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APPENDICES

APPENDIX I

SOURCE PROGRAM OF *SizeCalc* FOR AVERAGE PARTICLE SIZE CALCULATION

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10 ' *****
20 ' ** **
30 ' ** Program for Measurement of Particle Size **
40 ' ** **
50 ' ** 400-600 nanometers-Turbidity Method **
60 ' ** **
70 ' *****
80 CLS: CLEAR: PRINT " ***** Measurement of Particle Size *****"
90 LOCATE 4,6: INPUT "Sample No. "; S$: PRINT
100 LOCATE 6,6: PRINT "00000 Transmition (%) 00000"
110 LOCATE 10,6: INPUT "400 nm (%)"; D1
120 LOCATE 12,6: INPUT "450 nm (%)"; D2
130 LOCATE 14,6: INPUT "500 nm (%)"; D3
140 LOCATE 16,6: INPUT "550 nm (%)"; D4
150 LOCATE 18,6: INPUT "600 nm (%)"; D5
160 CLS: PRINT "***** Data *****"
170 PRINT
180 PRINT "(1) 400 nm ", D1; "%"
190 PRINT
200 PRINT "(2) 450 nm ", D2; "%"
210 PRINT
220 PRINT "(3) 500 nm ", D3; "%"
230 PRINT
240 PRINT "(4) 550 nm ", D4; "%"
250 PRINT
260 PRINT "(5) 600 nm ", D5; "%"
270 PRINT
280 PRINT "(6) Measurement is right, start to calculate"
290 PRINT
300 PRINT
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310 INPUT "Select number of data to change ( 1, 2, 3, 4, 5 and 6 for
      calculation )";T
320 ON T GOTO 340,350,360,370,380,390
330 GOTO 310
340 INPUT "400 nm (%)";D1:GOTO 160
350 INPUT "450 nm (%)";D2:GOTO 160
360 INPUT "500 nm (%)";D3:GOTO 160
370 INPUT "550 nm (%)";D4:GOTO 160
380 INPUT "600 nm (%)";D5:GOTO 160
390 X1=LOG(400)/LOG(10):X2=LOG(450)/LOG(10):X3=LOG(500)/LOG(10):
      X4=LOG(550)/LOG(10):X5=LOG(600)/LOG(10)
400 Y1=LOG(100-D1)/LOG(10):Y2=LOG(100-D2)/LOG(10):Y3=LOG(100-D3)/LOG(10):
      Y4=LOG(100-D4)/LOG(10):Y5=LOG(100-D5)/LOG(10)
410 LPRINT TAB(6);"Sample No.";TAB(16);S$:LPRINT
420 LPRINT TAB(6);"Wave Length";TAB(20);"400 nm";TAB(29);"450 nm";TAB(38);
      "500 nm";TAB(47);"550 nm";TAB(56);"600 nm"
430 LPRINT TAB(6);"Transmittance";TAB(20);D1;"%";TAB(29);D2;"%";TAB(38);
      D3;"%";TAB(47);D4;"%";TAB(56);D5;"%":LPRINT
440 XS1=X1^2:XS2=X2^2:XS3=X3^2:XS4=X4^2:XS5=X5^2
450 XY1=X1*Y1:XY2=X2*Y2:XY3=X3*Y3:XY4=X4*Y4:XY5=X5*Y5
460 WX=X1+X2+X3+X4+X5
470 XS=XS1+XS2+XS3+XS4+XS5
480 WY=Y1+Y2+Y3+Y4+Y5
490 WXY=XY1+XY2+XY3+XY4+XY5
500 MX=WX/5:MY=WY/5
510 XX=(X1-MX)^2+(X2-MX)^2+(X3-MX)^2+(X4-MX)^2+(X5-MX)^2
520 YY=(Y1-MY)^2+(Y2-MY)^2+(Y3-MY)^2+(Y4-MY)^2+(Y5-MY)^2
530 XY=(X1-MX)*(Y1-MY)+(X2-MX)*(Y2-MY)+(X3-MX)*(Y3-MY)+(X4-MX)*(Y4-MY)+
      (X5-MX)*(Y5-MY)
540 N=5:GOSUB 2000
550 LPRINT TAB(6);"400-450-500-550-600 nm";TAB(30);:LPRINT USING "#.#####
      microns";DIA;:
555 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";
      A:LPRINT
560 WX=X1+X2+X3+X4
570 XS=XS1+XS2+XS3+XS4

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580 WY=Y1+Y2+Y3+Y4
590 WXY=XY1+XY2+XY3+XY4
600 MX=W $X$ /4:MY=W $Y$ /4
610 XX=(X1-MX)2+(X2-MX)2+(X3-MX)2+(X4-MX)2
620 YY=(Y1-MY)2+(Y2-MY)2+(Y3-MY)2+(Y4-MY)2
630 XY=(X1-MX)*(Y1-MY)+(X2-MX)*(Y2-MY)+(X3-MX)*(Y3-MY)+(X4-MX)*(Y4-MY)
640 N=4:GOSUB 2000
650 LPRINT TAB(6);"400-450-500-550      nm";TAB(30);:LPRINT USING "#.#####
microns";DIA;:
655 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";A
660 WX=X1+X2+X3+X5
670 XS=XS1+XS2+XS3+XS5
680 WY=Y1+Y2+Y3+Y5
690 WXY=XY1+XY2+XY3+XY5
700 MX=W $X$ /4:MY=W $Y$ /4
710 XX=(X1-MX)2+(X2-MX)2+(X3-MX)2+(X5-MX)2
720 YY=(Y1-MY)2+(Y2-MY)2+(Y3-MY)2+(Y5-MY)2
730 XY=(X1-MX)*(Y1-MY)+(X2-MX)*(Y2-MY)+(X3-MX)*(Y3-MY)+(X5-MX)*(Y5-MY)
740 N=4:GOSUB 2000
750 LPRINT TAB(6);"400-450-500-      600 nm";TAB(30);:LPRINT USING "#.#####
microns";DIA;:
755 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING" A= +#.#####";A
760 WX=X1+X2+X4+X5
770 XS=XS1+XS2+XS4+XS5
780 WY=Y1+Y2+Y4+Y5
790 WXY=XY1+XY2+XY4+XY5
800 MX=W $X$ /4:MY=W $Y$ /4
810 XX=(X1-MX)2+(X2-MX)2+(X4-MX)2+(X5-MX)2
820 YY=(Y1-MY)2+(Y2-MY)2+(Y4-MY)2+(Y5-MY)2
830 XY=(X1-MX)*(Y1-MY)+(X2-MX)*(Y2-MY)+(X4-MX)*(Y4-MY)+(X5-MX)*(Y5-MY)
840 N=4:GOSUB 2000
850 LPRINT TAB(6);"400-450-      550-600 nm";TAB(30);:LPRINT USING "#.#####
microns";DIA;:
855 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";A
860 WX=X1+X3+X4+X5
870 XS=XS1+XS3+XS4+XS5

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880 WY=Y1+Y3+Y4+Y5
890 WXY=XY1+XY3+XY4+XY5
900 MX=WX/4:MY=WY/4
910 XX=(X1-MX)^2+(X3-MX)^2+(X4-MX)^2+(X5-MX)^2
920 YY=(Y1-MY)^2+(Y3-MY)^2+(Y4-MY)^2+(Y5-MY)^2
930 XY=(X1-MX)*(Y1-MY)+(X3-MX)*(Y3-MY)+(X4-MX)*(Y4-MY)+(X5-MX)*(Y5-MY)
940 N=4:GOSUB 2000
950 LPRINT TAB(6);"400-      500-550-600 nm";TAB(30);:LPRINT USING "#.#####
      microns";DIA;:
955 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";A
960 WX=X2+X3+X4+X5
970 XS=XS2+XS3+XS4+XS5
980 WY=Y2+Y3+Y4+Y5
990 WXY=XY2+XY3+XY4+XY5
1000 MX=WX/4:MY=WY/4
1010 XX=(X2-MX)^2+(X3-MX)^2+(X4-MX)^2+(X5-MX)^2
1020 YY=(Y2-MY)^2+(Y3-MY)^2+(Y4-MY)^2+(Y5-MY)^2
1030 XY=(X2-MX)*(Y2-MY)+(X3-MX)*(Y3-MY)+(X4-MX)*(Y4-MY)+(X5-MX)*(Y5-MY)
1040 N=4:GOSUB 2000
1050 LPRINT TAB(6);"      450-500-550-600 nm";TAB(30);:LPRINT USING "#.#####
      microns";DIA;:
1055 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";
      A:LPRINT
1060 WX=X1+X2+X3
1070 XS=XS1+XS2+XS3
1080 WY=Y1+Y2+Y3
1090 WXY=XY1+XY2+XY3
1100 MX=WX/3:MY=WY/3
1110 XX=(X1-MX)^2+(X2-MX)^2+(X3-MX)^2
1120 YY=(Y1-MY)^2+(Y2-MY)^2+(Y3-MY)^2
1130 XY=(X1-MX)*(Y1-MY)+(X2-MX)*(Y2-MY)+(X3-MX)*(Y3-MY)
1140 N=3:GOSUB 2000
1150 LPRINT TAB(6);"400-450-500      nm";TAB(30);:LPRINT USING "#.#####
      microns";DIA;:
1155 LPRINT TAB(50);USING " R= +#.#####";R;:LPRINT USING " A= +#.#####";A
1160 WX=X3+X4+X5

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APPENDIX II

SIZE DISTRIBUTION DETERMINATION BY ULTRACENTRIFUGE

General Principle

The principle combines the sedimentation and photometric methods, so analysis is based on Stokes' law and the proportional relationship between absorbance and particle concentration.

The relationship between terminal velocity and particle size under gravity is expressed by Stokes' equation in the following manner

:-

$$V = \frac{H}{T} = \frac{g (\delta p - \delta l)}{18 \eta} \cdot d_x^2 \dots\dots \text{Eq. (1)}$$

Where

- d_x = Particle diameter (cm)
- V = Terminal velocity of the particle with size d_x (cm/sec)
- H = Sedimentation distance
- T = Time required for H (cm) sedimentation (sec)
- g = Gravitational acceleration (cm/sec²)
- δp = Particle density (g/cm³)
- δl = Medium density (g/cm³)
- η = Medium viscosity (g/cm·sec)

Since g , δp , δl and η are constants that depend upon the sample, equation (1) can be converted as follows :-

$$T = k \cdot \frac{H}{d_x^2} \dots\dots \text{Eq. (2)}$$

Where

$$K = \frac{18 \eta}{g (\delta p - \delta l)}$$

The centrifugal force which applied to the particles will change in accordance with particle movement. Therefore equation (1) can be converted as follows :-

$$V = \frac{dR}{dT} = \frac{R\epsilon^2 (\delta p - \delta l)}{18 \pi} \cdot d_x \dots\dots \text{Eq. (3)}$$

Where

dR = Short distance of particle movement (cm)

dT = Time required for traversing dR (sec)

R = Distance between center of rotation and position of particle

ϵ = Angular velocity (rad/sec)

Equation (3) is integrated according with particle movement and changed as follow :-

$$T = \frac{1.05 \pi}{N^2 (\delta p - \delta l)} \log \frac{R_2}{R_1} \cdot \frac{1}{d_x^2} \dots\dots \text{Eq. (4)}$$

Where

N = Cell revolution (r.p.s.)

R_1 = Distance between center of rotation and initial position of particle (cm)

R_2 = Distance between center of rotation and initial position of particle after movement (cm)

Since the first term on the right side of equation (4) is composed entirely of constants,

$$T = k' \cdot \log \frac{R_2}{R_1} \cdot \frac{1}{d_x^2} \dots\dots \text{Eq. (5)}$$

Where

$$k' = \frac{1.05 \pi}{N^2 (\delta p - \delta l)}$$

If the sedimentation distance of the particle is fixed by equations (2) and (5), particle diameter can easily be determined by measuring the time required for the particles to move that distance (Figure 6). With a powder consisting, for example, of particles of sizes d_1 , d_2 , d_3 where $d_1 < d_2 < d_3$. The powder is dispersed in an appropriate medium and placed in the sedimentation cell. It is then stirred so that d_1 , d_2 , d_3 sized particles are present in the same proportion at every position in the cell. Particle concentration is detected by the optical system at distance H from surface. During centrifugal sedimentation by rotation, surface is R_1 , and the point of detection is distance R_2 from the center of rotation. (Thus $R_1 - R_2 = H$) Let us consider sedimentation under gravitational force and centrifugal force, assuming the above conditions. At the start of sedimentation ($T = 0$), d_1 , d_2 , and d_3 particles exist at the point of detection. At T_1 , after the start of sedimentation ($T = T_1$), all d_3 particles have subsided below the point of detection and only d_1 and d_2 particles remain. This means that d_3 particles that were initially just under the surface have subsided below the point of detection. Therefore d_3 particle size can be calculated by applying T_1 in equations (2) or (5). Particles detected will consist solely of d_2 and d_1 particles; the amount of particles identified by the photometric method is therefore the amount of particles smaller than d_3 , i.e., the amount of d_2 and d_1 particles.

When the elapsed time is T_2 ($T = T_2$), d_2 particles are also below the point of detection. The size of particles d_2 can be calculated by applying T_2 in equations (2) and (5), as in the case of d_3 . The amount of particles identified is thus equivalent to the amount of particles smaller than d_2 , i.e., the amount of d_1 particles.

When the elapsed time is T_3 ($T = T_3$), d_1 particles are also below, that is, no particles are present at, the point of detection. The

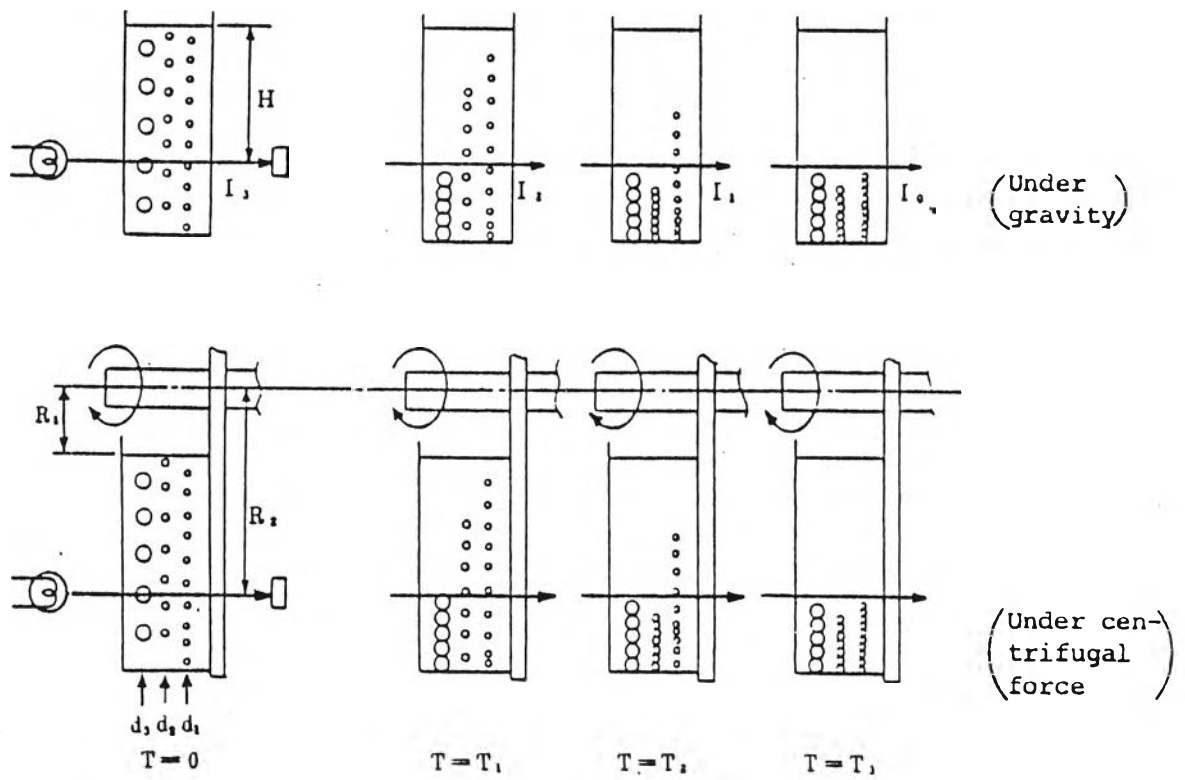


Figure 6 Principles for Sedimentation Analysis.

size of particles d_1 can also be calculated by equations (2) and (5).

Thus, the size of particles can be calculated from the sedimentation time, and the corresponding amount of particles is obtained by the photometric method.

The photometric method utilizes the phenomenon in which particles obscure detectable light and emergent light increases as the amount of particles decreases. The principle of this method is based on the following equation showing the relationship between light absorbance and particle size and its quantity :-

$$\ln \frac{I_0}{I_n} = K_{O1} \sum_{x=1}^n K_x N_x D_x^2 \quad \dots \text{Eq. (6)}$$

Where

- d_x = Particle diameter
- K_{O1} = Factor depending on cell and particle shape
- K_x = Efficiency of d_x particles obscuring light
- N_x = Concentration of d_x particles by number
- I_0 = Intensity of incident light
- I_n = Intensity of emergent light

Equation (6) shows the case in which $d_1, d_2, d_3 \dots d_n$ particles are present in the light path. When d_n particles subside below the point of detection as explained above, i.e. d_n particles are not present in the light path, equation (6) can be reduced as follows :-

$$\ln \frac{I_0}{I_{n-1}} = K_{O1} \sum_{x=1}^{n-1} K_x N_x D_x^2 \quad \dots \text{Eq. (7)}$$

Changes in the light absorbance are the difference between equations (6) and (7).

$$\ln \frac{I_{n-1}}{I_n} = \Delta \ln I_n = K_{O1} K_n N_n D_n^2 \dots \text{Eq. (8)}$$

This shows how much light is obscured by d_n particles. On the other hand, the quantity of d_n particles, N_n , can be identified by analyzing the difference in the light absorbance $\Delta \ln I_n$. Of course in this case K_{O1} , K_n , d_n must be known, but d_n can be calculated by equations (2) or (5) and K_{O1} , K_n can be derived from measurement of standard sample. Changes in light absorbance when d_{n-1} particles subside from particle groups $d_{n-1} \sim d_1$ and not present in the light paths are determined by the following equation :-

$$\ln \frac{I_{n-2}}{I_{n-1}} = \Delta \ln I_{n-1} = K_{O1} K_{n-1} N_{n-1} D_n^2 \dots \text{Eq. (9)}$$

In a similar manner, other particles, $d_{n-2} \dots d_2$, will subside in order, and finally d_1 will subside, resulting in the following equation :-

$$\ln \frac{I_0}{I_1} = \Delta \ln I_1 = K_{O1} K_1 N_1 D_1^2 \dots \text{Eq. (10)}$$

Thus, the quantity of $d_n, d_{n-1} \dots, d_1$ particles, N_x , can be calculated by analyzing changes in light absorbance. In general, the particle size distribution can be expressed by weight. Therefore, conversion into a weight basis is explained following, and a similar procedure can be used when employing other standards (e.g., area basis).

The relationship between number concentration (N_x) and weight concentration (W_x) is :-

$$N_x = \frac{W_x}{\frac{\pi}{6} d_x^3} \dots \text{Eq. (11)}$$

Applying this relationship to equations (8) ~ (10),

$$\ln \frac{I_{n-1}}{I_n} = \hat{\ln} I_n = K_{O1} K_n \phi \frac{W_n}{d_n} \quad \dots \text{Eq. (8')}$$

$$\ln \frac{I_{n-2}}{I_{n-1}} = \hat{\ln} I_{n-1} = K_{O1} K_{n-1} \phi \frac{W_{n-1}}{d_{n-1}} \quad \dots \text{Eq. (9')}$$

$$\ln \frac{I_0}{I_1} = \hat{\ln} I_1 = K_{O1} K_1 \phi \frac{W_1}{d_1} \quad \dots \text{Eq. (10')}$$

For all particles from d_n to d_1 ,

$$\ln \frac{I_0}{I_n} = \sum_{x=1}^n \hat{\ln} I_x = K_{O1} K_1 \sum_{x=1}^n \phi \frac{W_x}{d_x} \quad \dots \text{Eq. (12)}$$

Therefore, the weight fraction of d_n particles to the weight of particles $d_n \dots d_1$ (F_{wn}) can be calculated using equations (8') and (12') as follows :-

$$F_{wn} = \frac{W_n}{\sum_{x=1}^n W_x} = \frac{(d_n / K_n) \cdot \hat{\ln} I_n}{\sum_{x=1}^n \{ (d_x / K_x) \cdot \hat{\ln} I_x \}} \quad \dots \text{Eq. (13)}$$

For $d_{n-1} \dots d_1$, in the same manner,

$$F_{wn-1} = \frac{(d_{n-1} / K_{n-1}) \cdot \hat{\ln} I_{n-1}}{\sum_{x=1}^n \{ (d_x / K_x) \cdot \hat{\ln} I_x \}} \quad \dots \text{Eq. (13)}$$

$$F_{w1} = \frac{(d_1 / K_1) \cdot \hat{\ln} I_1}{\sum_{x=1}^n \{ (d_x / K_x) \cdot \hat{\ln} I_x \}} \quad \dots \text{Eq. (13)}$$

Particle Concentration Calculating Method

In actual calculation, d_n , d_{n-1} , d_1 in equation (13) are averaged with the next smaller particle diameter (Figure 7). Thus,

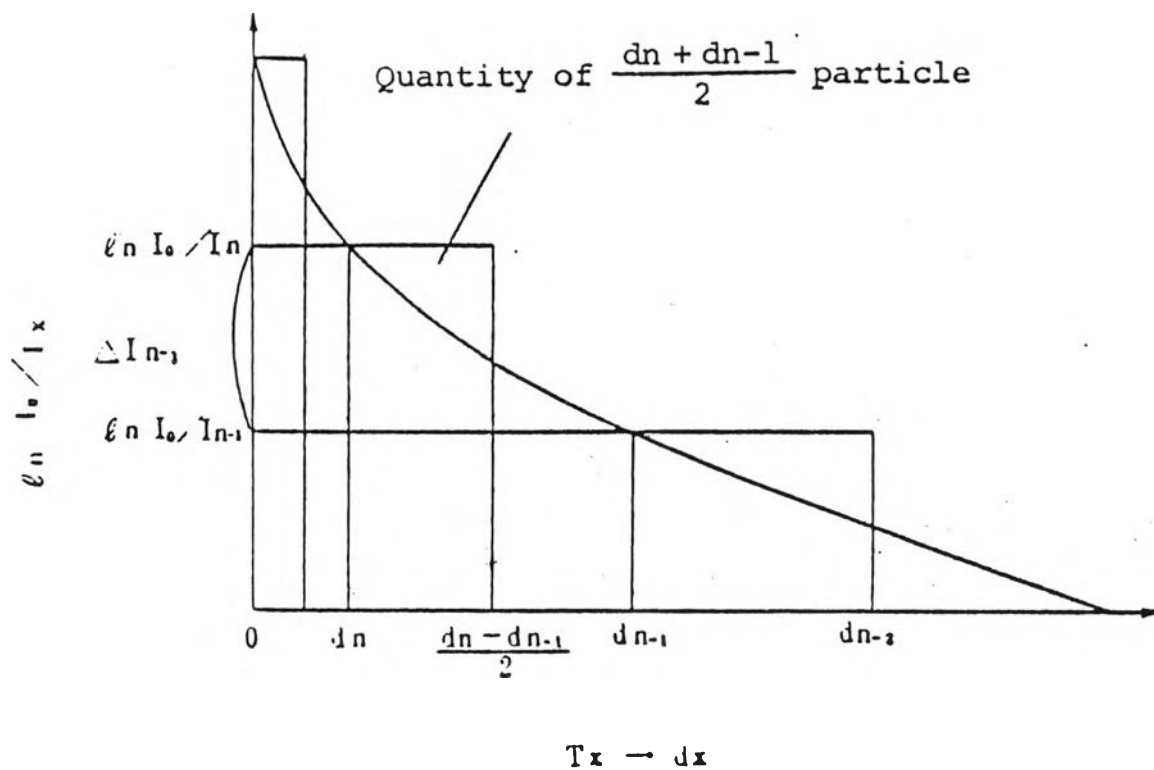


Figure 7 Method for Calculating Particle Concentration.

In stead of d_n , $(d_n + d_{n-1}) / 2$
 In stead of d_{n-1} $(d_{n-1} + d_{n-2}) / 2$
 In stead of d_1 , $(d_1 + d_0) / 2$

Where

$$d_n > d_{n-1} > d_{n-2} \dots\dots d_1, d_0 = 0$$

Generalizing equation (13),

$$F_{wx} = \frac{(d_x / \bar{K}_x) \cdot \bar{\ln} I_x}{\sum_{x=1}^n \{ (\bar{d}_x / \bar{K}_x) \cdot \bar{\ln} I_x \}} \dots\dots \text{Eq. (14)}$$

Where

- \bar{d}_x = Average between d_x and d_{x-1}
- \bar{K}_x = Extinction coefficient for \bar{d}_x particles

Particle size distribution is often expressed in cumulative form. The cumulative oversize fraction (R_{wx}) by weight can be calculated by the following equation :-

$$F_{wx} = \frac{\sum_{x=x}^n (d_x / K_x) \cdot \ln I_x}{\sum_{x=1}^n \{ (\bar{d}_x / \bar{K}_x) \cdot \ln I_x \}} \dots\dots \text{Eq. (15)}$$

$x = n, n-1, n-2 \dots\dots 2, 1$
 $d_n > d_{n-1} > d_{n-2} > \dots\dots d_2 > d_1$

Thus, particle size distribution can be obtained by reading the extinction coefficient curve, calculating particle diameter from elapsed time using equations (2) or (5) and calculating particle concentration from absorbance changes using equation (15). Those models are automatically calculated by the microcomputer which links to the analyzer as on Figure 2.



APPENDIX III

PARTICLE SIZE DISTRIBUTION DATA OF SECTION 2.8 - 2.13

Table series 69 Particle Size Distribution of SDP020/030-SDP100/030.

Dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules using poly(vinyl alcohol), 7.5 % of the total oil phase, as emulsifier; the homogenizing time at 30 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 69-1 Particle Size Distribution of SDP020/030.

2,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : SDP020/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	22.7	22.70	1475.50
50.00	55.00	42.5	19.80	1089.00
40.00	45.00	59.4	16.90	760.50
30.00	35.00	73.5	14.10	493.50
20.00	25.00	87.2	13.70	342.50
10.00	15.00	96.6	9.40	141.00
8.00	9.00	98.1	1.50	13.50
6.00	7.00	100.0	1.90	13.30
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				43.29

Table 69-2 Particle Size Distribution of SDP040/030.

4,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : SDP040/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	9.4	9.40	611.00
50.00	55.00	21.2	11.80	649.00
40.00	45.00	35.0	13.80	621.00
30.00	35.00	52.4	17.40	609.00
20.00	25.00	70.2	17.80	445.00
10.00	15.00	90.3	20.10	301.50
8.00	9.00	93.5	3.20	28.80
6.00	7.00	96.4	2.90	20.30
5.00	5.50	97.5	1.10	6.05
4.00	4.50	98.6	1.10	4.95
3.00	3.50	100.0	1.40	4.90
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				33.02

Table 69-3 Particle Size Distribution of SDP060/030.

6,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : SDP060/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.5	4.50	292.50
50.00	55.00	8.8	4.30	236.50
40.00	45.00	13.7	4.90	220.50
30.00	35.00	25.8	12.10	423.50
20.00	25.00	46.1	20.30	507.50
10.00	15.00	76.3	30.20	453.00
8.00	9.00	82.1	5.80	52.20
6.00	7.00	88.7	6.60	46.20
5.00	5.50	91.8	3.10	17.05
4.00	4.50	94.9	3.10	13.95
3.00	3.50	97.6	2.70	9.45
0.00	1.50	100.0	2.40	3.60
Average Particle Size (μm)				22.76

Table 69-4 Particle Size Distribution of SDP080/030.

8,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : SDP080/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.3	4.30	279.50
50.00	55.00	7.3	3.00	165.00
40.00	45.00	12.8	5.50	247.50
30.00	35.00	19.0	6.20	217.00
20.00	25.00	34.2	15.20	380.00
10.00	15.00	63.2	29.00	435.00
8.00	9.00	71.1	7.90	71.10
6.00	7.00	80.6	9.50	66.50
5.00	5.50	85.3	4.70	25.85
4.00	4.50	90.9	5.60	25.20
3.00	3.50	95.6	4.70	16.45
0.00	1.50	100.0	4.40	6.60
Average Particle Size (μm)				19.36

Table 69-5 Particle Size Distribution of SDP100/030.

10,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : SDP100/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.1	2.10	136.50
50.00	55.00	5.6	3.50	192.50
40.00	45.00	11.5	5.90	265.50
30.00	35.00	15.1	3.60	126.00
20.00	25.00	26.4	11.30	282.50
10.00	15.00	53.6	27.20	408.00
8.00	9.00	62.8	9.20	82.80
6.00	7.00	73.6	10.80	75.60
5.00	5.50	80.2	6.60	36.30
4.00	4.50	86.9	6.70	30.15
3.00	3.50	93.3	6.40	22.40
0.00	1.50	100.0	6.70	10.05
Average Particle Size (μm)				16.68

Table series 70 Particle Size Distribution of SDP020/060-SDP100/060.

Dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules using poly(vinyl alcohol), 7.5 % of the total oil phase, as emulsifier; the homogenizing time at 60 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 70-1 Particle Size Distribution of SDP020/060.

2,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : SDP020/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	17.0	17.00	1105.00
50.00	55.00	33.1	16.10	885.50
40.00	45.00	53.6	20.50	922.50
30.00	35.00	71.0	17.40	609.00
20.00	25.00	85.0	14.00	350.00
10.00	15.00	96.4	11.40	171.00
8.00	9.00	97.8	1.40	12.60
6.00	7.00	100.0	2.20	15.40
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				40.71

Table 70-2 Particle Size Distribution of SDP040/060.

4,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : SDP040/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	6.6	6.60	429.00
50.00	55.00	10.3	3.70	203.50
40.00	45.00	25.9	15.60	702.00
30.00	35.00	42.3	16.40	574.00
20.00	25.00	65.1	22.80	570.00
10.00	15.00	87.3	22.20	333.00
8.00	9.00	91.3	4.00	36.00
6.00	7.00	95.3	4.00	28.00
5.00	5.50	96.9	1.60	8.80
4.00	4.50	98.4	1.50	6.75
3.00	3.50	100.0	1.60	5.60
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				28.97

Table 70-3 Particle Size Distribution of SDP060/060.

6,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : SDP060/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.2	4.20	273.00
50.00	55.00	6.6	2.40	132.00
40.00	45.00	12.5	5.90	265.50
30.00	35.00	22.9	10.40	364.00
20.00	25.00	41.7	18.80	470.00
10.00	15.00	71.9	30.20	453.00
8.00	9.00	79.1	7.20	64.80
6.00	7.00	86.9	7.80	54.60
5.00	5.50	90.7	3.80	20.90
4.00	4.50	94.2	3.50	15.75
3.00	3.50	97.4	3.20	11.20
0.00	1.50	100.0	2.60	3.90
Average Particle Size (μm)				21.29



Table 70-4 Particle Size Distribution of SDP080/060.

8,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : SDP080/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.9	0.90	58.50
50.00	55.00	5.6	4.70	258.50
40.00	45.00	8.8	3.20	144.00
30.00	35.00	14.2	5.40	189.00
20.00	25.00	29.2	15.00	375.00
10.00	15.00	60.3	31.10	466.50
8.00	9.00	69.2	8.90	80.10
6.00	7.00	79.2	10.00	70.00
5.00	5.50	84.9	5.70	31.35
4.00	4.50	90.6	5.70	25.65
3.00	3.50	95.6	5.00	17.50
0.00	1.50	100.0	4.40	6.60
Average Particle Size (μm)				17.23

Table 70-5 Particle Size Distribution of SDP100/060.

10,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : SDP100/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	5.3	5.30	291.50
40.00	45.00	7.6	2.30	103.50
30.00	35.00	13.8	6.20	217.00
20.00	25.00	23.9	10.10	252.50
10.00	15.00	53.6	29.70	445.50
8.00	9.00	62.6	9.00	81.00
6.00	7.00	73.8	11.20	78.40
5.00	5.50	80.1	6.30	34.65
4.00	4.50	87.0	6.90	31.05
3.00	3.50	93.7	6.70	23.45
0.00	1.50	100.0	6.30	9.45
Average Particle Size (μm)				15.68

Table series 71 Particle Size Distribution of SDP020/090-SDP100/090.

Dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules using poly(vinyl alcohol), 7.5 % of the total oil phase, as emulsifier; the homogenizing time at 90 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 71-1 Particle Size Distribution of SDP020/090.

2,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : SDP020/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	10.3	10.30	669.50
50.00	55.00	31.8	21.50	1182.50
40.00	45.00	50.4	18.60	837.00
30.00	35.00	69.8	19.40	679.00
20.00	25.00	84.9	15.10	377.50
10.00	15.00	96.3	11.40	171.00
8.00	9.00	97.9	1.60	14.40
6.00	7.00	100.0	2.10	14.70
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				39.46

Table 71-2 Particle Size Distribution of SDP040/090.

4,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : SDP040/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	1.9	1.90	123.50
50.00	55.00	13.1	11.20	616.00
40.00	45.00	23.5	10.40	468.00
30.00	35.00	39.2	15.70	549.50
20.00	25.00	61.6	22.40	560.00
10.00	15.00	86.0	24.40	366.00
8.00	9.00	90.5	4.50	40.50
6.00	7.00	94.6	4.10	28.70
5.00	5.50	96.5	1.90	10.45
4.00	4.50	98.1	1.60	7.20
3.00	3.50	100.0	1.90	6.65
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				27.77

Table 71-3 Particle Size Distribution of SDP060/090.

6,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : SDP060/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	5.9	5.90	383.50
50.00	55.00	5.9	0.00	0.00
40.00	45.00	14.8	8.90	400.50
30.00	35.00	21.3	6.50	227.50
20.00	25.00	38.6	17.30	432.50
10.00	15.00	70.6	32.00	480.00
8.00	9.00	77.6	7.00	63.00
6.00	7.00	85.7	8.10	56.70
5.00	5.50	89.7	4.00	22.00
4.00	4.50	93.8	4.10	18.45
3.00	3.50	97.2	3.40	11.90
0.00	1.50	100.0	2.80	4.20
Average Particle Size (μm)				21.00

Table 71-4 Particle Size Distribution of SDP080/090.

8,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : SDP080/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	4.6	4.60	253.00
40.00	45.00	7.2	2.60	117.00
30.00	35.00	15.4	8.20	287.00
20.00	25.00	27.6	12.20	305.00
10.00	15.00	60.1	32.50	487.50
8.00	9.00	69.2	9.10	81.90
6.00	7.00	79.0	9.80	68.60
5.00	5.50	84.9	5.90	32.45
4.00	4.50	90.0	5.10	22.95
3.00	3.50	95.1	5.10	17.85
0.00	1.50	100.0	4.90	7.35
Average Particle Size (μm)				16.81

Table 71-5 Particle Size Distribution of SDP100/090.

10,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : SDP100/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	1.1	1.10	71.50
50.00	55.00	4.0	2.90	159.50
40.00	45.00	7.1	3.10	139.50
30.00	35.00	9.8	2.70	94.50
20.00	25.00	20.6	10.80	270.00
10.00	15.00	49.7	29.10	436.50
8.00	9.00	59.3	9.60	86.40
6.00	7.00	71.2	11.90	83.30
5.00	5.50	78.0	6.80	37.40
4.00	4.50	85.4	7.40	33.30
3.00	3.50	93.0	7.60	26.60
0.00	1.50	100.0	7.00	10.05
Average Particle Size (μm)				14.49

Table series 72 Particle Size Distribution of SDP020/120-SDP100/120.

Dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules using poly(vinyl alcohol), 7.5 % of the total oil phase, as emulsifier; the homogenizing time at 120 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 72-1 Particle Size Distribution of SDP020/120.

2,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : SDP020/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	19.4	19.40	1261.00
50.00	55.00	34.5	15.10	830.50
40.00	45.00	52.8	18.30	823.50
30.00	35.00	72.3	19.50	682.50
20.00	25.00	85.5	13.20	330.00
10.00	15.00	96.7	11.20	168.00
8.00	9.00	98.2	1.50	13.50
6.00	7.00	100.0	1.80	12.60
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				41.22

Table 72-2 Particle Size Distribution of SDP040/120.

4,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : SDP040/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	2.8	2.80	182.00
50.00	55.00	11.7	8.90	489.50
40.00	45.00	22.5	10.80	486.00
30.00	35.00	41.1	18.60	651.00
20.00	25.00	61.1	20.00	500.00
10.00	15.00	86.4	25.30	379.50
8.00	9.00	90.9	4.50	40.50
6.00	7.00	94.9	4.00	28.00
5.00	5.50	96.7	1.80	9.90
4.00	4.50	98.3	1.60	7.20
3.00	3.50	100.0	1.70	5.95
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				27.80

Table 72-3 Particle Size Distribution of SDP060/120.

6,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : SDP060/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.8	0.80	52.00
50.00	55.00	5.9	5.10	280.50
40.00	45.00	9.1	3.20	144.00
30.00	35.00	19.5	10.40	364.00
20.00	25.00	34.7	15.20	380.00
10.00	15.00	68.9	34.20	513.00
8.00	9.00	77.1	8.20	73.80
6.00	7.00	85.3	8.20	57.40
5.00	5.50	89.5	4.20	23.10
4.00	4.50	93.6	4.10	18.45
3.00	3.50	96.8	3.20	11.20
0.00	1.50	100.0	3.20	4.80
Average Particle Size (μm)				19.22

Table 72-4 Particle Size Distribution of SDP080/120.

8,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : SDP080/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	1.9	1.90	123.50
50.00	55.00	4.2	2.30	126.50
40.00	45.00	8.8	4.60	207.00
30.00	35.00	15.5	6.70	234.50
20.00	25.00	26.0	10.50	262.50
10.00	15.00	57.8	31.80	477.00
8.00	9.00	67.2	9.40	84.60
6.00	7.00	78.1	10.90	76.30
5.00	5.50	83.9	5.80	31.90
4.00	4.50	89.7	5.80	26.10
3.00	3.50	95.1	5.40	18.90
0.00	1.50	100.0	4.90	7.35
Average Particle Size (μm)				16.76

Table 72-5 Particle Size Distribution of SDP100/120.

10,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : SDP100/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.3	3.30	214.50
50.00	55.00	3.3	0.00	0.00
40.00	45.00	5.7	2.40	108.00
30.00	35.00	11.5	5.80	203.00
20.00	25.00	21.7	10.20	255.00
10.00	15.00	50.1	28.40	426.00
8.00	9.00	59.6	9.50	85.50
6.00	7.00	71.5	11.90	83.30
5.00	5.50	78.7	7.20	39.60
4.00	4.50	86.1	7.40	33.30
3.00	3.50	93.3	7.20	25.20
0.00	1.50	100.0	6.70	10.05
Average Particle Size (μm)				14.83

Table series 73 Particle Size Distribution, of SDP020/150-SDP100/150.

Dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules using poly(vinyl alcohol), 7.5 % of the total oil phase, as emulsifier; the homogenizing time at 150 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 73-1 Particle Size Distribution of SDP020/150.

2,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : SDP020/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	13.0	13.00	845.00
50.00	55.00	31.9	18.90	1039.50
40.00	45.00	50.5	18.60	837.00
30.00	35.00	70.8	20.30	710.50
20.00	25.00	84.4	13.60	340.00
10.00	15.00	96.6	12.20	183.00
8.00	9.00	98.1	1.50	13.50
6.00	7.00	100.0	1.90	13.30
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				39.82

Table 73-2 Particle Size Distribution of SDP040/150.

4,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : SDP040/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.8	4.80	312.00
50.00	55.00	10.8	6.00	330.00
40.00	45.00	21.6	10.80	486.00
30.00	35.00	36.3	14.70	514.50
20.00	25.00	58.2	21.90	547.50
10.00	15.00	85.3	27.10	406.50
8.00	9.00	90.5	5.20	46.80
6.00	7.00	94.6	4.10	28.70
5.00	5.50	96.4	1.80	9.90
4.00	4.50	98.1	1.70	7.65
3.00	3.50	100.0	1.90	6.65
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				26.96

Table 73-3 Particle Size Distribution of SDP060/150.

6,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : SDP060/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	3.2	3.20	176.00
40.00	45.00	9.7	6.50	292.50
30.00	35.00	18.7	9.00	315.00
20.00	25.00	34.1	15.40	385.00
10.00	15.00	68.4	34.30	514.50
8.00	9.00	76.7	8.30	74.70
6.00	7.00	85.3	8.60	60.20
5.00	5.50	89.6	4.30	23.65
4.00	4.50	93.7	4.10	18.45
3.00	3.50	96.9	3.20	11.20
0.00	1.50	100.0	3.10	4.65
Average Particle Size (μm)				18.76

Table 73-4 Particle Size Distribution of SDP080/150.

8,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : SDP080/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.8	2.80	182.00
50.00	55.00	4.5	1.70	93.50
40.00	45.00	7.8	3.30	148.50
30.00	35.00	15.1	7.30	255.50
20.00	25.00	27.0	11.90	297.50
10.00	15.00	58.5	31.50	472.50
8.00	9.00	67.5	9.00	81.00
6.00	7.00	78.1	10.60	74.20
5.00	5.50	83.8	5.70	31.35
4.00	4.50	89.7	5.90	26.55
3.00	3.50	95.4	5.70	19.95
0.00	1.50	100.0	4.60	6.90
Average Particle Size (μm)				16.89

Table 73-5 Particle Size Distribution of SDP100/150.

10,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : SDP100/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.3	3.30	214.50
50.00	55.00	4.2	0.90	49.50
40.00	45.00	8.1	3.90	175.50
30.00	35.00	13.2	5.10	178.50
20.00	25.00	21.9	8.70	217.50
10.00	15.00	50.0	28.10	421.50
8.00	9.00	59.6	9.60	86.40
6.00	7.00	72.0	12.40	86.80
5.00	5.50	78.6	6.60	36.30
4.00	4.50	86.6	8.00	36.00
3.00	3.50	93.3	6.70	23.45
0.00	1.50	100.0	6.70	10.05
Average Particle Size (μm)				15.36

Table 74 Summary and Comparison of Particle Size Distribution of SDP020/030-SDP100/030.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 30 sec. of the homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP020/030	SDP040/030	SDP060/030	SDP080/030	SDP100/030
< 60	22.7	9.4	4.5	4.3	2.1
60 - 50	19.8	11.8	4.3	3.0	3.5
50 - 40	16.9	13.8	4.9	5.5	5.9
40 - 30	14.1	17.4	12.1	6.2	3.6
30 - 20	13.7	17.8	20.3	15.2	11.3
20 - 10	9.4	20.1	30.2	29.0	27.2
10 >	3.4	9.7	23.7	36.8	46.4



Table 75 Summary and Comparison of Particle Size Distribution of SDP020/060-SDP100/060.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 60 sec. of the homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP020/060	SDP040/060	SDP060/060	SDP080/060	SDP100/060
< 60	17.0	6.6	4.2	0.9	0.0
60 - 50	16.1	3.7	2.4	4.7	5.3
50 - 40	20.5	15.6	5.9	3.2	2.3
40 - 30	17.4	16.4	10.4	5.4	6.2
30 - 20	14.0	22.8	18.8	15.0	10.1
20 - 10	11.4	22.2	30.2	31.1	29.7
10 >	3.6	12.7	28.1	39.7	46.4

Table 76 Summary and Comparison of Particle Size Distribution of SDP020/090-SDP100/090.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 90 sec. of the homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP020/090	SDP040/090	SDP060/090	SDP080/090	SDP100/090
< 60	10.3	1.9	5.9	0.0	1.1
60 - 50	21.5	11.2	0.0	4.6	2.9
50 - 40	18.6	10.4	8.9	2.6	3.1
40 - 30	19.4	15.7	6.5	8.2	2.7
30 - 20	15.1	22.4	17.3	12.2	10.8
20 - 10	11.4	24.4	32.0	32.5	29.1
10 >	3.7	14.0	29.4	39.9	50.3

Table 77 Summary and Comparison of Particle Size Distribution of SDP020/120-SDP100/120.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 120 sec. of the homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP020/120	SDP040/120	SDP060/120	SDP080/120	SDP100/120
< 60	19.4	2.8	0.8	1.9	3.3
60 - 50	15.1	8.9	5.1	2.3	0.0
50 - 40	18.3	10.8	3.2	4.6	2.4
40 - 30	19.5	18.6	10.4	6.7	5.8
30 - 20	13.2	20.0	15.2	10.5	10.2
20 - 10	11.2	25.3	34.2	31.8	28.4
10 >	3.3	13.6	31.1	42.2	49.9

Table 78 Summary and Comparison of Particle Size Distribution of SDP020/150-SDP100/150.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 150 sec. of the homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP020/150	SDP040/150	SDP060/150	SDP080/150	SDP100/150
< 60	13.0	4.8	0.0	2.8	3.3
60 - 50	18.9	6.0	3.2	1.7	0.9
50 - 40	18.6	10.8	6.5	3.3	3.9
40 - 30	20.3	14.7	9.0	7.3	5.1
30 - 20	13.6	21.9	15.4	11.9	8.7
20 - 10	12.2	27.1	34.3	31.5	28.1
10 >	3.4	14.7	31.6	41.5	50.0

Table series 79 Particle Size Distribution of TDP020/030-TDP100/030.

Dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules using poly(vinyl alcohol), 7.5 % of total oil phase, as emulsifier; the homogenizing time at 30 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 79-1 Particle Size Distribution of TDP020/030.

2,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : TDP020/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	22.0	22.00	1430.00
50.00	55.00	41.2	19.20	1056.00
40.00	45.00	58.1	16.90	760.50
30.00	35.00	75.5	17.40	609.00
20.00	25.00	90.2	14.70	367.50
10.00	15.00	97.5	7.30	109.50
8.00	9.00	98.2	0.70	6.30
6.00	7.00	100.0	1.80	12.60
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				43.51

Table 79-2 Particle Size Distribution of TDP040/030.

4,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : TDP040/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	10.3	10.30	669.50
50.00	55.00	19.7	9.40	517.00
40.00	45.00	35.9	16.20	729.00
30.00	35.00	56.4	20.50	717.50
20.00	25.00	74.0	17.60	440.00
10.00	15.00	91.4	17.40	261.00
8.00	9.00	93.9	2.50	22.50
6.00	7.00	96.5	2.60	18.20
5.00	5.50	97.6	1.10	6.05
4.00	4.50	98.6	1.00	4.50
3.00	3.50	100.0	1.40	4.90
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				33.90

Table 79-3 Particle Size Distribution of TDP060/030.

6,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : TDP060/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	1.6	1.60	104.00
50.00	55.00	13.4	11.80	649.00
40.00	45.00	25.1	11.70	526.50
30.00	35.00	41.5	16.40	574.00
20.00	25.00	61.1	19.60	490.00
10.00	15.00	80.8	19.70	295.50
8.00	9.00	85.8	5.00	45.00
6.00	7.00	90.5	4.70	32.90
5.00	5.50	93.2	2.70	14.85
4.00	4.50	95.7	2.50	11.25
3.00	3.50	97.8	2.10	7.35
0.00	1.50	100.0	2.20	3.30
Average Particle Size (μm)				27.54

Table 79-4 Particle Size Distribution of TDP080/030.

8,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : TDP080/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.2	4.20	273.00
50.00	55.00	7.7	3.50	192.50
40.00	45.00	20.4	12.70	571.50
30.00	35.00	35.2	14.80	518.00
20.00	25.00	50.2	15.00	375.00
10.00	15.00	73.4	23.20	348.00
8.00	9.00	79.7	6.30	56.70
6.00	7.00	86.2	6.50	45.50
5.00	5.50	89.4	3.20	17.60
4.00	4.50	93.1	3.70	16.65
3.00	3.50	96.3	3.20	11.20
0.00	1.50	100.0	3.70	5.55
Average Particle Size (μm)				24.31

Table 79-5 Particle Size Distribution of TDP100/030.

10,000 rpm. of the propeller speed and 30 sec. of the homogenizing time; assigned name : TDP100/030

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.0	4.00	260.00
50.00	55.00	7.2	3.20	176.00
40.00	45.00	15.6	8.40	378.00
30.00	35.00	21.8	6.20	217.00
20.00	25.00	35.0	13.20	330.00
10.00	15.00	64.0	29.00	435.00
8.00	9.00	73.5	9.50	85.50
6.00	7.00	81.4	7.90	55.30
5.00	5.50	86.3	4.90	26.95
4.00	4.50	91.1	4.80	21.60
3.00	3.50	95.6	4.50	15.75
0.00	1.50	100.0	4.40	6.60
Average Particle Size (μm)				20.08

Table series 80 Particle Size Distribution, of TDP020/060-TDP100/060.

Dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules using poly(vinyl alcohol), 7.5 % of total oil phase, as emulsifier; the homogenizing time at 60 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 80-1 Particle Size Distribution of TDP020/060.

2,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : TDP020/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	18.0	18.00	1170.00
50.00	55.00	35.2	17.20	946.00
40.00	45.00	54.4	19.20	864.00
30.00	35.00	72.6	18.20	637.00
20.00	25.00	86.5	13.90	347.50
10.00	15.00	96.5	10.00	150.00
8.00	9.00	97.5	1.00	9.00
6.00	7.00	98.4	0.90	6.30
5.00	5.50	100.0	1.60	8.80
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				41.39

Table 80-2 Particle Size Distribution of TDP040/060.

4,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : TDP040/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	12.8	12.80	832.00
50.00	55.00	22.3	9.50	522.50
40.00	45.00	35.8	13.50	607.50
30.00	35.00	53.9	18.10	633.50
20.00	25.00	71.6	17.70	442.50
10.00	15.00	90.1	18.50	277.50
8.00	9.00	93.1	3.00	27.00
6.00	7.00	96.0	2.90	20.30
5.00	5.50	97.3	1.30	7.15
4.00	4.50	98.5	1.20	5.40
3.00	3.50	100.0	1.50	5.25
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				33.81

Table 80-3 Particle Size Distribution of TDP060/060.

6,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : TDP060/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	7.8	7.80	507.00
50.00	55.00	11.6	3.80	209.00
40.00	45.00	21.4	9.80	441.00
30.00	35.00	35.9	14.50	507.50
20.00	25.00	55.9	20.00	500.00
10.00	15.00	79.3	23.40	351.00
8.00	9.00	84.6	5.30	47.70
6.00	7.00	90.1	5.50	38.50
5.00	5.50	92.8	2.70	14.85
4.00	4.50	95.6	2.80	12.60
3.00	3.50	97.7	2.10	7.35
0.00	1.50	100.0	2.30	3.45
Average Particle Size (μm)				26.40

Table 80-4 Particle Size Distribution of TDP080/060.

8,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : TDP080/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.4	3.40	221.00
50.00	55.00	9.8	6.40	352.00
40.00	45.00	17.1	7.30	328.50
30.00	35.00	26.8	9.70	339.50
20.00	25.00	46.6	19.80	495.00
10.00	15.00	74.5	27.90	418.50
8.00	9.00	81.0	6.50	58.50
6.00	7.00	87.0	6.00	42.00
5.00	5.50	90.5	3.50	19.25
4.00	4.50	93.9	3.40	15.30
3.00	3.50	96.7	2.80	9.80
0.00	1.50	100.0	3.30	4.95
Average Particle Size (μm)				23.04

Table 80-5 Particle Size Distribution of TDP100/060.

10,000 rpm. of the propeller speed and 60 sec. of the homogenizing time; assigned name : TDP100/060

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.4	2.40	156.00
50.00	55.00	9.2	6.80	374.00
40.00	45.00	13.2	4.00	180.00
30.00	35.00	22.2	9.00	315.00
20.00	25.00	38.0	15.80	395.00
10.00	15.00	66.9	28.90	433.50
8.00	9.00	74.5	7.60	68.40
6.00	7.00	82.6	8.10	56.70
5.00	5.50	87.0	4.40	24.20
4.00	4.50	91.2	4.20	18.90
3.00	3.50	95.5	4.30	15.05
0.00	1.50	100.0	4.50	6.75
Average Particle Size (μm)				20.44

Table series 81 Particle Size Distribution of TDP020/090-TDP100/090. Dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules using poly(vinyl alcohol), 7.5 % of total oil phase, as emulsifier; the homogenizing time at 90 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 81-1 Particle Size Distribution of TDP020/090. 2,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : TDP020/090

Diameter (µm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	21.1	21.10	1371.50
50.00	55.00	41.3	20.20	1111.00
40.00	45.00	56.0	14.70	661.50
30.00	35.00	75.8	19.80	693.00
20.00	25.00	88.5	12.70	317.50
10.00	15.00	97.2	8.70	130.50
8.00	9.00	98.3	1.10	9.90
6.00	7.00	100.0	1.70	11.90
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (µm)				43.07

Table 81-2 Particle Size Distribution of TDP040/090.

4,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : TDP040/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	5.4	5.40	351.00
50.00	55.00	19.1	13.70	753.50
40.00	45.00	32.8	13.70	616.50
30.00	35.00	51.7	18.90	661.50
20.00	25.00	70.6	18.90	472.50
10.00	15.00	90.2	19.60	294.00
8.00	9.00	93.1	2.90	26.10
6.00	7.00	96.0	2.90	20.30
5.00	5.50	97.3	1.30	7.15
4.00	4.50	98.4	1.10	4.95
3.00	3.50	100.0	1.60	5.60
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				32.13

Table 81-3 Particle Size Distribution of TDP060/090.

6,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : TDP060/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	1.8	1.80	117.00
50.00	55.00	9.0	7.20	396.00
40.00	45.00	15.1	6.10	274.50
30.00	35.00	28.0	12.90	451.50
20.00	25.00	49.9	21.90	547.50
10.00	15.00	77.9	28.00	420.00
8.00	9.00	83.6	5.70	51.30
6.00	7.00	89.5	5.90	41.30
5.00	5.50	92.5	3.00	16.50
4.00	4.50	95.3	2.80	12.60
3.00	3.50	97.9	2.60	9.10
0.00	1.50	100.0	2.10	3.15
Average Particle Size (μm)				23.40

Table 81-4 Particle Size Distribution of TDP080/090.

8,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : TDP080/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.1	2.10	136.50
50.00	55.00	12.7	10.60	583.00
40.00	45.00	20.0	7.30	328.50
30.00	35.00	31.1	11.10	388.50
20.00	25.00	48.0	16.90	422.50
10.00	15.00	73.4	25.40	381.00
8.00	9.00	79.9	6.50	58.50
6.00	7.00	86.5	6.60	46.20
5.00	5.50	89.7	3.20	17.60
4.00	4.50	93.4	3.70	16.65
3.00	3.50	96.6	3.20	11.20
0.00	1.50	100.0	3.40	5.10
Average Particle Size (μm)				23.95

Table 81-5 Particle Size Distribution of TDP100/090.

10,000 rpm. of the propeller speed and 90 sec. of the homogenizing time; assigned name : TDP100/090

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.6	2.60	169.00
50.00	55.00	5.4	2.80	154.00
40.00	45.00	11.4	6.00	270.00
30.00	35.00	19.0	7.60	266.00
20.00	25.00	34.6	15.60	390.00
10.00	15.00	65.0	30.40	456.00
8.00	9.00	72.8	7.80	70.20
6.00	7.00	81.6	8.80	61.60
5.00	5.50	86.4	4.80	26.40
4.00	4.50	91.0	4.60	20.70
3.00	3.50	95.3	4.30	15.05
0.00	1.50	100.0	4.70	7.05
Average Particle Size (μm)				19.06

Table series 82 Particle Size Distribution of TDP020/120-TDP100/120.

Dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules using poly(vinyl alcohol), 7.5 % of total oil phase, as emulsifier; the homogenizing time at 120 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 82-1 Particle Size Distribution of TDP020/120.

2,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : TDP020/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	17.2	17.20	1118.00
50.00	55.00	31.3	14.10	775.50
40.00	45.00	51.9	20.60	927.00
30.00	35.00	74.8	22.90	801.50
20.00	25.00	86.8	12.00	300.00
10.00	15.00	97.0	10.20	153.00
8.00	9.00	98.2	1.20	10.80
6.00	7.00	100.0	1.80	12.60
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				40.98

Table 82-2 Particle Size Distribution of TDP040/120.

4,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : TDP040/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.0	3.00	195.00
50.00	55.00	15.4	12.40	682.00
40.00	45.00	30.3	14.90	670.50
30.00	35.00	49.9	19.60	686.00
20.00	25.00	68.3	18.40	460.00
10.00	15.00	88.8	20.50	307.50
8.00	9.00	92.3	3.50	31.50
6.00	7.00	95.5	3.20	22.40
5.00	5.50	97.0	1.50	8.25
4.00	4.50	98.3	1.30	5.85
3.00	3.50	100.0	1.70	5.95
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				30.75



Table 82-3 Particle Size Distribution of TDP060/120.

6,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : TDP060/120

Diameter (µm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.8	3.80	247.00
50.00	55.00	6.9	3.10	170.50
40.00	45.00	13.8	6.90	310.50
30.00	35.00	24.5	10.70	374.50
20.00	25.00	40.2	15.70	392.50
10.00	15.00	70.6	30.40	456.00
8.00	9.00	77.6	7.00	63.00
6.00	7.00	85.2	7.60	53.20
5.00	5.50	89.1	3.90	21.45
4.00	4.50	93.0	3.90	17.55
3.00	3.50	96.4	3.40	11.90
0.00	1.50	100.0	3.60	5.40
Average Particle Size (µm)				21.24

Table 82-4 Particle Size Distribution of TDP080/120.

8,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : TDP080/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	2.9	2.90	188.50
50.00	55.00	7.8	4.90	269.50
40.00	45.00	13.6	5.80	261.00
30.00	35.00	22.8	9.20	322.00
20.00	25.00	36.2	13.40	335.00
10.00	15.00	67.7	31.50	472.50
8.00	9.00	76.3	8.60	77.40
6.00	7.00	83.8	7.50	52.50
5.00	5.50	88.4	4.60	25.30
4.00	4.50	92.7	4.30	19.35
3.00	3.50	96.5	3.80	13.30
0.00	1.50	100.0	3.50	5.25
Average Particle Size (μm)				20.42

Table 82-5 Particle Size Distribution of TDP100/120.

10,000 rpm. of the propeller speed and 120 sec. of the homogenizing time; assigned name : TDP100/120

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.6	2.60	169.00
50.00	55.00	7.1	4.50	247.50
40.00	45.00	11.5	4.40	198.00
30.00	35.00	19.8	8.30	290.50
20.00	25.00	32.4	12.60	315.00
10.00	15.00	62.6	30.20	453.00
8.00	9.00	70.6	8.00	72.00
6.00	7.00	80.2	9.60	67.20
5.00	5.50	85.1	4.90	26.95
4.00	4.50	90.4	5.30	23.85
3.00	3.50	95.1	4.70	16.45
0.00	1.50	100.0	4.90	7.35
Average Particle Size (μm)				18.87

Table series 83 Particle Size Distribution of TDP020/150-TDP100/150.

Dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules using poly(vinyl alcohol), 7.5 % of total oil phase, as emulsifier; the homogenizing time at 150 sec. and the propeller speed from 2,000 to 10,000 rpm.

Table 83-1 Particle Size Distribution of TDP020/150.

2,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : TDP020/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	18.6	18.60	1209.00
50.00	55.00	36.0	17.40	957.00
40.00	45.00	56.3	20.30	913.50
30.00	35.00	75.7	19.40	679.00
20.00	25.00	87.4	11.70	292.50
10.00	15.00	96.8	9.40	141.00
8.00	9.00	98.1	1.30	11.70
6.00	7.00	100.0	1.90	13.30
5.00	5.50	100.0	0.00	0.00
4.00	4.50	100.0	0.00	0.00
3.00	3.50	100.0	0.00	0.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				42.17

Table 83-2 Particle Size Distribution of TDP040/150.

4,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : TDP040/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	10.4	10.40	676.00
50.00	55.00	18.8	8.40	462.00
40.00	45.00	31.0	12.20	549.00
30.00	35.00	49.9	18.90	661.50
20.00	25.00	68.1	18.20	455.00
10.00	15.00	88.7	20.60	309.00
8.00	9.00	92.2	3.50	31.50
6.00	7.00	95.5	3.30	23.10
5.00	5.50	97.0	1.50	8.25
4.00	4.50	98.3	1.30	5.85
3.00	3.50	100.0	1.70	5.95
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				31.87

Table 83-3 Particle Size Distribution of TDP060/150.

6,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : TDP060/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.5	4.50	292.50
50.00	55.00	6.2	1.70	93.50
40.00	45.00	14.5	8.30	373.50
30.00	35.00	29.9	15.40	539.00
20.00	25.00	46.4	16.50	412.50
10.00	15.00	75.6	29.20	438.00
8.00	9.00	81.9	6.30	56.70
6.00	7.00	88.4	6.50	45.50
5.00	5.50	91.5	3.10	17.05
4.00	4.50	94.8	3.30	14.85
3.00	3.50	97.3	2.50	8.75
0.00	1.50	100.0	2.70	4.05
Average Particle Size (μm)				22.96

Table 83-4 Particle Size Distribution of TDP080/150.

8,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : TDP080/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	6.2	6.20	341.00
40.00	45.00	11.4	5.20	234.00
30.00	35.00	19.1	7.70	269.50
20.00	25.00	35.7	16.60	415.00
10.00	15.00	66.2	30.50	457.50
8.00	9.00	74.2	8.00	72.00
6.00	7.00	82.9	8.70	60.90
5.00	5.50	87.3	4.40	24.20
4.00	4.50	91.7	4.40	19.80
3.00	3.50	95.7	4.00	14.00
0.00	1.50	100.0	4.30	6.45
Average Particle Size (μm)				19.14

Table 83-5 Particle Size Distribution of TDP100/150.

10,000 rpm. of the propeller speed and 150 sec. of the homogenizing time; assigned name : TDP100/150

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	6.3	6.30	409.50
50.00	55.00	10.1	3.80	209.00
40.00	45.00	11.4	1.30	58.50
30.00	35.00	21.6	10.20	357.00
20.00	25.00	32.1	10.50	262.50
10.00	15.00	61.5	29.40	441.00
8.00	9.00	69.9	8.40	75.60
6.00	7.00	79.5	9.60	67.20
5.00	5.50	84.4	4.90	26.95
4.00	4.50	89.9	5.50	24.75
3.00	3.50	94.8	4.90	17.15
0.00	1.50	100.0	5.20	7.80
Average Particle Size (μm)				19.57

Table 84 Summary and Comparison of Particle Size Distribution of TDP020/030-TDP100/030.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 30 sec. of the homogenization time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP020/030	TDP040/030	TDP060/030	TDP080/030	TDP100/030
< 60	22.0	10.3	1.6	4.2	4.0
60 - 50	19.2	9.4	11.8	3.5	3.2
50 - 40	16.9	16.2	11.7	12.7	8.4
40 - 30	17.4	20.5	16.4	14.8	6.2
30 - 20	14.7	17.6	19.6	15.0	13.2
20 - 10	7.3	17.4	19.7	23.2	29.0
10 >	2.5	8.6	19.2	26.6	36.0

Table 85 Summary and Comparison of Particle Size Distribution of TDP020/060-TDP100/060.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 60 sec. of the homogenization time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP020/060	TDP040/060	TDP060/060	TDP080/060	TDP100/060
< 60	18.0	12.8	7.8	3.4	2.4
60 - 50	17.2	9.5	3.8	6.4	6.8
50 - 40	19.2	13.5	9.8	7.3	4.0
40 - 30	18.2	18.1	14.5	9.7	9.0
30 - 20	13.9	17.7	20.0	19.8	15.8
20 - 10	10.0	18.5	23.4	27.9	28.9
10 >	3.5	9.9	20.7	25.5	33.1

Table 86 Summary and Comparison of Particle Size Distribution of TDP020/090–TDP100/090.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 90 sec. of the homogenization time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP020/090	TDP040/090	TDP060/090	TDP080/090	TDP100/090
< 60	21.1	5.4	1.8	2.1	2.6
60 – 50	20.2	13.7	7.2	10.6	2.8
50 – 40	14.7	13.7	6.1	7.3	6.0
40 – 30	19.8	18.9	12.9	11.1	7.6
30 – 20	12.7	18.9	21.9	16.9	15.6
20 – 10	8.7	19.6	28.0	25.4	30.4
10 >	2.8	9.8	22.1	26.6	35.0

Table 87 Summary and Comparison of Particle Size Distribution of TDP020/120-TDP100/120.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 120 sec. of the homogenization time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP020/120	TDP040/120	TDP060/120	TDP080/120	TDP100/120
< 60	17.2	3.0	3.8	2.9	2.6
60 - 50	14.1	12.4	3.1	4.9	4.5
50 - 40	20.6	14.9	6.9	5.8	4.4
40 - 30	22.9	19.6	10.7	9.2	8.3
30 - 20	12.0	18.4	15.7	13.4	12.6
20 - 10	10.2	20.5	30.4	31.5	30.2
10 >	3.0	11.2	29.4	32.3	37.4

Table 88 Summary and Comparison of Particle Size Distribution of TDP020/150-TDP100/150.

Summary of the particle size distribution and the comparison of the speeds from 2,000 to 10,000 rpm. at 150 sec. of the homogenization time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP020/150	TDP040/150	TDP060/150	TDP080/150	TDP100/150
< 60	18.6	10.4	4.5	0.0	6.3
60 - 50	17.4	8.4	1.7	6.2	3.8
50 - 40	20.3	12.2	8.3	5.2	1.3
40 - 30	19.4	18.9	15.4	7.7	10.2
30 - 20	11.7	18.2	16.5	16.6	10.5
20 - 10	9.4	20.6	29.2	30.5	29.4
10 >	3.2	11.3	24.4	33.8	38.5

Table series 89 Particle Size Distribution of SDP025E-SDP125E. Dibutyl phthalate was encapsulated poly(hexamethylene sebacamide) microcapsules synthesized through the propeller speed at 6,000 rpm. and homogenizing time for 90 sec., sebacoyl chloride : dibutyl phthalate = 3:27 and the concentrations of poly(vinyl alcohol) from 2.5 - 12.5 % of the total oil phase.

Table 89-1 Particle Size Distribution of SDP25E. 2.5 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : SDP025E

Diameter (µm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	11.8	11.80	767.00
50.00	55.00	21.8	10.00	550.00
40.00	45.00	38.4	16.60	747.00
30.00	35.00	55.0	16.60	581.00
20.00	25.00	72.0	17.00	425.00
10.00	15.00	89.2	17.20	258.00
8.00	9.00	92.2	3.00	27.00
6.00	7.00	95.3	3.10	21.70
5.00	5.50	96.7	1.40	7.70
4.00	4.50	98.0	1.30	5.85
3.00	3.50	100.0	2.00	7.00
0.00	1.50	100.0	0.00	0.00
Average Particle Size (µm)				33.97

Table 89-2 Particle Size Distribution of SDP050E.

5.0 % concentration of poly(vinyl alcohol) of the total oil phase
for the assigned name : SDP050E

Diameter (µm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	7.0	7.00	455.00
50.00	55.00	14.2	7.20	396.00
40.00	45.00	22.2	8.00	360.00
30.00	35.00	38.0	15.80	553.00
20.00	25.00	57.7	19.70	492.50
10.00	15.00	82.2	24.50	367.50
8.00	9.00	87.0	4.80	43.20
6.00	7.00	91.9	4.90	34.30
5.00	5.50	94.2	2.30	12.65
4.00	4.50	96.4	2.20	9.90
3.00	3.50	98.3	1.90	6.65
0.00	1.50	100.0	1.70	2.55
Average Particle Size (µm)				27.33

Table 89-3 Particle Size Distribution, of SDP075E.

7.5 % concentration of poly(vinyl alcohol) of the total oil phase
for the assigned name : SDP075E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.5	2.50	162.50
50.00	55.00	7.8	5.30	291.50
40.00	45.00	13.5	5.70	256.50
30.00	35.00	27.6	14.10	493.50
20.00	25.00	46.9	19.30	482.50
10.00	15.00	77.1	30.20	453.00
8.00	9.00	83.6	6.50	58.50
6.00	7.00	89.7	6.10	42.70
5.00	5.50	92.8	3.10	17.05
4.00	4.50	95.8	3.00	13.50
3.00	3.50	98.2	2.40	8.40
0.00	1.50	100.0	1.80	2.70
Average Particle Size (μm)				22.82

Table 89-4 Particle Size Distribution of SDP100E.

10.0 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : SDP100E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.2	2.20	143.00
50.00	55.00	4.1	1.90	104.50
40.00	45.00	9.3	5.20	234.00
30.00	35.00	18.5	9.20	322.00
20.00	25.00	34.6	16.10	402.50
10.00	15.00	69.2	34.60	519.00
8.00	9.00	77.8	8.60	77.40
6.00	7.00	86.4	8.60	60.20
5.00	5.50	90.6	4.20	23.10
4.00	4.50	94.6	4.00	18.00
3.00	3.50	97.7	3.10	10.85
0.00	1.50	100.0	2.30	3.45
Average Particle Size (μm)				19.18

Table 89-5 Particle Size Distribution, of SDP125E.

12.5 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : SDP125E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.3	4.30	279.50
50.00	55.00	7.1	2.80	154.00
40.00	45.00	11.3	4.20	189.00
30.00	35.00	17.4	6.10	213.50
20.00	25.00	29.5	12.10	302.50
10.00	15.00	61.7	32.20	483.00
8.00	9.00	70.7	9.00	81.00
6.00	7.00	81.5	10.80	75.60
5.00	5.50	86.9	5.40	29.70
4.00	4.50	92.5	5.60	25.20
3.00	3.50	96.9	4.40	15.40
0.00	1.50	100.0	3.10	4.65
Average Particle Size (μm)				18.53

Table 90 Summary and Comparison of Particle Size Distribution of SDP025E-SDP125E.

Summary of particle size distribution and comparison of emulsifier concentrations from 2.5 - 12.5 % of the total oil phase at 6,000 rpm. of propeller speed and for 90 sec. of homogenizing time for dibutyl phthalate being encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP025E	SDP050E	SDP075E	SDP100E	SDP125E
< 60	11.8	7.0	2.5	2.2	4.3
60 - 50	10.0	7.2	5.3	1.9	2.8
50 - 40	16.6	8.0	5.7	5.2	4.2
40 - 30	16.6	15.8	14.1	9.2	6.1
30 - 20	17.0	19.7	19.3	16.1	12.1
20 - 10	17.2	24.5	30.2	34.6	32.2
10 >	10.8	17.8	22.9	30.8	38.3

Table series 91 Particle Size Distribution of TDP025E-TDP125E.

Dibutyl phthalate was encapsulated by poly(para-phenylene terephthalamide) microcapsules synthesized through the propeller speed at 6,000 rpm. and homogenizing time for 90 sec., terephthaloyl chloride : dibutyl phthalate = 2:28 and the concentrations of poly(vinyl alcohol) from 2.5 - 12.5 % of the total oil phase.

Table 91-1 Particle Size Distribution of TDP025E.

2.5 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : TDP025E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	7.3	7.30	474.50
50.00	55.00	24.2	16.90	929.50
40.00	45.00	38.9	14.70	661.50
30.00	35.00	55.5	16.60	581.00
20.00	25.00	71.2	15.70	392.50
10.00	15.00	89.4	18.20	273.00
8.00	9.00	92.5	3.10	27.90
6.00	7.00	95.5	3.00	21.00
5.00	5.50	96.9	1.40	7.70
4.00	4.50	98.2	1.30	5.85
3.00	3.50	100.0	1.80	6.30
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				33.81

Table 91-2 Particle Size Distribution of TDP050E.

5.0 % concentration of poly(vinyl alcohol) of the total oil phase
for the assigned name : TDP050E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.9	3.90	253.50
50.00	55.00	18.5	14.60	803.00
40.00	45.00	30.1	11.60	522.00
30.00	35.00	51.8	21.70	759.50
20.00	25.00	67.4	15.60	390.00
10.00	15.00	87.4	20.00	300.00
8.00	9.00	91.1	3.70	33.30
6.00	7.00	94.9	3.80	26.60
5.00	5.50	96.6	1.70	9.35
4.00	4.50	98.1	1.50	6.75
3.00	3.50	100.0	1.90	6.65
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				31.11

Table 91-3 Particle Size Distribution of TDP075E.

7.5 % concentration of poly(vinyl alcohol) of the total oil phase
for the assigned name : TDP075E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	6.7	6.70	435.50
50.00	55.00	16.4	9.70	533.50
40.00	45.00	29.2	12.80	576.00
30.00	35.00	46.2	19.00	665.00
20.00	25.00	64.5	16.30	407.50
10.00	15.00	84.8	20.30	304.50
8.00	9.00	89.2	4.40	39.60
6.00	7.00	93.4	4.20	29.40
5.00	5.50	95.5	2.10	11.55
4.00	4.50	97.4	1.90	8.55
3.00	3.50	100.0	2.60	9.10
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				30.20

Table 91-4 Particle Size Distribution of TDP100E.

10.0 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : TDP100E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	8.8	8.80	572.00
50.00	55.00	15.4	6.60	363.00
40.00	45.00	26.8	11.40	513.00
30.00	35.00	41.2	14.40	504.00
20.00	25.00	59.8	18.60	465.00
10.00	15.00	85.1	25.30	379.50
8.00	9.00	88.9	3.80	34.20
6.00	7.00	93.3	4.40	30.80
5.00	5.50	95.6	2.30	12.65
4.00	4.50	97.6	2.00	9.00
3.00	3.50	100.0	2.40	8.40
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				28.92

Table 91-5 Particle Size Distribution of TDP125E.

12.5 % concentration of poly(vinyl alcohol) of the total oil phase for the assigned name : TDP125E

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.0	2.00	130.00
50.00	55.00	6.9	4.90	269.50
40.00	45.00	14.3	7.40	333.00
30.00	35.00	24.7	10.40	364.00
20.00	25.00	44.4	19.70	492.50
10.00	15.00	75.2	30.80	462.00
8.00	9.00	83.0	7.80	70.20
6.00	7.00	90.2	7.20	50.40
5.00	5.50	93.7	3.50	19.25
4.00	4.50	96.6	2.90	13.05
3.00	3.50	100.0	3.40	11.90
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				22.16

Table 92 Summary and Comparison of Particle Size Distribution of TDP025E-TDP125E.

Summary of particle size distribution and comparison of emulsifier concentrations from 2.5 - 12.5 % of the total oil phase at 6,000 rpm. of propeller speed and for 90 sec. of homogenizing time for dibutyl phthalate being encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP025E	TDP050E	TDP075E	TDP100E	TDP125E
< 60	7.3	6.7	3.9	8.8	2.0
60 - 50	16.9	9.7	14.6	6.6	4.9
50 - 40	14.7	12.1	11.6	11.4	7.4
40 - 30	16.6	19.1	21.8	14.4	10.4
30 - 20	15.7	16.2	15.5	18.6	19.7
20 - 10	18.2	20.3	20.0	25.3	30.8
10 >	10.6	15.2	12.6	14.9	24.8

Table series 93 Particle Size Distribution of SDP010/290-SDP050/250. Effect of the concentrations of sebacoyl chloride on microencapsulation under the following condition : dibutyl phthalate, an encapsulated material, encapsulated by poly(hexamethylene sebacamide) microcapsule synthesized by the propeller speed at 6,000 rpm.; homogenizing time for 90 sec.; the concentration of poly(vinyl alcohol) at 7.5 % of the total oil phase. Tables 78-1 to 78-5 show the effect of the concentration of sebacoyl chloride from 1 - 5 gm. in dibutyl phthalate of 29 - 25 gm. respectively on microencapsulation.

Table 93-1 Particle Size Distribution of SDP010/290.

1.0 gm. of sebacoyl chloride in 29.0 gm. of dibutyl phthalate for the assigned name : SDP010/290

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.9	4.90	318.50
50.00	55.00	9.0	4.10	225.50
40.00	45.00	18.1	9.10	409.50
30.00	35.00	31.2	13.10	458.50
20.00	25.00	53.8	22.60	565.00
10.00	15.00	81.8	28.00	420.00
8.00	9.00	86.7	4.90	44.10
6.00	7.00	92.0	5.30	37.10
5.00	5.50	94.6	2.60	14.30
4.00	4.50	97.0	2.40	10.80
3.00	3.50	100.0	3.00	10.50
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				25.14

Table 93-2 Particle Size Distribution of SDP020/280.

2.0 gm. of sebacoyl chloride in 28.0 gm. of dibutyl phthalate for
the assigned name : SDP020/280

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.8	4.80	312.00
50.00	55.00	8.4	3.60	198.00
40.00	45.00	15.6	7.20	324.00
30.00	35.00	28.4	12.80	448.00
20.00	25.00	48.7	20.30	507.50
10.00	15.00	78.6	29.90	448.50
8.00	9.00	84.4	5.80	52.20
6.00	7.00	90.5	6.10	42.70
5.00	5.50	93.5	3.00	16.50
4.00	4.50	96.0	2.50	11.25
3.00	3.50	98.3	2.30	8.05
0.00	1.50	100.0	1.70	2.55
Average Particle Size (μm)				23.71

Table 93-3 Particle Size Distribution of SDP030/270.

3.0 gm. of sebacoyl chloride in 27.0 gm. of dibutyl phthalate for
the assigned name : SDP030/270

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	7.3	7.30	474.50
50.00	55.00	10.1	2.80	154.00
40.00	45.00	14.9	4.80	216.00
30.00	35.00	28.1	13.20	462.00
20.00	25.00	51.0	22.90	572.50
10.00	15.00	80.6	29.60	444.00
8.00	9.00	86.5	5.90	53.10
6.00	7.00	92.1	5.60	39.20
5.00	5.50	94.7	2.60	14.30
4.00	4.50	97.1	2.40	10.80
3.00	3.50	100.0	2.90	10.15
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				24.51

Table 93-4 Particle Size Distribution of SDP040/260.

4.0 gm. of sebacoyl chloride in 26.0 gm. of dibutyl phthalate for
the assigned name : SDP040/260

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	4.6	4.60	299.00
50.00	55.00	9.9	5.30	291.50
40.00	45.00	15.2	5.30	238.50
30.00	35.00	27.4	12.20	427.00
20.00	25.00	47.7	20.30	507.50
10.00	15.00	79.6	31.90	478.50
8.00	9.00	85.9	6.30	56.70
6.00	7.00	91.8	5.90	41.30
5.00	5.50	94.5	2.70	14.85
4.00	4.50	97.0	2.50	11.25
3.00	3.50	100.0	3.00	10.50
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				23.77

Table 93-5 Particle Size Distribution of SDP050/250.

5.0 gm. of sebacoyl chloride in 25.0 gm. of dibutyl phthalate for
the assigned name : SDP050/250

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.4	3.40	221.00
50.00	55.00	9.1	5.70	313.50
40.00	45.00	14.2	5.10	229.50
30.00	35.00	28.8	14.60	511.00
20.00	25.00	49.2	20.40	510.00
10.00	15.00	80.0	30.80	462.00
8.00	9.00	86.4	6.40	57.60
6.00	7.00	92.3	5.90	41.30
5.00	5.50	94.9	2.60	14.30
4.00	4.50	97.2	2.30	10.35
3.00	3.50	100.0	2.80	9.80
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				23.80



Table 94 Summary and Comparison of Particle Size Distribution of SDP010/290-SDP050/250.

Summary of the particle size distribution and comparison of the effect of diacid chloride concentration from 1.0:29.0 - 5.0:25.0 of sebacoyl chloride : dibutyl phthalate at 6,000 rpm. of propeller speed and for 90 sec. of homogenizing time of dibutyl phthalate encapsulated by poly(hexamethylene sebacamide) microcapsules.

DIAMETER (μm)	SDP010/290	SDP020/280	SDP030/270	SDP040/260	SDP050/250
< 60	4.9	4.8	7.3	4.6	3.4
60 - 50	4.1	3.6	2.8	5.3	5.7
50 - 40	9.1	7.2	4.8	5.3	5.1
40 - 30	13.1	12.8	13.2	12.2	14.6
30 - 20	22.6	20.3	22.9	20.3	20.4
20 - 10	28.0	29.9	29.6	31.9	30.8
10 >	18.2	21.4	19.4	20.4	20.0

Table series 95 Particle Size Distribution of TDP010/290-TDP030/270.

Effect of the concentrations of terephthaloyl chloride microencapsulation under the following condition : dibutyl phthalate, an encapsulated material, encapsulated by poly(para-phenylene terephthalamide) microcapsule synthesized by the propeller speed at 6,000 rpm.; homogenizing time for 90 sec.; the concentration of poly(vinyl alcohol) at 7.5 % of the total oil phase. Tables 79-1 to 79-5 show the effect of the concentration of terephthaloyl chloride from 1 - 3 gm. in dibutyl phthalate of 29 - 27 gm. respectively on microencapsulation.

Table 95-1 Particle Size Distribution of TDP010/290.

1.0 gm. of terephthaloyl chloride in 29.0 gm. of dibutyl phthalate for the assigned name : TDP010/290

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	10.6	10.60	689.00
50.00	55.00	24.3	13.70	753.50
40.00	45.00	38.8	14.50	652.50
30.00	35.00	50.9	12.10	423.50
20.00	25.00	63.5	12.60	315.00
10.00	15.00	81.7	18.20	273.00
8.00	9.00	86.1	4.40	39.60
6.00	7.00	90.7	4.60	32.20
5.00	5.50	93.3	2.60	14.30
4.00	4.50	95.8	2.50	11.25
3.00	3.50	98.0	2.20	7.70
0.00	1.50	100.0	2.00	3.00
Average Particle Size (μm)				32.15

Table 95-2 Particle Size Distribution of TDP015/285.

1.5 gm. of terephthaloyl chloride in 28.5 gm. of dibutyl phthalate for the assigned name : TDP015/285

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	9.7	9.70	630.50
50.00	55.00	21.5	11.80	649.00
40.00	45.00	33.3	11.80	531.00
30.00	35.00	48.2	14.90	521.50
20.00	25.00	60.6	12.40	310.00
10.00	15.00	80.3	19.70	295.50
8.00	9.00	85.1	4.80	43.20
6.00	7.00	90.1	5.00	35.00
5.00	5.50	92.8	2.70	14.85
4.00	4.50	95.5	2.70	12.15
3.00	3.50	97.8	2.30	8.05
0.00	1.50	100.0	2.20	3.30
Average Particle Size (μm)				30.54

Table 95-3 Particle Size Distribution of TDP020/280.

2.0 gm. of terephthaloyl chloride in 28.0 gm. of dibutyl phthalate for the assigned name : TDP020/280

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	8.2	8.20	533.00
50.00	55.00	17.8	9.60	528.00
40.00	45.00	32.0	14.20	639.00
30.00	35.00	49.6	17.60	616.00
20.00	25.00	63.8	14.20	355.00
10.00	15.00	83.1	19.30	289.50
8.00	9.00	87.3	4.20	37.80
6.00	7.00	91.7	4.40	30.80
5.00	5.50	94.1	2.40	13.20
4.00	4.50	96.4	2.30	10.35
3.00	3.50	98.3	1.90	6.65
0.00	1.50	100.0	1.70	2.55
Average Particle Size (μm)				30.62

Table 95-4 Particle Size Distribution of TDP025/275.

2.5 gm. of terephthaloyl chloride in 27.5 gm. of dibutyl phthalate for the assigned name : TDP025/275

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	8.4	8.40	546.00
50.00	55.00	17.6	9.20	506.50
40.00	45.00	32.0	14.40	648.00
30.00	35.00	48.4	16.40	574.50
20.00	25.00	66.4	18.00	450.00
10.00	15.00	86.1	19.70	295.00
8.00	9.00	90.2	4.10	36.90
6.00	7.00	94.1	3.90	27.30
5.00	5.50	96.0	1.90	10.45
4.00	4.50	97.8	1.80	8.10
3.00	3.50	100.0	2.20	7.70
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				31.10

Table 95-5 Particle Size Distribution of TDP030/270.

3.0 gm. of terephthaloyl chloride in 27.0 gm. of dibutyl phthalate for the assigned name : TDP030/270

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	8.9	8.90	578.50
50.00	55.00	20.6	11.70	643.50
40.00	45.00	32.0	11.40	513.00
30.00	35.00	48.4	16.40	574.00
20.00	25.00	66.4	18.00	450.00
10.00	15.00	86.1	19.70	295.50
8.00	9.00	90.2	4.10	36.90
6.00	7.00	94.1	3.90	27.30
5.00	5.50	96.0	1.90	10.45
4.00	4.50	97.8	1.80	8.10
3.00	3.50	100.0	2.20	7.70
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				31.45

Table 96 Summary and Comparison of Particle Size Distribution of TDP010/290-TDP030/270.

Summary of the particle size distribution and comparison of the effect of diacid chloride concentration from 1.0:29.0 - 3.0:27.0 of terephthaloyl chloride : dibutyl phthalate at 6,000 rpm. of propeller speed and for 90 sec. of homogenization time of dibutyl phthalate encapsulated by poly(para-phenylene terephthalamide) microcapsules.

DIAMETER (μm)	TDP010/290	TDP015/285	TDP020/280	TDP025/275	TDP030/270
< 60	10.6	9.7	8.2	8.4	8.9
60 - 50	13.7	11.8	9.6	9.2	11.7
50 - 40	14.5	11.8	14.2	14.4	11.4
40 - 30	12.1	14.9	17.6	16.4	16.4
30 - 20	12.6	12.4	14.2	18.0	18.0
20 - 10	18.2	19.7	19.3	19.7	19.7
10 >	18.3	19.7	16.9	13.9	13.9

Table series 97 Particle Size Distribution of SD-PVSD Series.

The following subtables were the results indicating the effect of concentration of sodium dodecyl sulfonate with 7.5 % of poly(vinyl alcohol) of the total oil phase. Dibutyl phthalate encapsulated by poly(hexamethylene sebacamide) microcapsules, sodium dodecyl sulfonate as emulsifier, the propeller speed was at 6,000 rpm., the homogenizing time at 90 sec. and the ratio of sebacoyl chloride : dibutyl phthalate was 3:27.

Table 97-1 Particle Size Distribution of SD-PVSD75/10.

1.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : SD-PVSD75/10

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.0	0.00	0.00
40.00	45.00	1.2	1.20	54.00
30.00	35.00	5.6	4.40	154.00
20.00	25.00	16.8	11.20	280.00
10.00	15.00	34.9	18.10	271.50
8.00	9.00	60.7	25.80	232.20
6.00	7.00	80.4	19.70	137.90
5.00	5.50	91.3	10.90	59.95
4.00	4.50	95.7	4.40	19.80
3.00	3.50	98.5	2.80	9.80
2.00	2.50	99.1	0.60	1.50
1.00	1.50	100.0	0.90	1.35
0.00	0.50	100.0	0.00	0.00
Average Particle Size (μm)				12.22

Table 97-2 Particle Size Distribution of SD-PVSD75/20.

2.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : SD-PVSD75/20

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.0	0.00	0.00
40.00	45.00	0.0	0.00	0.00
30.00	35.00	2.1	2.10	73.50
20.00	25.00	6.8	4.70	117.50
10.00	15.00	14.5	7.70	115.50
8.00	9.00	32.6	18.10	162.90
6.00	7.00	60.8	28.20	197.40
5.00	5.50	76.9	16.10	88.55
4.00	4.50	88.4	11.50	51.75
3.00	3.50	95.7	7.30	25.55
2.00	2.50	99.2	3.50	8.75
1.00	1.50	100.0	0.80	1.20
0.00	0.50	100.0	0.00	0.00
Average Particle Size (μm)				8.43

Table 97-3 Particle Size Distribution of SD-PVSD75/30.

3.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : SD-PVSD75/30

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.0	0.00	0.00
40.00	45.00	0.0	0.00	0.00
30.00	35.00	0.0	0.00	0.00
20.00	25.00	0.6	0.60	15.00
10.00	15.00	3.4	2.80	42.00
8.00	9.00	13.8	10.40	93.60
6.00	7.00	37.6	23.80	166.60
5.00	5.50	63.8	26.20	144.10
4.00	4.50	78.6	14.80	66.60
3.00	3.50	89.4	10.80	37.80
2.00	2.50	96.7	7.30	18.25
1.00	1.50	99.4	2.70	4.05
0.00	0.50	100.0	0.60	0.30
Average Particle Size (μm)				5.88

Table series 98 Particle Size Distribution of TD-PVSD Series.

The following subtables were the results indicating the effect of concentration of sodium dodecyl sulfonate with 7.5 % of poly(vinyl alcohol) of the total oil phase. Dibutyl phthalate encapsulated by poly(para-phenylene terephthalamide), sodium dodecyl sulfonate as emulsifier, the propeller speed was at 6,000 rpm., the homogenizing time at 90 sec. and the ratio of terephthaloyl chloride : dibutyl phthalate was 3:27.

Table 98-1 Particle Size Distribution of TD-PVSD75/10.

1.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : TD-PVSD75/10

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.8	0.80	44.00
40.00	45.00	3.4	2.60	117.00
30.00	35.00	12.8	9.40	329.00
20.00	25.00	31.5	18.70	467.50
10.00	15.00	60.7	29.20	438.00
8.00	9.00	76.8	16.10	144.90
6.00	7.00	87.5	10.70	74.90
5.00	5.50	93.4	5.90	32.45
4.00	4.50	96.7	3.30	14.85
3.00	3.50	98.3	1.60	5.60
2.00	2.50	99.2	0.90	2.25
1.00	1.50	100.0	0.80	1.20
0.00	0.50	100.0	0.00	0.00
Average Particle Size (μm)				16.72



Table 98-2 Particle Size Distribution of TD-PVSD75/20.

2.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : TD-PVSD75/20

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.0	0.00	0.00
40.00	45.00	1.9	1.90	85.50
30.00	35.00	6.8	4.90	171.50
20.00	25.00	12.9	6.10	152.50
10.00	15.00	29.7	16.80	252.00
8.00	9.00	59.8	30.10	270.90
6.00	7.00	78.6	18.80	131.60
5.00	5.50	90.5	11.90	65.45
4.00	4.50	94.7	4.20	18.90
3.00	3.50	98.4	3.70	12.95
2.00	2.50	99.3	0.90	2.25
1.00	1.50	100.0	0.70	1.05
0.00	0.50	100.0	0.00	0.00
Average Particle Size (μm)				11.65

Table 98-3 Particle Size Distribution of TD-PVSD75/30.

3.0 % of sodium dodecyl sulfonate and 7.5 % of poly(vinyl alcohol) of the total oil phase for the assigned name : TD-PVSD75/30

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	0.0	0.00	0.00
50.00	55.00	0.0	0.00	0.00
40.00	45.00	0.3	0.30	13.50
30.00	35.00	0.8	0.50	17.50
20.00	25.00	2.4	1.60	40.00
10.00	15.00	11.2	8.80	132.00
8.00	9.00	29.7	18.50	166.50
6.00	7.00	58.6	28.90	202.30
5.00	5.50	77.9	19.30	106.15
4.00	4.50	88.2	10.30	46.35
3.00	3.50	94.1	5.90	20.65
2.00	2.50	97.7	3.60	9.00
1.00	1.50	99.4	1.70	2.55
0.00	0.50	100.0	0.60	0.30
Average Particle Size (μm)				7.57

Table series 99 Particle Size Distribution of SBC/PNDA, TPC/HMDA and STC/HMPN.

Effect of the appropriate monomer pairs on average particle size and particle size distribution in microencapsulation. The fixed conditions were 7.5 % poly(vinyl alcohol) as emulsifier, dibutyl phthalate as encapsulated material, 6,000 rpm. propeller speed and 90 sec. homogenizing time.

Table 99-1 Particle Size Distribution of SBC/PNDA.

Effect of sebacoyl chloride and para-phenylene diamine, the monomer pairs, on microencapsulation of dibutyl phthalate; assigned name : SBC/PNDA

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	2.2	2.20	143.00
50.00	55.00	6.7	4.50	247.50
40.00	45.00	13.5	6.80	306.00
30.00	35.00	27.6	14.10	493.50
20.00	25.00	46.9	19.30	482.50
10.00	15.00	75.4	28.50	427.50
8.00	9.00	83.6	8.20	73.80
6.00	7.00	89.7	6.10	42.70
5.00	5.50	92.8	3.10	17.05
4.00	4.50	95.8	3.00	13.50
3.00	3.50	98.2	2.40	8.40
0.00	1.50	100.0	1.80	2.70
Average Particle Size (μm)				22.58

Table 99-2 Particle Size Distribution of STC/HMPN.

Effect of sebacoyl chloride and terephthaloyl chloride mixture and hexamethylene diamine and terephthaloyl chloride mixture, the monomer pairs, on microencapsulation of dibutyl phthalate; assigned name : STC/HMPN

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*,**	0.0	0.00	0.00
60.00	65.00	1.5	1.50	97.50
50.00	55.00	6.4	4.90	269.50
40.00	45.00	16.8	10.40	468.00
30.00	35.00	31.8	15.00	525.00
20.00	25.00	58.7	26.90	672.50
10.00	15.00	79.6	20.90	313.50
8.00	9.00	88.3	8.70	78.30
6.00	7.00	94.2	5.90	41.30
5.00	5.50	96.7	2.50	13.75
4.00	4.50	98.0	1.30	5.85
3.00	3.50	99.7	1.70	5.95
0.00	1.50	100.0	0.30	0.45
Average Particle Size (μm)				24.92

Table 99-3 Particle Size Distribution of STC/HMDA.

Effect of terephthaloyl chloride and hexamethylene diamine, the monomer pairs, on microencapsulation of dibutyl phthalate; assigned name : TPC/HMDA.

Diameter (μm) Micrometer	Average Diameter	Percentage Cumulative	Percentage Different	Diameter Coefficient
70.00	*.**	0.0	0.00	0.00
60.00	65.00	3.8	3.80	247.00
50.00	55.00	13.5	9.70	533.50
40.00	45.00	30.1	16.60	747.00
30.00	35.00	51.8	21.70	759.50
20.00	25.00	67.4	15.60	390.00
10.00	15.00	84.9	17.50	262.50
8.00	9.00	91.1	6.20	55.80
6.00	7.00	94.9	3.80	26.60
5.00	5.50	96.6	1.70	9.35
4.00	4.50	98.1	1.50	6.75
3.00	3.50	100.0	1.90	6.65
0.00	1.50	100.0	0.00	0.00
Average Particle Size (μm)				30.45



VITA

Mr. Suthon Chuenchokesant was born on January 22, 1958 in Nakornsrihummaraj province, Thailand. He received a Bachelor Degree of Science in Chemistry from Faculty of Science, Prince of Songkla University in 1979. Since 1980, he has worked at Siam Resin & Chemical Co., Ltd. as a research and development staff. To date, he is a specialist in stepwise polymerizations of amino, phenolic, polyester, alkyd, and epoxy resin and radical addition polymerizations of vinyl, acrylate, methacrylate, and styrene emulsion. He furthers his study in the Graduate School of Chulalongkorn University with a major discipline in polymer science.