr)											
		0.00	0.25	0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.00
No wall		0.00	85.60	93.76	95.35	95.29	95.63	95.32	95.35	95.43	95.63	95.49	94.98
EC	2:1	0.00	9.69	15.31	21.06	28.26	41.16	55.15	70.09	76.63	88.12	92.84	96.58
EC	1:1	0.00	7.56	13.43	19.14	28.28	50.73	69.67	74.71	84.02	88.48	93.19	93.05
EC	1:2	0.00	6.89	9.47	32.60	53.07	65.87	76.47	81.49	83.36	83.17	82.75	82.39
3:2 ERL:RS	2:1	0.00	60.20	80.12	88.07	93.04	96.22	94.80	94.43	93.57	93.15	93.12	93.37
3:2 ERL:RS	1:1	0.00	77.12	83.59	90.17	93.23	92.84	91.51	91.48	90.95	90.50	90.95	93.07
3:2 ERL:RS	1:2	0.00	82.72	84.17	88.57	91.92	91.00	89.05	88.71	88.80	89.65	89.88	90.08
2:3 ERL:RS	2:1	0.00	61.96	73.50	78.60	83.98	93.63	92.90	92.04	91.59	91.51	92.10	96.19
2:3 ERL:RS	1:1	0.00	63.86	73.90	78.83	84.05	87.08	83.91	84.49	81.56	79.64	81.93	86.64
2:3 ERL:RS	1:2	0.00	63.78	73.60	76.64	80.08	82.42	79.85	79.18	78.49	77.09	77.82	82.84

จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of EC microcapsules prepared by coacervation technique,

core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	41.08	34.49	28.46	36.00	30.23	33.70	33.99	5.6943	16.75
0.50	43.76	43.53	44.02	43.53	43.53	39.72	43.01	2.9953	6.96
0.75	49.03	49.05	50.03	46.54	46.79	44.98	47.74	2.2867	4.79
1.00	52.79	51.56	51.04	49.80	51.05	48.49	50.79	5.8080	11.44
1.50	65.58	60.84	63.33	59.08	59.33	58.77	61.15	3.5359	5.78
2.00	68.84	65.86	66.34	64.35	67.86	66.03	66.55	3.9676	5.96
3.00	72.10	74.14	75.62	72.88	73.89	73.55	73.70	3.5007	4.75
4.00	76.87	82.42	82.89	77.40	78.40	76.81	79.13	2.8110	3.55
6.00	83.64	83.92	84.14	82.17	81.41	81.32	82.77	2.8642	3.46
8.00	87.40	89.19	89.41	85.93	87.69	86.33	87.66	2.4834	2.83
10.00	89.41	92.70	92.17	90.95	93.71	89.84	91.46	2.4834	2.72

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of EC microcapsules prepared by coacervation technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	34.52	32.24	32.48	32.12	32.64	32.25	32.71	2.7733	0.90
0.50	35.04	32.42	32.79	32.83	32.88	32.68	33.11	2.9046	0.96
0.75	37.80	33.31	33.21	33.73	33.11	33.43	34.10	5.3549	1.82
1.00	40.00	34.33	34.18	35.01	34.04	34.23	35.30	6.5954	2.32
1.50	44.53	36.39	36.20	37.22	36.11	36.41	37.81	8.7689	3.31
2.00	47.65	38.53	37.95	39.55	38.04	38.49	40.03	9.4258	3.77
3.00	55.50	42.52	41.26	43.31	41.56	42.43	44.43	12.3168	5.47
4.00	58.59	45.52	49.96	46.92	43.85	45.46	48.38	11.1721	5.40
6.00	64.28	61.86	68.34	64.52	61.42	52.20	62.10	8.7627	5.44
8.00	68.01	66.38	74.28	68.84	65.76	67.19	68.41	4.5022	3.07
10.00	74.35	68.72	77.45	70.84	69.92	69.69	71.83	4.6930	3.37

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of EC microcapsules prepared by coacervation technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	21.65	20.14	19.66	20.32	20.50	20.80	20.51	0.6747	3.29
0.50	27.66	23.99	26.68	25.01	27.52	27.16	26.34	1.5008	5.70
0.75	30.34	28.50	29.53	27.85	31.21	30.00	29.57	1.2296	4.16
1.00	34.02	30.84	33.38	31.86	33.88	33.51	32.91	1.2748	3.87
1.50	35.35	33.18	34.38	35.54	37.40	36.18	35.34	1.4536	4.11
2.00	39.37	35.69	37.06	39.56	38.40	39.02	38.18	1.5186	3.98
3.00	41.54	38.03	40.74	41.06	41.41	41.20	40.66	1.3207	3.25
4.00	42.38	40.03	42.75	41.57	43.59	42.70	42.17	1.2325	2.92
6.00	46.55	43.55	45.42	43.74	46.27	45.37	45.15	1.2575	2.79
8.00	47.72	46.22	47.93	50.93	48.44	47.04	48.05	1.6092	3.35
10.00	47.89	48.06	48.10	50.93	48.60	47.04	48.44	1.3229	2.73

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	37.27	29.27	25.54	37.43	31.90	24.42	30.97	5.6122	18.12
0.50	55.69	45.96	50.67	52.83	49.46	40.73	49.22	5.2874	10.74
0.75	69.93	64.64	72.44	73.03	70.02	60.99	68.51	4.7265	6.89
1.00	79.14	67.98	77.80	77.39	76.36	65.89	74.09	5.6558	7.63
1.50	89.19	81.66	90.20	86.72	79.96	76.87	84.10	5.3911	6.41
2.00	94.05	88.50	95.72	95.19	86.21	84.26	90.65	4.9615	5.47
3.00	98.57	94.00	99.07	98.10	94.18	93.27	96.20	2.6453	2.74
4.00	99.24	98.00	98.40	99.38	99.14	95.59	98.29	1.4282	1.45
6.00	98.74	96.17	98.74	98.79	98.54	96.53	97.92	1.2227	1.24
8.00	99.24	95.33	99.24	98.01	98.71	95.59	97.69	1.7838	1.82
10.00	99.07	95.00	98.91	97.07	98.12	95.85	97.34	1.6629	1.70

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	29.09	30.75	28.69	29.51	31.88	30.27	30.03	1.1796	3.92
0.50	43.67	44.15	46.59	44.72	43.09	45.36	44.60	1.2543	2.81
0.75	55.58	64.94	59.47	58.60	57.49	60.79	59.48	3.2075	5.39
1.00	63.12	67.95	63.15	66.29	65.02	64.31	64.97	1.8869	2.90
1.50	72.01	71.30	72.02	72.14	73.22	71.35	72.01	0.6941	0.96
2.00	75.53	76.00	73.19	75.99	76.40	74.70	75.30	1.1864	1.57
3.00	80.06	76.83	76.87	77.83	78.24	77.56	77.90	1.1915	1.52
4.00	83.41	80.52	78.54	82.17	80.41	81.24	81.05	1.6651	2.05
6.00	84.25	82.36	80.04	83.34	82.59	81.75	82.39	1.4367	1.74
8.00	85.59	84.88	82.89	85.35	85.10	83.26	84.51	1.1452	1.35
10.00	87.27	86.55	86.90	87.52	86.77	85.94	86.83	0.5569	0.64

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of 3:2 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	14.80	14.34	15.81	14.27	16.38	17.76	15.56	1.3641	8.77
0.50	25.95	23.77	26.16	21.96	26.38	29.25	25.58	2.4885	9.73
0.75	35.37	33.08	36.46	26.57	36.08	38.76	34.39	4.2442	12.34
1.00	45.99	42.59	49.60	49.45	49.46	50.90	48.00	3.1153	6.49
1.50	59.82	58.17	60.10	56.86	60.94	60.82	59.45	1.6126	2.71
2.00	61.02	60.40	61.92	59.27	61.75	62.44	61.13	1.1602	1.90
3.00	70.44	73.35	73.03	68.10	71.25	70.34	71.08	1.9403	2.73
4.00	81.66	83.26	82.73	80.33	80.95	79.45	81.40	1.4454	1.78
6.00	88.89	89.13	85.76	84.95	86.21	85.52	86.74	1.8038	2.08
8.00	89.94	92.37	88.18	89.16	87.62	87.54	89.14	1.8366	2.06
10.00	91.54	93.78	93.30	92.39	90.34	91.47	92.14	1.2764	1.39

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	21.59	33.34	32.94	32.16	26.82	29.33	29.36	4.5438	15.47
0.50	37.93	52.39	52.62	53.04	43.71	46.55	47.70	6.1217	12.83
0.75	48.60	58.74	63.12	63.73	52.40	56.91	57.25	5.9529	10.40
1.00	58.94	68.26	69.13	72.59	63.43	66.61	66.49	4.7681	7.17
1.50	70.61	77.12	78.13	78.77	74.80	74.46	75.65	3.0196	3.99
2.00	75.28	81.80	79.13	82.78	79.81	76.64	79.24	2.8940	3.65
3.00	85.62	88.65	80.13	88.29	82.65	80.98	84.39	3.6774	4.36
4.00	86.28	88.15	86.81	87.62	87.83	85.49	87.03	1.0212	1.17
6.00	85.78	86.64	84.80	87.12	86.66	84.83	85.97	0.9968	1.16
8.00	86.12	86.14	86.30	85.79	86.33	83.49	85.69	1.0981	1.28
10.00	84.78	84.97	84.14	81.78	82.32	79.64	82.94	2.0764	2.50

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	28.56	23.49	25.49	25.81	24.00	27.15	25.75	1.9026	7.39
0.50	48.49	38.04	41.87	39.85	38.05	42.70	41.50	3.9259	9.46
0.75	57.87	55.93	56.74	56.06	54.95	57.24	56.46	1.0404	1.84
1.00	67.09	63.12	62.43	62.74	65.32	63.42	64.02	1.8129	2.83
1.50	70.94	69.80	70.28	70.60	70.34	69.60	70.26	0.4935	0.70
2.00	72.11	72.48	71.96	71.77	71.68	72.28	72.04	0.3063	0.43
3.00	76.47	75.32	73.29	77.95	75.52	77.63	76.03	1.7129	2.25
4.00	80.65	77.49	75.47	80.29	78.03	79.63	78.59	1.9750	2.51
6.00	81.49	79.33	81.15	82.46	79.87	81.97	81.05	1.2142	1.50
8.00	82.66	83.01	83.66	83.80	82.88	83.14	83.19	0.4447	0.53
10.00	87.02	84.68	88.17	87.81	85.89	87.15	86.79	1.2925	1.49

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by coacervation technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	12.57	13.31	11.47	14.48	15.51	12.35	13.28	1.4872	11.20
0.50	18.31	17.97	18.67	20.31	19.97	18.21	18.91	0.9874	5.22
0.75	21.37	20.38	23.41	22.15	20.31	21.47	21.52	1.1625	5.40
1.00	25.66	26.95	30.11	28.57	24.72	23.35	26.56	2.5018	9.42
1.50	32.23	30.66	38.16	30.71	29.63	29.49	31.81	3.2608	10.25
2.00	44.78	51.18	49.57	48.80	49.83	49.52	48.95	2.1848	4.46
3.00	55.66	67.23	67.26	67.57	67.81	67.32	65.47	4.8135	7.35
4.00	68.37	79.28	74.19	74.94	72.69	78.23	74.62	3.9453	5.29
6.00	82.43	83.96	84.27	81.10	82.95	82.32	82.84	1.1642	1.41
8.00	88.57	86.19	85.16	85.88	85.57	85.57	86.16	1.2316	1.43
10.00	90.46	88.64	88.07	86.55	88.16	86.91	88.13	1.3913	1.58

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of EC microcapsules prepared by fluidization technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	%C. V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	62.29	55.51	55.03	58.45	55.93	57.74	57.49	2.6995	4.70
0.50	74.02	71.76	71.99	73.17	72.15	71.95	72.51	0.8937	1.23
0.75	85.21	82.00	88.53	83.37	82.51	84.82	84.41	2.3778	2.82
1.00	92.03	90.74	96.19	92.23	91.21	94.34	92.79	2.0767	2.24
1.50	95.44	92.24	96.19	95.91	95.22	96.18	95.20	1.5012	1.58
2.00	93.94	92.00	95.23	94.07	92.04	94.34	93.61	1.3050	1.39
3.00	88.62	88.00	95.37	92.73	93.38	91.50	91.60	2.8469	3.11
4.00	92.44	93.60	94.41	92.07	93.72	89.50	92.62	1.7590	1.90
6.00	94.49	93.85	93.86	93.40	91.54	90.16	92.88	1.6687	1.80
8.00	88.76	90.87	93.18	91.23	93.55	91.00	91.43	1.7449	1.91
10.00	91.90	91.55	91.26	92.73	92.21	91.84	91.92	0.5154	0.56

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of EC microcapsules prepared by fluidization technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	%C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	51.79	49.64	45.65	49.73	49.27	47.46	48.93	2.1150	4.32
0.50	65.52	63.87	60.01	63.28	61.15	61.85	62.61	1.9965	3.19
0.75	70.70	72.41	64.02	69.13	70.52	68.22	69.17	2.9039	4.20
1.00	74.55	74.76	70.36	72.47	71.70	71.06	72.48	1.8219	2.51
1.50	76.56	76.60	74.37	76.15	75.54	76.08	75.88	0.8361	1.10
2.00	77.73	77.10	83.55	77.99	77.72	80.44	79.09	2.4733	3.13
3.00	79.07	77.27	75.87	79.16	78.39	78.93	78.11	1.3038	1.67
4.00	76.39	78.44	74.53	77.32	78.05	77.42	77.03	1.4079	1.83
6.00	76.06	76.43	79.54	76.15	76.05	76.59	76.80	1.3597	1.77
8.00	75.72	75.43	72.87	76.15	73.37	75.75	74.88	1.3945	1.86
10.00	76.06	75.09	74.53	75.31	74.71	75.08	75.13	0.5355	0.71

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of EC microcapsules prepared by fluidization technique,

core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	2.23	1.62	2.18	2.10	2.15	1.90	2.03	0.2312	11.39
0.50	8.20	5.48	6.31	6.53	6.99	5.71	6.54	0.9814	15.01
0.75	11.75	12.76	15.29	13.11	13.43	12.00	13.06	1.2678	9.71
1.00	21.92	24.33	28.13	24.85	27.53	22.83	24.93	2.4827	9.96
1.50	30.97	33.76	38.46	31.87	34.73	31.20	33.50	2.8466	8.50
2.00	45.80	45.71	53.94	47.77	48.62	49.60	48.57	3.0461	6.27
3.00	61.50	58.03	63.76	60.99	61.67	62.82	61.46	1.9577	3.19
4.00	69.42	66.71	72.95	70.03	70.54	70.85	70.08	2.0413	2.91
6.00	72.38	72.35	75.72	73.21	72.72	73.36	73.29	1.2614	1.72
8.00	73.06	73.25	74.84	74.38	73.72	74.79	74.01	0.7742	1.05
10.00	71.55	75.01	75.09	74.71	75.23	74.36	74.33	1.3945	1.88

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	81.53	81.44	77.49	79.91	79.15	78.60	79.69	1.6017	2.01
0.50	93.65	94.42	94.55	93.44	94.02	94.67	94.13	0.5033	0.53
0.75	97.30	99.85	98.63	98.12	98.70	99.86	98.74	0.9963	1.00
1.00	99.93	99.85	99.89	99.62	99.37	99.53	99.70	0.2271	0.22
1.50	96.71	99.23	99.89	97.12	96.86	99.69	98.25	1.5047	1.53
2.00	93.50	99.02	97.05	95.28	94.86	96.68	96.06	1.9345	2.01
3.00	99.10	98.80	98.63	97.79	96.86	98.86	98.34	0.8513	0.86
4.00	97.15	99.96	99.89	96.95	98.87	97.01	98.31	1.4432	1.46
6.00	96.28	99.23	96.30	98.12	97.03	99.02	97.66	1.3180	1.34
8.00	95.84	97.19	95.86	96.45	96.03	96.68	96.34	0.5343	0.55
10.00	97.09	99.85	98.20	98.79	99.71	99.53	98.86	1.0687	1.08

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C. V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	80.65	64.38	80.50	66.73	71.06	69.04	72.06	6.9638	9.66
0.50	94.56	79.78	90.82	80.47	83.45	82.93	85.33	5.9844	7.01
0.75	96.05	86.21	92.76	83.82	86.63	87.95	88.90	4.5856	5.15
1.00	96.80	86.66	97.25	86.66	94.16	94.65	92.70	4.8243	5.20
1.50	98.74	98.03	99.94	95.54	98.85	99.84	98.49	1.6141	1.63
2.00	99.86	98.18	98.89	97.88	99.69	99.50	99.00	0.8232	0.83
3.00	99.86	97.88	99.94	99.56	97.18	98.00	98.73	1.1908	1.20
4.00	99.19	99.43	99.30	98.89	98.35	99.00	99.03	0.3846	0.38
6.00	98.59	99.52	98.46	99.56	99.52	98.33	99.00	0.5933	0.59
8.00	98.59	98.93	99.04	98.55	99.02	98.67	98.80	0.2213	0.22
10.00	97.18	99.93	99.94	98.22	99.69	99.50	99.08	1.1290	1.13

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C. V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	72.50	74.72	73.54	73.12	72.83	72.82	73.25	0.7989	1.09
0.50	78.52	81.24	80.90	79.47	80.52	80.67	80.22	1.0243	1.27
0.75	82.36	82.25	80.56	81.98	81.35	82.18	81.78	0.6967	0.85
1.00	84.20	82.58	83.74	83.65	83.19	83.35	83.45	0.5512	0.66
1.50	91.88	89.94	90.42	91.01	91.39	90.71	90.89	0.6926	0.76
2.00	90.98	89.94	90.59	90.67	91.05	91.38	90.77	0.4948	0.54
3.00	92.89	91.78	88.92	93.18	93.06	92.71	92.09	1.6310	1.77
4.00	91.38	90.94	88.76	91.51	90.72	90.71	90.67	0.9931	1.09
6.00	90.98	90.61	90.26	91.01	90.89	90.87	90.77	0.2868	0.31
8.00	91.38	90.77	89.09	91.67	91.22	89.54	90.61	1.0571	1.16
10.00	95.56	91.61	89.59	94.35	93.90	91.38	92.73	2.2333	2.40

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of 2:3 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 2:1.

time ( hr )	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	54.38	51.71	49.95	57.40	54.24	52.38	53.34	2.5863	4.85
0.50	75.48	82.37	81.45	85.31	80.07	78.38	80.51	3.3886	4.21
0.75	90.41	93.24	91.27	90.81	88.31	89.14	90.53	1.7231	1.90
1.00	93.94	94.72	96.34	95.35	96.27	92.41	94.84	1.5023	1.58
1.50	97.37	98.39	99.01	96.04	98.94	96.11	97.64	1.3493	1.38
2.00	98.41	98.97	98.84	96.97	97.41	97.39	98.00	0.8480	0.87
3.00	99.04	98.47	98.91	97.38	98.94	96.97	98.29	0.8913	0.91
4.00	99.24	99.08	98.44	97.97	98.35	98.38	98.58	0.4838	0.49
6.00	97.31	98.38	96.04	94.45	98.11	96.04	96.72	1.4909	1.54
8.00	98.44	97.21	98.15	95.39	96.64	98.09	97.32	1.1607	1.19
10.00	99.11	98.94	97.37	98.15	97.39	99.07	98.34	0.8204	0.83

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	41.71	39.55	44.24	40.41	39.93	41.40	41.21	1.7015	4.12
0.50	74.14	67.32	72.67	72.04	70.90	69.50	71.10	2.4280	3.41
0.75	86.68	82.20	86.89	83.58	84.96	86.40	85.12	1.9015	2.23
1.00	89.86	85.55	93.58	86.60	87.98	90.58	89.02	2.9300	3.29
1.50	91.53	92.91	93.24	91.11	92.00	93.09	92.31	0.8928	0.96
2.00	90.86	92.07	92.91	91.62	93.17	92.92	92.26	0.9056	0.98
3.00	91.53	90.57	93.41	91.28	92.33	91.75	91.81	0.9736	1.06
4.00	90.52	91.40	90.90	90.95	91.66	91.25	91.11	0.4056	0.44
6.00	88.18	87.06	89.73	90.44	91.49	90.42	89.55	1.6399	1.83
8.00	89.86	89.06	91.07	89.27	90.99	88.91	89.86	0.9617	1.07
10.00	88.18	90.57	91.07	88.94	90.99	89.91	89.94	1.1717	1.30

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by fluidization technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	47.07	42.61	38.06	43.05	40.86	42.22	42.31	2.9510	6.97
0.50	72.16	71.74	66.66	69.80	71.28	69.32	70.16	2.0396	2.90
0.75	84.37	82.45	85.40	83.68	82.64	84.87	83.90	1.1947	1.42
1.00	87.38	83.63	86.07	87.36	85.48	87.04	86.16	1.4557	1.68
1.50	81.36	85.64	81.39	86.52	86.99	86.38	84.71	2.6224	3.09
2.00	82.19	82.29	84.90	86.36	86.15	85.54	84.57	1.8759	2.21
3.00	81.19	81.28	82.72	82.68	82.98	83.70	82.43	0.9908	1.20
4.00	80.52	80.95	80.88	82.18	81.14	81.36	81.17	0.5657	0.69
6.00	80.02	78.77	79.38	81.01	81.97	79.85	80.17	1.1537	1.43
8.00	80.19	78.94	81.89	80.17	80.47	80.19	80.31	0.9428	1.17
10.00	80.19	78.60	81.39	81.34	80.80	80.36	80.45	1.0277	1.27

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of EC microcapsules prepared by spray drying technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	8.80	10.57	9.10	10.15	10.04	9.50	9.69	0.674679	6.96
0.50	14.16	15.81	14.79	14.83	15.22	17.08	15.31	1.019771	6.65
0.75	19.28	23.10	19.98	20.82	21.32	21.83	21.06	1.357187	6.44
1.00	24.68	32.00	27.17	26.35	28.51	30.87	28.26	2.775058	9.81
1.50	37.07	47.30	40.21	42.24	39.37	40.74	41.16	3.458243	8.40
2.00	50.66	58.90	57.80	54.28	54.76	56.64	55.51	2.951067	5.31
3.00	68.25	72.50	70.64	69.51	68.63	71.03	70.09	1.60215	2.28
4.00	75.45	78.91	77.33	74.86	75.16	78.06	76.63	1.697828	2.21
6.00	89.03	87.30	87.70	88.24	88.70	87.76	88.12	0.655146	0.74
8.00	93.63	92.10	93.21	92.76	92.21	93.12	92.84	0.597103	0.64
10.00	96.23	96.90	97.06	96.44	96.22	96.63	96.58	0.348573	0.36

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of EC microcapsules prepared by spray drying technique,  
core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	7.75	7.78	7.52	7.64	7.42	7.27	7.56	0.1990	2.63
0.50	13.48	13.53	13.41	13.46	13.34	13.39	13.43	0.0694	0.52
0.75	19.64	20.14	19.49	18.46	17.98	19.15	19.14	0.7983	4.17
1.00	27.33	33.18	25.17	28.49	27.68	27.86	28.28	2.6516	9.38
1.50	44.71	52.74	46.25	48.37	66.57	45.76	50.73	8.2636	16.29
2.00	68.12	72.30	69.84	67.92	70.32	69.52	69.67	1.6031	2.30
3.00	75.30	77.65	72.85	74.27	73.00	75.21	74.71	1.7783	2.38
4.00	84.83	84.50	83.22	83.63	83.53	84.41	84.02	0.6444	0.77
6.00	88.51	88.18	87.23	89.31	88.72	88.93	88.48	0.7193	0.81
8.00	93.86	92.69	93.42	92.98	93.23	92.94	93.19	0.4147	0.45
10.00	94.36	91.69	92.75	93.32	92.90	93.28	93.05	0.8731	0.94

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of EC microcapsules prepared by spray drying technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	6.82	6.99	6.92	7.02	6.77	6.85	6.89	0.0976	1.42
0.50	9.26	9.95	9.40	9.53	9.22	9.46	9.47	0.2644	2.79
0.75	38.55	28.20	33.05	30.19	29.38	36.23	32.60	4.1048	12.59
1.00	53.27	53.64	52.79	53.12	52.65	52.92	53.07	0.3586	0.68
1.50	66.31	65.86	66.18	65.50	65.38	66.01	65.87	0.3735	0.57
2.00	76.52	76.74	76.05	77.04	76.09	76.39	76.47	0.3797	0.50
3.00	80.36	82.94	80.74	81.22	81.62	82.08	81.49	0.9337	1.15
4.00	82.71	83.94	82.92	83.73	83.29	83.59	83.36	0.4809	0.58
6.00	83.71	82.44	83.42	82.89	83.63	82.92	83.17	0.4985	0.60
8.00	83.38	82.77	82.75	82.73	82.46	82.41	82.75	0.3436	0.42
10.00	82.71	82.27	82.41	82.06	82.29	82.58	82.39	0.2334	0.28

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by spray drying technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	68.66	54.06	59.85	55.78	57.70	65.18	60.20	5.6551	9.39
0.50	79.87	77.15	80.11	78.19	81.65	83.75	80.12	2.3726	2.96
0.75	89.57	89.21	88.81	85.22	88.35	87.27	88.07	1.6102	1.83
1.00	92.09	93.90	92.83	92.91	93.38	93.12	93.04	0.6066	0.65
1.50	97.09	94.91	95.68	96.59	97.06	95.97	96.22	0.8588	0.89
2.00	91.57	95.91	94.51	95.42	96.06	95.30	94.80	1.6708	1.76
3.00	91.07	97.59	94.17	94.92	95.56	93.29	94.43	2.1972	2.33
4.00	92.08	94.07	95.01	93.41	94.55	92.29	93.57	1.1993	1.28
6.00	91.74	93.40	93.67	92.91	93.88	93.29	93.15	0.7657	0.82
8.00	92.24	93.07	93.00	93.41	94.22	92.79	93.12	0.6612	0.71
10.00	94.08	92.90	93.33	93.08	93.71	93.12	93.37	0.4461	0.48

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by spray drying technique,

core: wall ratio 1:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	77.80	77.72	75.92	76.87	77.36	77.04	77.12	0.6896	0.89
0.50	83.65	84.58	83.79	83.23	82.88	83.39	83.59	0.5842	0.70
0.75	89.33	91.27	90.16	90.76	89.57	89.92	90.17	0.7339	0.81
1.00	93.34	92.11	94.01	93.26	93.58	93.10	93.23	0.6337	0.68
1.50	91.34	92.95	93.50	93.77	92.24	93.26	92.84	0.9062	0.98
2.00	90.84	90.77	92.16	92.76	91.41	91.09	91.51	0.7979	0.87
3.00	89.83	93.45	90.66	90.25	91.57	93.10	91.48	1.5099	1.65
4.00	88.66	93.78	91.66	89.42	90.24	91.93	90.95	1.8755	2.06
6.00	88.50	92.95	92.33	89.08	89.73	90.42	90.50	1.7871	1.97
8.00	89.33	93.78	89.65	91.26	91.74	89.92	90.95	1.6806	1.85
10.00	92.01	94.29	93.34	91.76	92.91	94.10	93.07	1.0478	1.13

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 3:2 ERL:RS microcapsules prepared by spray drying technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	83.17	82.65	81.55	82.18	83.54	83.23	82.72	0.7486	0.90
0.50	84.01	83.99	83.72	84.35	84.71	84.24	84.17	0.3420	0.41
0.75	88.19	88.84	89.08	88.37	88.72	88.25	88.57	0.3578	0.40
1.00	91.70	92.01	92.26	91.54	92.40	91.60	91.92	0.3599	0.39
1.50	91.53	89.00	90.58	91.38	92.07	91.43	91.00	1.0872	1.19
2.00	87.02	88.84	89.08	89.87	90.06	89.42	89.05	1.0963	1.23
3.00	88.36	87.33	88.41	89.04	89.39	89.76	88.71	0.8699	0.98
4.00	88.69	88.67	88.24	88.70	89.06	89.42	88.80	0.4014	0.45
6.00	88.93	89.84	89.41	89.70	90.06	89.93	89.65	0.4140	0.46
8.00	90.53	89.50	89.75	90.04	89.73	89.76	89.88	0.3590	0.40
10.00	90.03	89.17	90.08	90.54	90.06	90.59	90.08	0.5097	0.57

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by spray drying technique,  
core: wall ratio 2:1.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	63.60	60.34	61.66	62.96	60.96	62.26	61.96	1.2224	1.97
0.50	78.30	69.71	72.04	74.33	71.84	74.79	73.50	2.9902	4.07
0.75	83.32	74.73	77.73	79.18	76.52	80.14	78.60	3.0011	3.82
1.00	89.17	81.26	81.91	83.69	83.04	84.82	83.98	2.8382	3.38
1.50	96.02	91.97	92.62	93.39	92.91	94.85	93.63	1.5201	1.62
2.00	93.68	89.96	91.45	94.40	93.41	94.52	92.90	1.8138	1.95
3.00	94.35	90.80	89.94	92.39	92.74	92.01	92.04	1.5420	1.68
4.00	93.52	91.30	91.11	91.22	91.41	91.01	91.59	0.9514	1.04
6.00	93.01	89.96	89.78	92.72	91.74	91.84	91.51	1.3632	1.49
8.00	94.02	91.14	89.44	93.89	92.91	91.17	92.10	1.8112	1.97
10.00	97.53	96.99	94.96	95.06	96.42	96.19	96.19	1.0257	1.07

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



Dissolution data of 2:3 ERL:RS microcapsules prepared by spray drying technique,  
core: wall ratio 1:1.

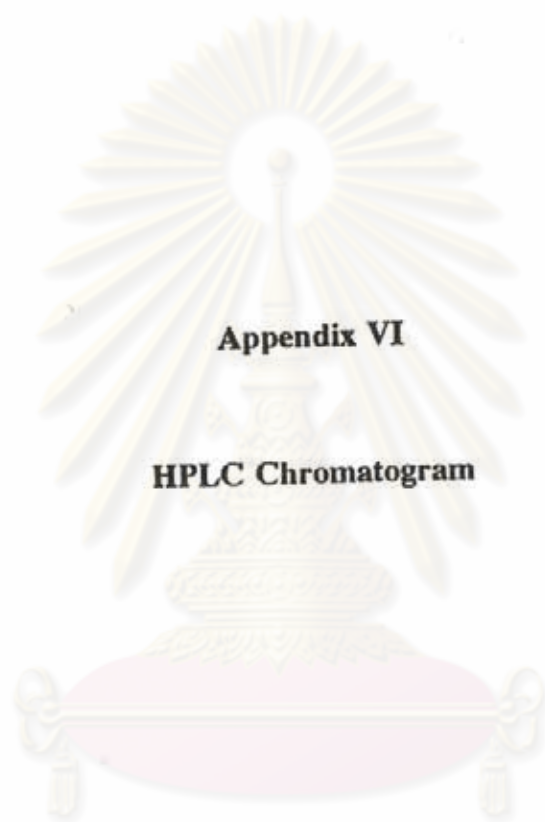
time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0
0.25	65.33	62.98	63.61	63.16	64.81	63.29	63.86	0.9718	1.52
0.50	76.21	71.85	73.48	72.70	74.34	74.83	73.90	1.56447	2.11
0.75	80.06	76.36	79.16	78.22	79.69	79.51	78.83	1.36299	1.72
1.00	84.91	83.22	83.34	84.41	84.71	83.69	84.05	0.72415	0.86
1.50	87.75	86.57	87.35	86.42	87.72	86.70	87.08	0.59816	0.68
2.00	81.90	84.39	82.50	83.74	84.88	86.03	83.91	1.53118	1.82
3.00	80.89	87.57	87.02	84.91	84.04	82.52	84.49	2.57178	3.04
4.00	79.05	82.22	84.34	82.73	80.36	80.68	81.56	1.90010	2.32
6.00	78.22	80.54	80.33	80.89	78.35	79.51	79.64	1.14563	1.43
8.00	79.56	82.38	82.67	83.24	82.70	81.02	81.93	1.3810	1.68
10.00	88.26	85.73	86.68	87.92	85.04	86.20	86.64	1.25067	1.44

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

Dissolution data of 2:3 ERL:RS microcapsules prepared by spray,drying technique,  
core: wall ratio 1:2.

time (hr.)	%Q						Average	SD.	% C.V.
	RUN1	RUN2	RUN3	RUN4	RUN5	RUN6			
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000	0.00
0.25	61.20	68.73	61.68	63.87	64.37	62.84	63.78	2.7120	4.25
0.50	69.74	79.28	71.72	73.91	73.75	73.22	73.60	3.1902	4.33
0.75	72.75	80.78	74.74	77.26	78.10	76.23	76.64	2.7772	3.62
1.00	75.77	83.13	78.59	81.28	81.62	80.08	80.08	2.6036	3.25
1.50	79.12	84.47	81.77	83.95	81.45	83.77	82.42	2.0306	2.46
2.00	77.44	81.62	79.42	81.11	77.94	81.59	79.85	1.8641	2.33
3.00	78.11	80.45	78.42	79.60	79.28	79.25	79.18	0.8384	1.06
4.00	77.11	81.28	77.42	79.10	78.27	77.74	78.49	1.5399	1.96
6.00	76.10	77.43	76.41	77.42	77.10	78.08	77.09	0.7260	0.94
8.00	76.44	78.44	77.92	78.26	78.44	77.41	77.82	0.7809	1.00
10.00	84.31	82.12	82.77	82.45	83.29	82.09	82.84	0.8483	1.02

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย



**Appendix VI**

**HPLC Chromatogram**

ศูนย์วิทยทรัพยากร  
จุฬาลงกรณ์มหาวิทยาลัย

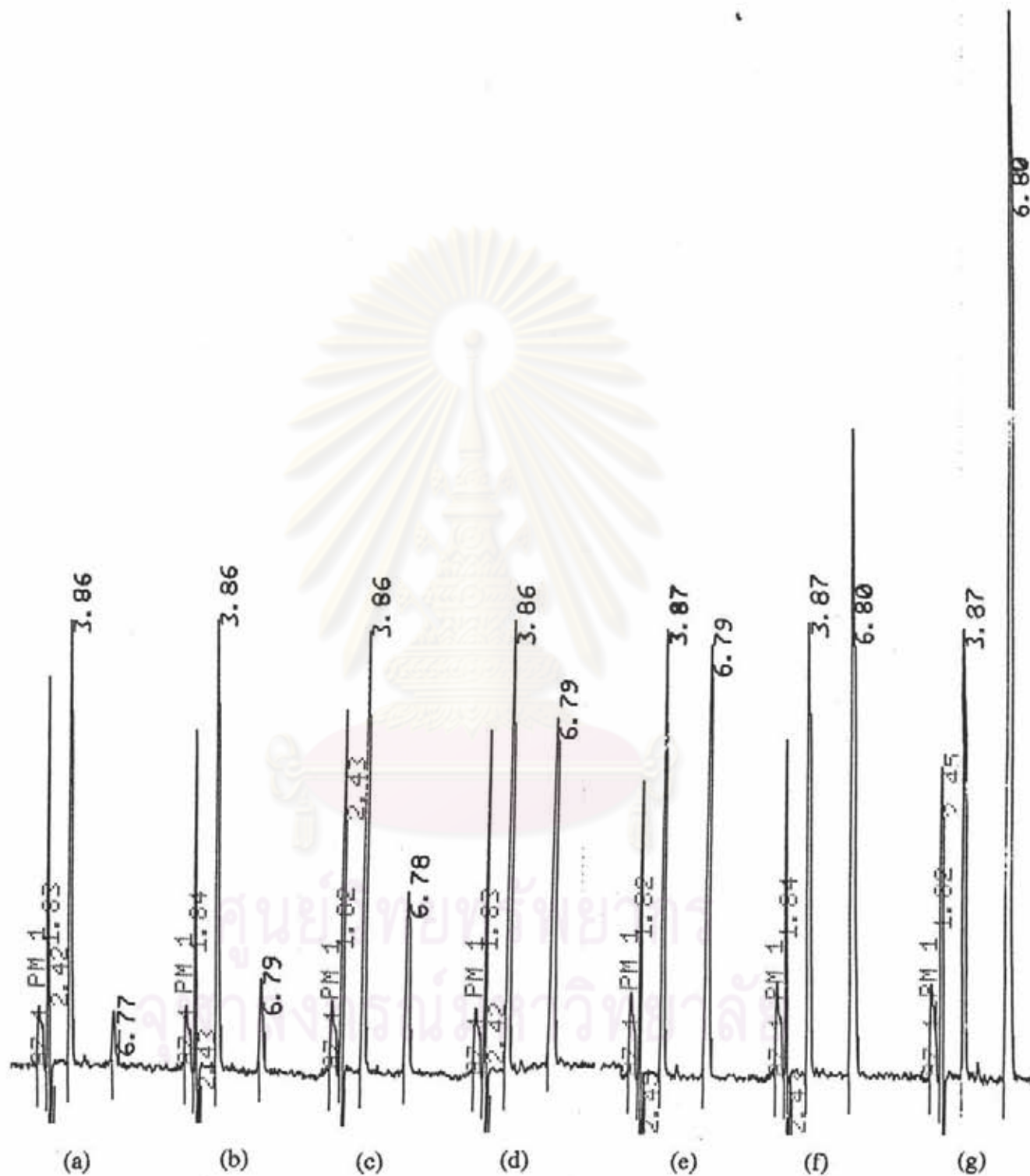


Fig. 136 : HPLC chromatogram of cephalixin standard curve at UV 262 nm,

(a) 0.1  $\mu\text{g/ml}$ , (b) 0.2  $\mu\text{g/ml}$ , (c) 0.4  $\mu\text{g/ml}$ , (d) 0.8  $\mu\text{g/ml}$ ,

(e) 1.0  $\mu\text{g/ml}$ , (f) 1.5  $\mu\text{g/ml}$ , (g) 2.5  $\mu\text{g/ml}$ .

Retention time of pyrazinamide is 3.86 min (internal standard)

Retention time of cephalixin is 6.79 min.



**Appendix VII**

**ANOVA tables**

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	coacervation	fluidization	spray-drying	sum	mean
2:1	35.358	71.183	43.673	150.214	50.07133
1:1	10.884	47.482	47.151	105.517	35.17233
1:2	18.861	41.756	53.422	255.731	85.24367
sum	65.103	160.421	144.246	369.77	
mean	21.701	53.4736667	48.082		41.08556

$$\begin{aligned} \text{correction term} &= (369.77)^2 / 9 \\ &= 15192.2059 \end{aligned}$$

$$\begin{aligned} \text{SS. Total} &= 17773.9681 \\ \text{SS. Block} &= 17839.9366 \\ \text{SS. treatment} &= 1734.52956 \end{aligned}$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	1734.52956	867.264778	-1.926722	6.94
block	2	17839.9366	8919.96829	-19.81667	6.94
residual (error)	4	-1800.498	-450.12451		
Total	8	17773.9681			

Between treatment : Accepted null hypothesis.

Between block : Rejected null hypothesis, there are some difference between block.

Two - way ANOVA test of released rate of ethylcellulose microcapsules.

Duncan's new multiple range test

$$S_x = \sqrt{450.1245/3}$$

$$S_x = 12.2491$$

$$df \text{ error} = 4$$

p-value	2	3
SSR	3.93	4.01
LSR=(SSR)S	48.138963	49.118891

35.1723      50.07134      85.2437

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จุฬาลงกรณ์มหาวิทยาลัย

	coacervation	fluidization	spray-drying	sum
2:1	63.803	99.231	75.015	238.049
1:1	51.375	69.032	71.009	191.416
1:2	42.379	57.788	66.881	429.465
sum	157.557	226.051	212.905	596.513

$$\text{correction term} = (596.513)^2 / 9$$

$$= 39536.4177$$

$$\text{SS. Total} = 2064.03319$$

$$\text{SS. Block} = 53046.1149$$

$$\text{SS. treatment} = 880.849606$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	880.849606	440.424803	-0.033968	6.94
block	2	53046.1149	26523.0574	-2.045627	6.94
residual (error)	4	-51862.931	-12965.733		
Total	8	2064.03319			

Two - way ANOVA test of released rate of ERL:RS 2:3 microcapsules.

จุฬาลงกรณ์มหาวิทยาลัย

	coacervation	fluidization	spray-drying	sum
2:1	64.849	119.035	95.726	279.61
1:1	59.561	94.417	94.061	248.039
1:2	46.919	71.138	91.614	527.649
sum	171.329	284.59	281.401	737.32

$$\begin{aligned} \text{correction term} &= (732.32)^2 / 9 \\ &= 60404.5314 \end{aligned}$$

$$\text{SS. Total} = 4098.34666$$

$$\text{SS. Block} = 78968.3236$$

$$\text{SS. treatment} = 2772.67434$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	2772.67434	1386.33717	-0.071421	6.94
block	2	78968.3236	39484.1618	-2.034148	6.94
residual (error)	4	-77642.651	-19410.663		
Total	8	4098.34666			

√Two - way ANOVA test of released rate of ERL:RS 3:2 microcapsules.

core:wall 2:1	coacervation	fluidization	spray-drying	sum	mean
ethylcellulose	35.358	71.183	43.673	150.214	50.07133
ERL:RS 3:2	64.849	119.035	95.726	279.61	93.20333
ERL:RS 2:3	63.803	99.231	75.015	429.824	143.2747
sum	164.01	289.449	214.414	667.873	
mean	54.67	96.483	71.4713333		74.20811

$$\begin{aligned} \text{correction term} &= (667.873)^2 / 9 \\ &= 49561.5938 \end{aligned}$$

$$\begin{aligned} \text{SS. Total} &= 55307.5941 \\ \text{SS. Block} &= 79972.6837 \\ \text{SS. treatment} &= 37025.5831 \end{aligned}$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	37025.5831	18512.7916	-1.200362	6.94
block	2	79972.6837	39986.3419	-2.592699	6.94
residual (error)	4	-61690.673	-15422.668		
Total	8	55307.5941			

Between treatment : Accepted null hypothesis.

Between block : Accepted null hypothesis.

Two - way ANOVA test of released rate of core:wall ratio 2:1 microcapsules.



core:wall 1:1	coacervation	fluidization	spray-drying	sum	mean
ethylcellulose	10.884	47.482	47.151	105.517	35.17233
ERL:RS 3:2	59.561	94.417	94.061	248.039	82.67967
ERL:RS 2:3	51.375	69.032	71.009	353.556	117.852
sum	121.82	210.931	212.221	544.972	
mean	40.6066667	70.3103333	70.7403333		60.55244

$$\begin{aligned} \text{correction term} &= (544.972)^2 / 9 \\ &= 32999.3868 \end{aligned}$$

$$\begin{aligned} \text{SS. Total} &= 38352.8586 \\ \text{SS. Block} &= 50694.1367 \\ \text{SS. treatment} &= 19597.7114 \end{aligned}$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	19597.7114	9798.85572	-1.227197	6.94
block	2	50694.1367	25347.0684	-3.174436	6.94
residual (error)	4	-31938.99	-7984.7474		
Total	8	38352.8586			

Between treatment : Accepted null hypothesis.

Between block : Accepted null hypothesis.

Two - way ANOVA test of released rate of core:wall ratio 1:1 microcapsules.

core:wall 1:2	coacervation	fluidization	spray-drying	sum	mean
ethylcellulose	18.861	41.756	53.422	114.039	38.013
ERL:RS 3:2	46.919	71.138	91.614	209.671	69.89033
ERL:RS 2:3	42.379	57.788	66.881	323.71	107.9033
sum	108.159	170.682	211.917	490.758	
mean	36.053	56.894	70.639		54.52867

$$\text{correction term} = (490.758)^2 / 9$$

$$= 26760.3794$$

$$\text{SS. Total} = 30216.8443$$

$$\text{SS. Block} = 38726.1227$$

$$\text{SS. treatment} = 13387.6372$$

source	df	SS.	MS	F	f 0.05(2,4)
treatment	2	13387.6372	6693.8186	-1.222787	6.94
block	2	38726.1227	19363.0614	-3.53713	6.94
residual (error)	4	-21896.916	-5474.2289		
Total	8	30216.8443			

Between treatment : Accepted null hypothesis.

Between block : Accepted null hypothesis.

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Two - way ANOVA test of released rate of core:wall ratio 1:2 microcapsules.

## VITA

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ศูนย์วิทยทรัพยากร  
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