

(19) (KR)
(12) (B1)

(21)	10 - 2000 - 7003749	(65)	2001 - 0024444
(22)	2000 04 07	(43)	2001 03 26
	2000 04 07		
(86)	PCT/US1999/17661	(87)	WO 2000/07426
(86)	1999 08 03	(87)	2000 02 17

(30) 09/130,615 1998 08 07 (US)

(73) 45202

(72) 45209 3784

45202 #11041

45215 4702

(74)

(54)

$$\begin{array}{lll}
 1 & , & 1 \\
 041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4 & E & , \\
 0.5 \quad x < 0.8 & y(x) & 73.041 - 260.72x + 275.27x^2 - 70.158x^3 \\
 3 - 6.9911x^4 & E \text{ 가} & , \quad 0.8 \quad x \quad 1.4 \quad y(x) \quad 2, \\
 & & \quad 0.5 \quad x < 0.8
 \end{array}$$

(ink rub - off)
가
가

가

가 (, , , ,)

가
가
가

1972 2 15

3,642,502

가

가 (, ,)
pH
가

1

, 1	2	.	.	.	.	.	.	.	.
	E	.	.	.	.	.	.	.	.
y(x) 75.041 - 260.72x + 275.27x ² - 70.158x ³ - 6.9911x ⁴	,	,	,	,	,	,	,	,	E
4 y(x) 3, 0.5 x < 8	.	.	.	.	.	.	.	,	,
+ 275.27x ² - 70.158x ³ - 6.9911x ⁴	,	,	,	,	,	,	,	y(x) 2,	0.8 x 1.
8 .	.	.	.	.	.	.	.	.	.
275.27x ² - 70.158x ³ - 6.9911x ⁴	,	,	,	,	,	,	,	y(x) 3,	0.5 x < 0.8
260.72x + 275.27x ² - 70.158x ³ - 6.9911x ⁴	,	,	,	,	,	,	,	y(x) 2,	0.5
x < 0.8 .	.	.	.	.	.	.	.	.	.
+ 2073.8x ³ - 465.5x ⁴	,	,	,	,	,	,	,	y(x) - 593.36 + 2340.1x - 3350x ²	1
,	E	y(x) - 595.36 + 2340.1x - 3350x ² + 2073.8x ³ - 465.5x ⁴	,	,	,	,	,	,	.
,	, 0.7 x 1.50	.	.	.	.	.	.	.	.
268.91x ² - 87.964x ³	,	,	,	,	,	,	,	E y(x) 57.701 - 222.16x + 1	1
,	E	y(x) 55.701 - 222.16x + 268.91x ² - 87.964x ³	,	,	,	,	,	,	.
, 0.5 x 1.5 .	.	.	.	.	.	.	.	.	.
+ 69923x ³ - 65676x ⁴ + 32126x ⁵ - 6391.7x ⁶	,	,	,	,	,	,	,	y(x) - 1549.8 + 12473x - 40898x ²	1
2 x 1.4 .	,	1	,	1	,	1	,	y(x) 22,	1.
1551.8 + 12473x - 40898x ² + 69923x ³ - 65676x ⁴ + 32126x ⁵ - 6391.7x ⁶	,	,	,	,	,	,	,	,	.
1.2 y(x) 16, 1.2 x 1.4 .	.	.	.	.	.	.	.	,	.
490.01x ² + 398.49x ³ - 112.31x ⁴	,	,	,	,	,	,	,	E y(x) - 50.197 + 265.12x - 1	1
x ³ - 112.31x ⁴	,	,	,	,	,	,	,	y(x) - 52.197 + 265.12x - 490.01x ² + 398.49	.
,	0.5 x 1.4 .	.	.	.	.	.	.	.	.
7x ² + 14346.4x ³ - 4175.14x ⁴	,	,	,	,	,	,	,	E y(x) 4,	0.5 x < 0.7
,	1	,	,	,	,	,	,	E y(x) - 2105.34 + 10184.4x -	.
18237x ² + 14346.4x ³ - 4175.14x ⁴	,	,	,	,	,	,	,	y(x) 14,	0.5 x <
0.7 .	.	.	.	.	.	.	.	.	.
422.27x ² - 158.5x ³	,	,	,	,	,	,	,	E y(x) 90.549 - 332.78x + 1	1
,	0.7 x < 1.3 .	.	.	.	.	,	,	y(x) 86.549 - 332.78x + 422.27x ² - 158.5x ³	.
,	E	,	,	,	,	,	,	,	.

가 500,000, 100, T_g, 가
 0.10:1, 3:1, 85 mg, 0.01 MOa
 (50%)) , 0.3

- 1 ,
- 2 1 ,
- 2a 1 ,
- 3 1 ,
- 3a 3 ,
- 4 1 E ,
- 5 1 E ,
- 6 1 E ,
- 7 1 E ,
- 8 1 E ,
- 9 1 E ,
- 10 1 E ,
- 11 1 E ,

1

$$D = \log <_{>_{10} </_{\geq J/R}}$$

, | , R

가 , " (rub - off)" 가
2 (bleed) 가
가 (abration)

1995 5 2 5,411,636 , 1995 10 18
2,677,812

4.440.597 1980 5 4 . . 1984 4 3 4.191.756

pH , , , , ; ; ; , , , () .

$$(\quad, \quad 20 \quad) \quad ,$$

$$T = \int^{\sigma_5} \sigma d\epsilon$$

$$= [(\quad \quad \quad - \quad \quad \quad) / \quad \quad \quad]$$

, 0.5 . , 50%
1.5 가 .

100 30 200,000 , 1,000,000
 (T₂) 가

. 가

가 500,000 가 20 T_g , 45 % 50 %
가

가 , " " 가 ,
가 ,

10 T_g 가
45 % , 500,000 . 96% 4%
% . 135 가
Rohm Haas 가 PHOPLEX NW2744
6

400,000 30 % 30 T_g
Witco Corporation 가 WITCOBON

DW - 234

500,000
10 , - 15 T_g , 50 %
100 135 가 가

Air Prod
ucts and Chemicals, Inc. AIRFLEX 124 AIRFLEX 192 가

1

[1]

		T_g ()	가
		- 20	
		- 10	
		- 30	
		- 15	
		+10	

20 200 , 70
," , 가
(raw ink)"
, #1 Shell Cup 1 10 Shell Cup 가
II Cup 7.5 30 #4 Shell Cup #3 Shell Cup #2 She
80 25 200

2 - 11,
0.10:1 3:1, 7 - 10 pH
0.5:1 2:1,
가 1.0:1 1.5:1

가

JONWAX 26

가 0.5% 10%
S.C. Johnson Sons, Inc.

가

가

"

가
, pH

가
,

가
가

가
,

"

"

가

가 가

가

가

%

가
)

가
가

3%

15%,

4%

8%(가

Hercules Inc.

KY

MENE PLUS가

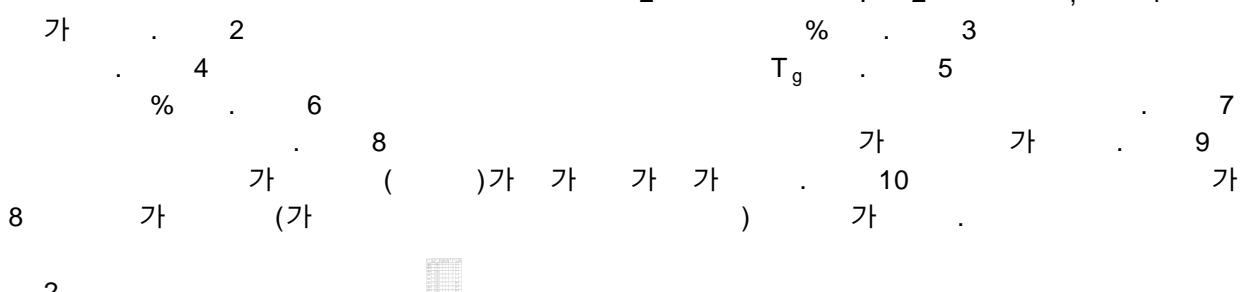
가

3% 15%,

%
8% 13%

0.5% 20%,

(, , , X)



(1) 색소 형태 및 칼라	(2) 색소 고 형물 (중량%)	(3) 결합제 고 래	(4) 결합제의 대략 T_g ($^{\circ}\text{C}$)	(5) 결합제 고형물(대 중량%)	(6) 결합제 고형물 비율	(7) 전색제	(8) 왁스 함 유	(9) 가교 결 합제	(10) 가교 결 합제 양 (중량%)
DIAYLIDE YELLOW 14	20.3	아크릴 에 멀센 중합 체	-10	24.8	1.2:1	풀	예	없음	-
RUBINE MAGENTA RED 238	20.0	아크릴 에 멀센 중합 체	-10	22.5	1.1:1	풀	예	없음	-
PHTHALOCYAN BLUE 15:3	20.2	아크릴 에 멀센 중합 체	-10	24.5	1.2:1	풀	예	없음	-
CARBON BLACK 7	19.7	아크릴 에 멀센 중합 체	-10	23.2	1.2:1	풀	예	없음	-

(, 20 T_g) 10 T_g 가
 ,
 pH
 85mg ,
 5mg , 가
 20mg ,
 0.5mg
 50%
 0.01
 MPa,
 0.3,
 0.05 MPa
 1
 3
 3
 1
 4
 가 . 2
 가 . 5
 가 . 3
 가 . 3
 가 . 7
 가 . 7
 가 . 8
 가 . 9
 가 . 10
 6 가
 8
 7
 8
 9 50%
 3

A

，
， ("PTFE")

Goodfellow Corporation
No. FP301300

1cm , 10cm x 5cm PTFE 가 . 0.4mm
 0.5mm . 3M C
 orporation FLEXMOUNT() No. 412X18 STICKYBACK DL 20

BIC Corporation , BIC WITE - OUT 8.0 11
2 .
105 1

B.

3 7 6 8 10 4 11

Aldrich Chemical Company
4가 99.5% EDTA 0.20 가 .
Aldrich Chemical Company
4가 100 가 .

C ₁₂ - C ₁₄	가	가	C ₁₂ - C ₁₄
BARLOX 12	2 -	9.5	Lonza Inc.
Union Carbide Corporation			30%
88	가	99%	
가 75	6 , C ₉ - C ₁₁	가 C ₉ - C ₁₁	가 20
100	가	Shell Oil Company	C ₉ - C ₁₁
12N incorporated	2 , 12.5	pH가 12.5	12N J.T. Baker a division of Mallinckrodt I
	pH	,	
		pH	가
		12.5	,
C:			
3 6	,		
A	,		
	가		
Carbon Black 7 500			
Diarylide 14 430			
Rubine Magenta Red 238 580			
Phthalocyan Blue 15:3 610			
, 1μm	, 25mm	1cm × 1cm 3 10Mℓ	A , PTFE 1
		VWR Scientific	Gelman No. 4523 Glass
Fiber Acrodisc Syringe Filter			
		가	(Beer - Lambert's)

Mℓ

3

(Beer - L)

ambert's)

3

Y=mx+b

, Y_(abs)

, b y

가

, m

, X (conc)

,

Hewlett - Packard Company

Diode Array Spectrophotometer,

No. 8452A

3 7

가,

B

3

3

3

17

3

D:

3 8 9

,

50%

A

3

Exacto

3cm

4mm

3

가

가

가

Thwing - Albert Instrument Company

가

Thwing - Albert

No. 89 - 100

, Thwing - Albert

5cm

가

in² 95

100N

가

1cm

0.15cm/

0.5cm

Instron Corporation

Instron

No. 4502

1cm가

1cm

4mm

가

()

4

4

= /(

*

)

()

5

5

= [(-) /]
 50% 0 0.5
) (,
 8, 9 3 17
 3
 3



[5]

(1)	(2)	(3) T g()	(4)	(5) 가 %	(6) 가 (%)	(7) (N=3) (mg/g)	(8) (N=3)	(9) 50% (N=3)	(10) (N=3)
PHTHALO CYAN BL UE 15:3		- 10			-	0.05 ± 0.003	0.11 ± 0.04	0.147 ± 0.005	20 ± 3.60
CARBON BLACK 7		- 10			-	0.07 ± 0.0006	0.10 ± 0.02	0.240 ± 0.056	20 ± 3.60

ND -

NA -

Sun Chemical Corporation

가 4

[3]

(1)	(2)	(3)	(4)	(5)	(6) T_g	(7)
SUN CHEMICALWKF20712F		DIARYLIDE YELLOW 1 4			- 30	
SUN CHEMICALWKF41508F		RUBINE MAGENTA RE D 238			- 30	
SUN CHEMICALWKF51310F		PHTHALOCYAN BLUE 15:3			- 30	
SUN CHEMICALWKF41584F		RUBINE MAGENTA RE D 238			- 15	
SUN CHEMICALWKF51372F		PHTHALOCYAN BLUE 15:3			- 15	
SUN CHEMICALWKF20762F		DIARYLIDE YELLOW 1 4			+10	
SUN CHEMICALWKG41585F		RUBINE MAGENTA RE D 238			+10	
SUN CHEMICALWKG51373F		PHTHALOCYAN BLUE 15:3			+10	
SUN CHEMICALWKG90603F		CARBON BLACK 7			+10	
SUN CHEMICALWKFW283 - 0204		DIARYLIDE YELLOW 1 4			- 20	
SUN CHEMICALWKFW483 - 0203		RUBINE MAGENTA RE D 238			- 20	
SUN CHEMICALWKFW583 - 0205		PHTHALOCYAN BLUE 15:3			- 20	
SUN CHEMICALWKFW983 - 0206		CARBON BLACK 7			- 20	
SUN CHEMICAL*YDE - 9773		DIARYLIDE YELLOW 1 4			-	
SUN CHEMICAL*RPD - 9775		RUBINE MAGENTA RE D 238			-	
SUN CHEMICAL*BPD - 9777		PHTHALOCYAN BLUE 15:3			-	
SUN CHEMICAL*LPD - 9776		CARBON BLACK 7			-	

가

1993 5 25

2

5,213,037

, 1993 10 26

5,255,603

" (line work)"

, (,)가 , 가

가 . , 가

3 . , 10가 10가 가

E:

1
4

4

91.17, 0.64 4.29 L*a*b* 가 4 가 , L*a*b*
 CIELAB L*a*b* (A) 10° . 91.17, 0.64
 4.29 L*a*b* 가 BOUNTY() .

17, 0.64 4.29 L*a*b* 가 가 . . , 91.
X - Rite, Inc. X - Rite 418 .

, L*a*b* CIELAB L*a*b* . CIELAB L*a*b*
 가 , . L*a*b*
 a* a* , . L*
 가 . a* 가 . b* b*
 가 . b* . L*a*b* ,
 E , E L*a*b* 2
 E가 . 가 .

F:

가 가 가
가 . 가

10.15cm x 10.15cm , 0.6cm . 0.5cm
 0.11cm
 93.65, -0.32 0.11 CIELAB L*a*b* , 47 가 가
 0.14 , 3.53 μm
 Zyg Co

Zygo New View 200, No. 97 - 51 - 60655
Formica Corporation 가 FORMICA No. 459
Georgia - Pacific Corporation
3M Corp
Model No. 30NF

$$2 \quad \begin{matrix} 2a \\ . \end{matrix} \quad \begin{matrix} (10) & 1 & 3 \\ (14) & , 1.2\text{cm} & \times 0.9\text{cm} \end{matrix} \quad \begin{matrix} (14) & 1000 \\ (12) & , \quad (14) \end{matrix} \quad (12)$$

(14) 0.125 , 1200psi , 55 A 가
ter - Carr Supply Company 8616K64 (14) McMas

(12) DURO QUICK GEL NO - RUN SUPER GLUE . . . Loctite Corporati
on

(30) (18)가 (10) (30) (16) . , (20) (30) (16) (30)

(30) , (12) (14) (12) 9.81N . 3
 (12) (40) 29.2cm () 11.2 ° (.
 3 "A") 44.28 / (30) 7
 3a , (40) 7 () 2
 (12) (7) (40)
 (40) 3a ("A") ("B")

(10) ny CTC 1280 Ink Rub Tester . Concord - Renn Compa

, , 5 ,
 G:
 (30) 24 , (30) (30) CIELAB
 $L^*a^*b^*$
 가 .
 , E (30) , 가 (30)

6

$$\Delta E = \sqrt{(L^*_1 - L^*_0)^2 + (a^*_1 - a^*_0)^2 + (b^*_1 - b^*_0)^2}$$

$$\frac{L^*_0, a^*_0, b^*_0}{L^*a^*b^*} \quad (30) \quad \frac{E}{(30)} \quad \frac{L^*a^*b^*, L^*_{-1}, a^*_{-1}, b^*_{-1}}{(30)} \quad (30)$$

(A) 10° $L^*a^*b^*$ $L^*a^*b^*$ $L^*a^*b^*$ $CIELAB$ $L^*a^*b^*$ F F (30) (30) (30) (30)

$L^*a^*b^*$	$93.65, -0.32, 0.11$	E	0.40
$L^*a^*b^*$	(30)	E	(30)

30) $L^*a^*b^*$

E $L^*a^*b^*$ E E $5mm$ $7mm$ $X - Rite, Inc.$ $L^*a^*b^*$ 8 8 $X - RITE 948$

5	8	,	가	BOUNTY()	6
.	5	8	.	4	.
5	Carbon Black 7	.	BOUNTY()	.	.
Phthalocyan Blue 15:3	.	BOUNTY()	.	.	.
7 Rubine Magenta Red 238	.	BOUNTY()	.	.	.
8 Diarylide 14	.	BOUNTY()	.	.	.

5	8	,	1	T_g	2	가
가	가	.	3	가	4	가
6	가	.	5	가	7	가
가	.	8	가	가	E	135
1	가	.	9	E	.	가

10

F G

BOUNTY()
E(, E)
E 가 ,

E ,
B

[4]

(1)	(2)	(3) Tg()	(4)가	(5)가	(6)	(7)135 가	(8)	(9)	(10) E
CARBON BL ACK 7		- 20		-				0.51	1.58
CARBON BL ACK 7		- 20		-				0.65	1.62
CARBON BL ACK 7		- 20		-				1.01	2.70
CARBON BL ACK 7		- 20		-				0.83	2.90
CARBON BL ACK 7		- 10		-				0.86	3.27
CARBON BL ACK 7		+10	KYMENE P LUS	6%				0.52	8.22
CARBON BL ACK 7		+10	KYMENE P LUS	6%				0.81	9.50
CARBON BL ACK 7		+10		-				0.95	10.15
CARBON BL ACK 7		- 10		-				0.99	10.98
CARBON BL ACK 7		+10	KYMENE P LUS	6%				0.96	12.13
CARBON BL ACK 7		+10	KYMENE P LUS	6%				0.69	12.16
CARBON BL ACK 7		- 20		-				1.41	13.21

6



(1) 색소 칼라	(2) 결합제 형태	(3) 결합제 의 대 략 T _g (°C)	(4) 가교결 합제	(5) 가교결 합제 량(중 량%)	(6) 왁스 함유	(7) 135°C 로 가 열	(8) 농도계 칼라	(9) 밀도	(10) $\Sigma \Delta E$
PHTHALOCYAN BLUE 15:3	풀리우레탄 분 산체	-30	없음	-	예	아니오	CYAN	0.85	15.52
PHTHALOCYAN BLUE 15:3	에틸렌 비닐 아 세테이트 에멀 션	+10	KEMENE PLUS	6%	예	아니오	CYAN	0.55	21.71
PHTHALOCYAN BLUE 15:3	에틸렌 비닐 아 세테이트 에멀 션	-15	없음	-	예	아니오	CYAN	0.51	22.05
PHTHALOCYAN BLUE 15:3	에틸렌 비닐 아 세테이트 에멀 션	+10	KEMENE PLUS	6%	예	아니오	CYAN	0.66	26.47
PHTHALOCYAN BLUE 15:3	에틸렌 비닐 아 세테이트 에멀 션	+10	KEMENE PLUS	6%	예	아니오	CYAN	1.00	28.52
PHTHALOCYAN BLUE 15:3	아크릴 에멀션 중합체	-10	없음	-	아니오	예	CYAN	0.98	29.83
PHTHALOCYAN BLUE 15:3	에핀 맨 비닐 아 세테이트 에멀 션	+10	KEMENE PLUS	6%	예	아니오	CYAN	0.87	30.62



(1) 색소 및 형태	(2) 결합체 형태	(3) 결합체의 대략 T_g (°C)	(4) 가교 결합 체	(5) 가교 결합 체 양	(6) 왁스 합유	(7) 135°C로 가열	(8) 농도계 칼라	(9) 밀도	(10) $\Sigma \Delta E$
RUBINE MAGENTA RED 238	에틸렌 비닐 아 세테이트 에멀션	+10	KEMENE PLUS	6%	예	아니오	MAGENTA	0.96	15.63
RUBINE MAGENTA RED 238	에틸렌 비닐 아 세테이트 에멀션	+10	KEMENE PLUS	6%	예	아니오	MAGENTA	0.67	15.78
RUBINE MAGENTA RED 238	에틸렌 비닐 아 세테이트 에멀션	+10	KEMENE PLUS	6%	예	아니오	MAGENTA	0.86	16.91
RUBINE MAGENTA RED 238	스티렌 부타디엔 리텍스 에멀션	-20	없음	-	예	아니오	MAGENTA	1.20	18.53
RUBINE MAGENTA RED 238	폴리우레탄 분산 제	-30	없음	-	예	아니오	MAGENTA	1.20	20.49
RUBINE MAGENTA RED 238	에틸렌 비닐 아 세테이트 에멀션	-15	없음	-	예	아니오	MAGENTA	1.22	21.99
RUBINE MAGENTA RED 238	에틸렌 비닐 아 세테이트 에멀션	-15	없음	-	예	아니오	MAGENTA	1.39	29.99
RUBINE MAGENTA RED 238	폴리우레탄 분산 제	-30	없음	-	예	아니오	MAGENTA	1.38	31.03
RUBINE MAGENTA RED 238	스티렌 부타디엔 리텍스 에멀션	-20	없음	-	예	아니오	MAGENTA	1.41	34.39

[5]

(1)	(2)	(3) T _g ()	(4)가	(5)가	(6)	(7)135 가	(8)	(9)	(10) E
DIARYLIDE YE LLOW 14		- 20		-			YELLOW	0.84	5.10
DIARYLIDE YE LLOW 14		- 20		-			YELLOW	0.66	5.75
DIARYLIDE YE LLOW 14		- 20		-			YELLOW	0.50	6.48
DIARYLIDE YE LLOW 14		- 20		-			YELLOW	0.98	8.80
DIARYLIDE YE LLOW 14		- 10		-			YELLOW	0.85	11.23
DIARYLIDE YE LLOW 14		- 30		-			YELLOW	0.53	12.53
DIARYLIDE YE LLOW 14		- 30		-			YELLOW	0.62	14.29
DIARYLIDE YE LLOW 14		- 10		-			YELLOW	1.01	14.92
DIARYLIDE YE LLOW 14		- 30		-			YELLOW	0.86	17.51
DIARYLIDE YE LLOW 14		- 30		-			YELLOW	0.95	19.71
DIARYLIDE YE LLOW 14		- 20		-			YELLOW	1.21	19.90
DIARYLIDE YE LLOW 14		- 30		-			YELLOW	1.11	24.23
DIARYLIDE YE LLOW 14		+10		-			YELLOW	1.08	27.90
DIARYLIDE YE LLOW 14		+10		-			YELLOW	0.51	28.41
DIARYLIDE YE LLOW 14		+10		-			YELLOW	1.11	29.11
DIARYLIDE YE LLOW 14		+10	KEMENE PLUS	6%			YELLOW	1.00	29.99
DIARYLIDE YE LLOW 14		+10		-			YELLOW	0.67	30.14
DIARYLIDE YE LLOW 14		+10		-			YELLOW	0.98	31.00
DIARYLIDE YE LLOW 14		+10	KEMENE PLUS	6%			YELLOW	0.51	32.13
DIARYLIDE YE LLOW 14		+10	KEMENE PLUS	6%			YELLOW	0.86	36.69
DIARYLIDE YE LLOW 14		+10		-			YELLOW	0.87	37.91
DIARYLIDE YE LLOW 14		+10	KEMENE PLUS	6%			YELLOW	0.64	40.76

10

$$y(x) = -593.36 + 2340.1x - 3350x^2 + 2073.8x^3 - 465.5x^4$$

$$, 0.7 \leq x \leq 1.50$$

$$11 \quad , \quad \left(\frac{1}{5} E - E \right), \quad E$$

11

$$y(x) = -595.36 + 2340.1x - 3350x^2 + 2073.8x^3 - 465.5x^4$$

$$, 0.7 \leq x \leq 1.50$$

$$12 \quad , \quad \left(\frac{1}{6} F - F \right), \quad E$$

12

$$y(x) = -1549.8 + 12473x - 40898x^2 + 69923x^3 - 65676x^4 + 32126x^5 - 6391.7x^6$$

$$, 0.5 \leq x < 1.2 \quad / \quad y(x) = 22, \quad 1.2 \leq x \leq 1.4$$

$$13 \quad , \quad \left(\frac{1}{6} G - G \right), \quad E$$

13

$$y(x) = -1551.8 + 12473x - 40898x^2 + 69923x^3 - 65676x^4 + 32126x^5 - 6391.7x^6$$

$$, 0.7 \leq x < 1.2 \quad / \quad y(x) = 16, \quad 1.2 \leq x \leq 1.4$$

$$14 \quad , \quad \left(\frac{1}{7} H - H \right), \quad E$$

14

$$y(x) = -2103.34 + 10184.4x - 18237x^2 + 14346.4x^3 - 4175.14x^4$$

$$, 0.7 \leq x \leq 1.0 \quad / \quad y(x) = 4, \quad 0.5 \leq x < 0.7$$

$$15 \quad , \quad \left(\frac{1}{7} I - I \right), \quad E$$

15

$$y(x) = -2105.34 + 10184.4x - 18237x^2 + 14346.4x^3 - 4175.14x^4$$

$$, 0.7 \leq x < 1.0 \quad / \quad y(x) = 14, \quad 1.0 \leq x \leq 1.2 \quad / \quad y(x) = 2, 0.5 \leq x \leq 0.7$$

$$8 \quad 11 \quad , \quad E \text{가}$$

$$8 \quad , \quad \left(\frac{1}{8} J - J \right), \quad E$$

16

$$y(x) = 75.041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4$$

$$, 0.8 \leq x \leq 1.4 \quad / \quad y(x) = 3, \quad 0.5 \leq x < 0.8$$

$$17 \quad , \quad \frac{1}{(8K-K)}.$$

17

$$y(x) = 74.041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4$$

$$, 0.8 \leq x \leq 1.4 \quad / \quad y(x) = 2, \quad 0.5 \leq x < 0.8$$

$$18 \quad , \quad \frac{1}{(8L-L)}.$$

18

$$y(x) = 73.041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4$$

$$19 \quad , \quad \frac{1}{(8M-M)}.$$

19

$$y(x) = 68.041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4$$

$$, 0.9 \leq x \leq 1.4$$

$$20 \quad , \quad \frac{1}{(9N-N)}.$$

20

$$y(x) = 57.701 - 222.16x + 268.91x^2 - 87.964x^3$$

$$, 0.5 \leq x \leq 1.5$$

$$21 \quad , \quad \frac{1}{(9O-O)}.$$

21

$$y(x) = 55.701 - 222.16x + 268.91x^2 - 87.964x^3$$

$$, 0.5 \leq x \leq 1.5$$

$$23 \quad , \quad \frac{1}{(9P-P)}.$$

22

$$y(x) = 53.701 - 222.16x + 268.91x^2 - 87.964x^3$$

$$, 0.8 \leq x < 1.5 / y(x) = 2, \quad 0.7 \leq x < 0.8$$

가 23 , $\frac{1}{(9-Q-Q)}$, E

23
 $y(x) = 51.701 - 222.16x + 268.91x^2 - 87.964x^3$

$$, 0.9 \leq x < 1.5 / y(x) = 2, \quad 0.8 \leq x < 0.9$$

10 24 , $\frac{1}{(10-R-R)}$, E

24
 $y(x) = -50.197 + 265.12x - 490.01x^2 + 398.49x^3 - 112.31x^4$

$$, 0.5 \leq x < 1.4$$

25 , $\frac{1}{(10-S-S)}$, E

25
 $y(x) = -52.197 + 265.12x - 490.01x^2 + 398.49x^3 - 112.31x^4$

$$, 0.5 \leq x < 1.4$$

11 26 , $\frac{1}{(11-T-T)}$, E

26
 $y(x) = 90.549 - 332.78x + 422.27x^2 - 158.5x^3$

$$, 0.7 \leq x < 1.3$$

27 , $\frac{1}{(11-U-U)}$, E

27
 $y(x) = 86.549 - 332.78x + 422.27x^2 - 158.5x^3$

$$, 0.7 \leq x < 1.3$$

28 , $\frac{1}{(11-V-V)}$, E

28
 $y(x) = 82.549 - 332.78x + 422.27x^2 - 158.5x^3$

$$, 0.8 \leq x < 1.3$$

(57)

1.

1 , 1 2 , 1 , 2
 , , E , ,
 (a sanitary disposab
 le paper product) ,

E y(x) 75.041 - 260.72x + 275.27x² - 70.158x³ - 6.9911x⁴
 0.8 x 1.4 y(x) 3, 0.5 x < 0.8 , y(x) 73.041 - 260.72x + 2
 75.27x² - 70.158x³ - 6.9911x⁴ E 가 , , 0.8 x 1.4 y(x) 2,
 0.5 x < 0.8

2.

1 , 1 2 , 1 , 2
 , , E , ,
 E y(x) - 593.36 + 2340.1x - 3350x² + 2073.8x³ - 465.5x⁴
 0.7 x 1.50 y(x) - 595.36 + 2340.1x - 3350x² + 2073.8x³ - 465.5x⁴
 E 가 , , 0.7 x 1.50

3.

1 , 1 2 , 1 , 2
 , , E , ,
 E y(x) - 1549.8 + 12473x - 40898x² + 69923x³ - 65676x⁴ + 32126x⁵ - 6391.7
 x⁶ , , 0.5 x < 1.2 y(x) 22, 1.2 x 1.4 , y(x)
 - 1551.8 + 12473x - 40898x² + 69923x³ - 65676x⁴ + 32126x⁵ - 6391.7x⁶ E 가 , ,
 , 0.7 x 1.2 y(x) 16, 1.2 x 1.4

4.

1 , 1 2 , 1 , 2
 , , E , ,

$$\begin{aligned}
 & E \quad y(x) = -2103.34 + 10184.4x - 18237x^2 + 14346.4x^3 - 4175.14x^4, \\
 , 0.7 \quad x \quad 1.0 \quad y(x) = 4, \quad 0.5 \quad x < 0.7, \quad & E \quad y(x) = -2105.34 + 10 \\
 184.4x - 18237x^2 + 14346.4x^3 - 4175.14x^4, \quad & E \quad \text{가}, \quad , 0.7 \quad x \quad 1.0 \quad y(x) \\
 14, \quad 1.0 \quad x \quad 1.2 \quad 0.5 \quad x < 0.7
 \end{aligned}$$

5.

$$\begin{aligned}
 & 1, \quad 1 \quad 2, \quad 1 \quad 2, \\
 & 1, \quad , \quad E, \quad , \\
 & E \quad y(x) = 75.041 - 260.72x + 275.27x^2 - 70.158x^3 - 6.9911x^4, \\
 0.8 \quad x \quad 1.4 \quad y \quad 3, \quad 0.5 \quad x \quad 0.8, \quad & E \quad y(x) = 74.041 - 260.72 \\
 x + 275.27x^2 - 70.158x^3 - 6.9911x^4, \quad E \quad \text{가}, \quad , 0.8 \quad x \quad 1.4 \quad y \quad 2, \\
 0.5 \quad x < 0.8
 \end{aligned}$$

6.

$$\begin{aligned}
 & 1, \quad 1 \quad 2, \quad 1 \quad 2, \\
 & 1, \quad , \quad E, \quad , \\
 & E \quad y(x) = 57.701 - 222.16x + 268.91x^2 - 87.964x^3, \quad , 0.5 \quad x \\
 1.5, \quad , \quad y(x) = 55.701 - 222.16x + 268.91x^2 - 87.964x^3, \quad E \\
 \text{가}, \quad , 0.5 \quad x \quad 1.5
 \end{aligned}$$

7.

$$\begin{aligned}
 & 1, \quad 1 \quad 2, \quad 1 \quad 2, \\
 & 1, \quad , \quad E, \quad , \\
 & E \quad y(x) = -50.197 + 265.12x - 490.01x^2 + 398.49x^3 - 112.31x^4, \\
 , 0.5 \quad x \quad 1.4, \quad & E \quad y(x) = -52.197 + 265.12x - 490.01x^2 + 398.49x^3 - 1 \\
 12.31x^4, \quad E \quad \text{가}, \quad , 0.5 \quad x \quad 1.4
 \end{aligned}$$

8.

1 , 1 2 , 1 2
 1 ,
 ,
 E $y(x) = 90.549 - 332.78x + 422.27x^2 - 158.5x^3$, 0.7 $x < 1.$
 3 ,
 $y(x) = 86.549 - 332.78x + 422.27x^2 - 158.5x^3$ E 가 ,
 , 0.7 $x < 1.3$

9.

1 8 ,
 가 , ,

10.

9 ,
 가 500,000 가 -

11.

9 ,
 가 100 T_g

12.

9 ,
 가

13.

9 ,
 가 가

14.

1 8 ,

0.10:1 3:1

15.

1 8 ,

가 85mg 가

16.

1 8 ,

가 가 85mg 가

17.

1 8 ,

가 3% 20%

18.

1 8 ,

가 % 0.5% 10%

19.

1 8 ,

가 50% 0.01 MPa 가

20.

1 8 ,

0.3

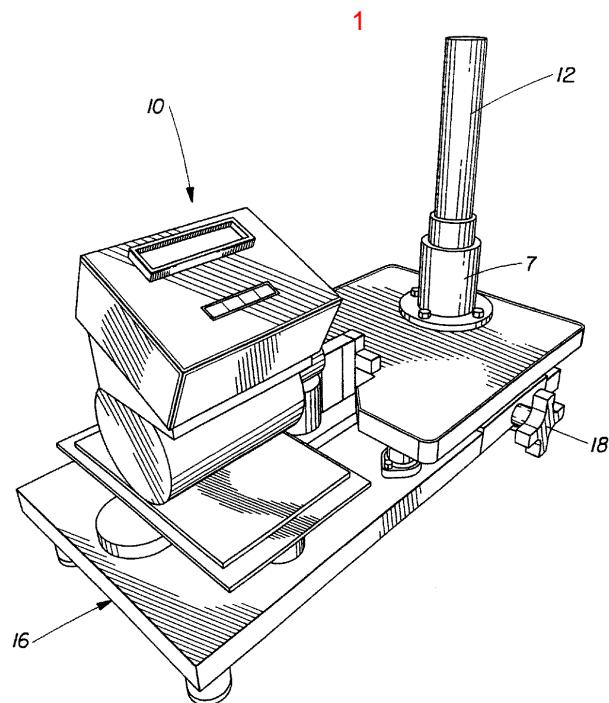
21.

19 ,
 $\gamma \downarrow 50\%$ 0.05 MPa

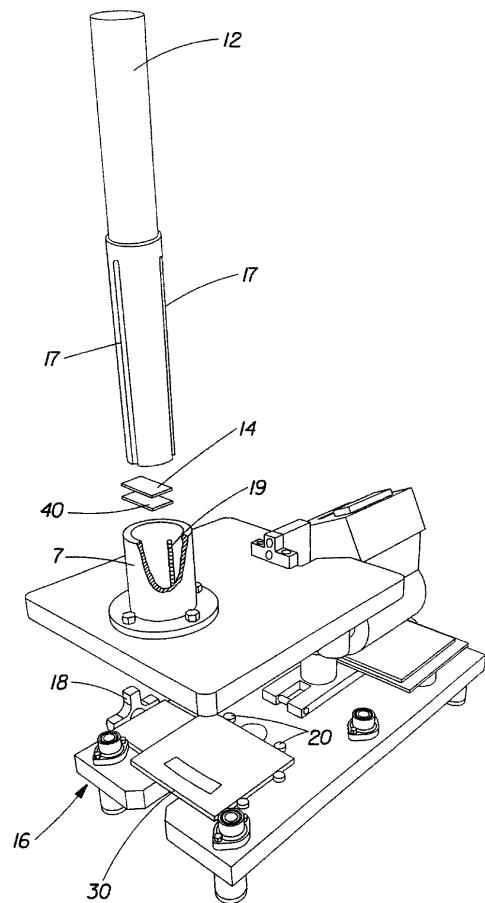
22.

20 ,

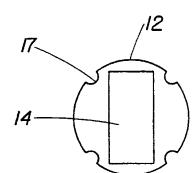
1



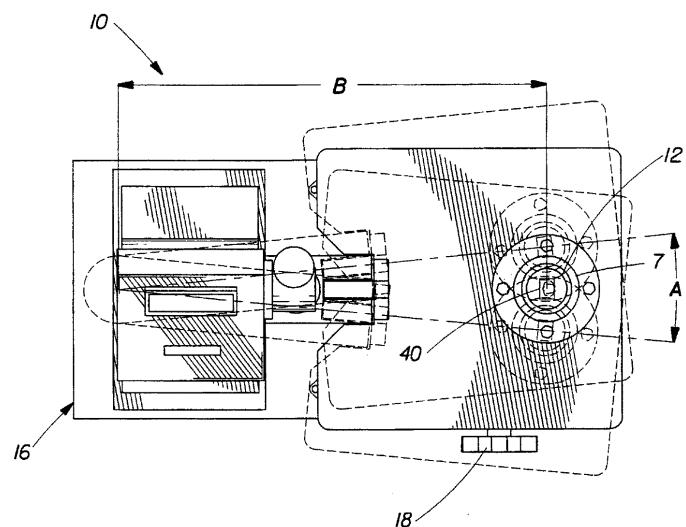
2



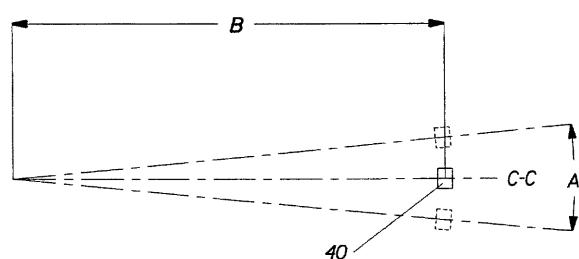
2a



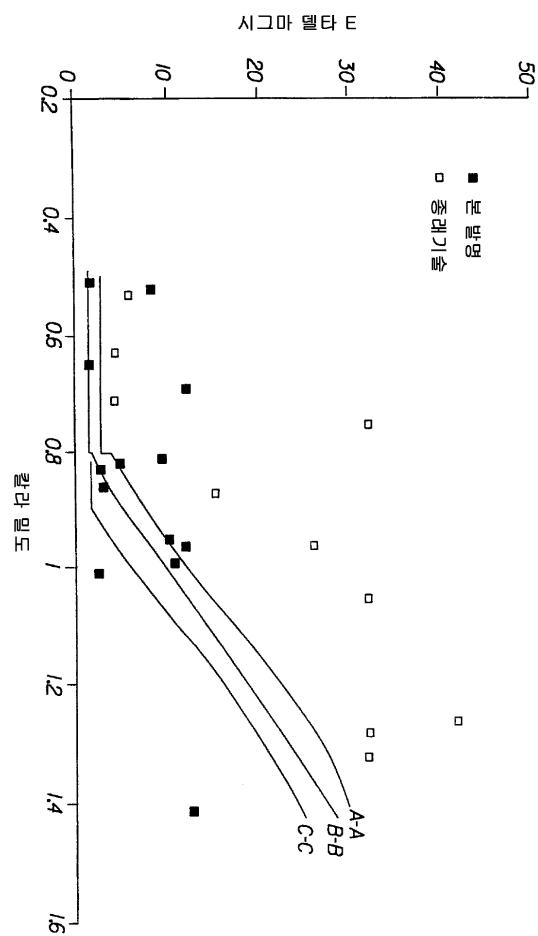
3



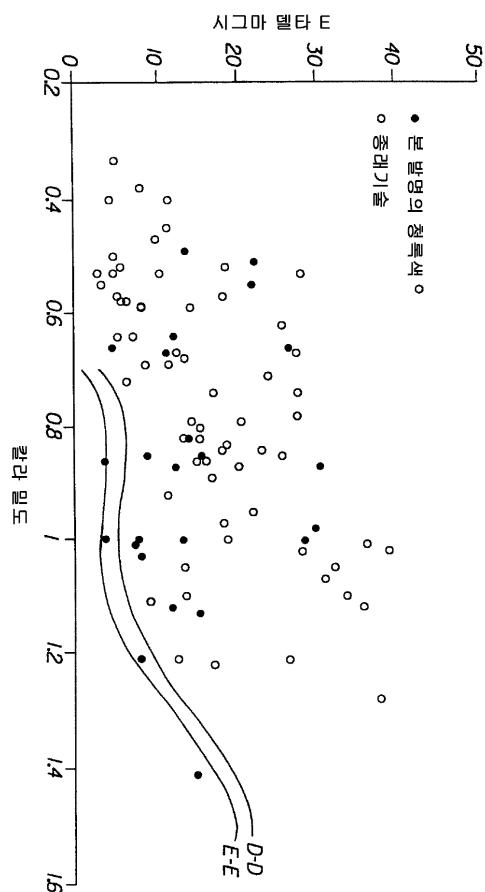
3a



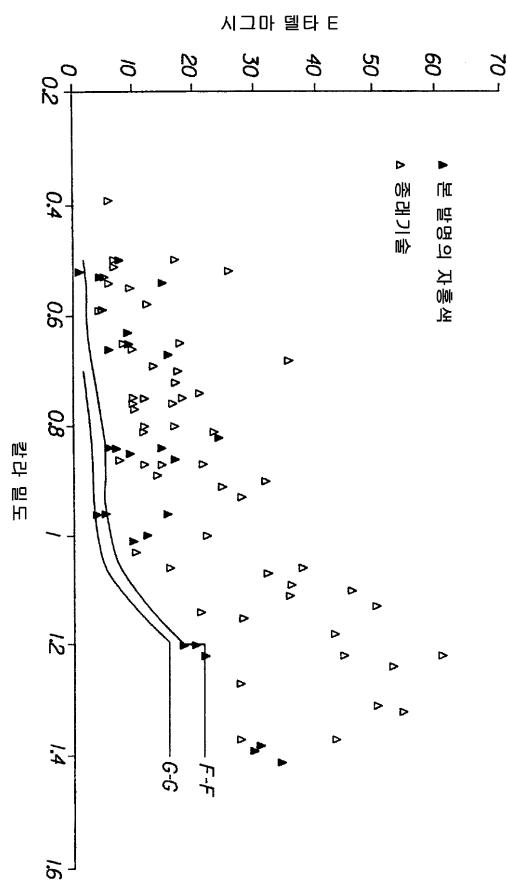
4



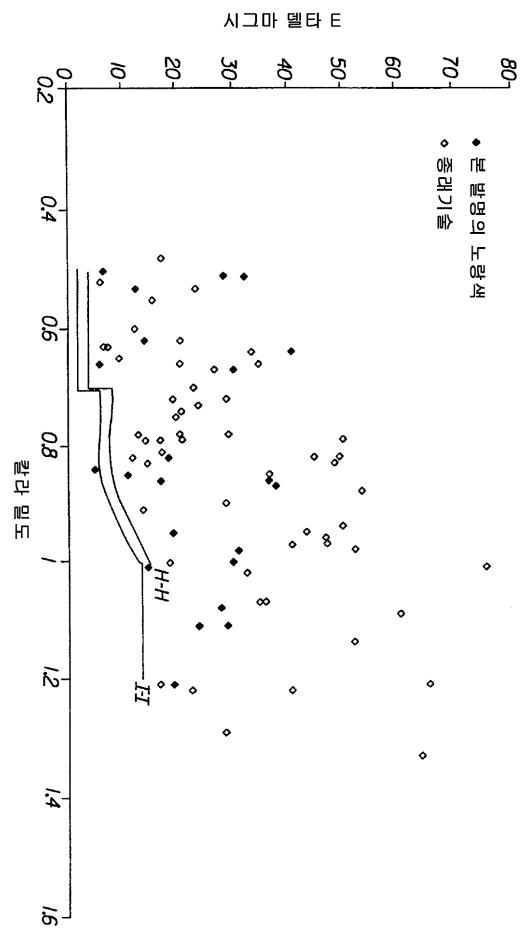
5



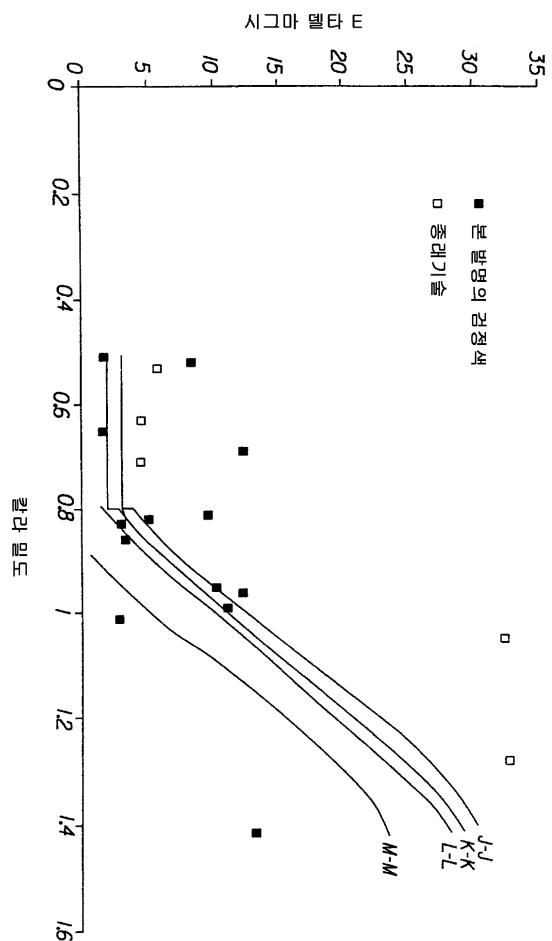
6



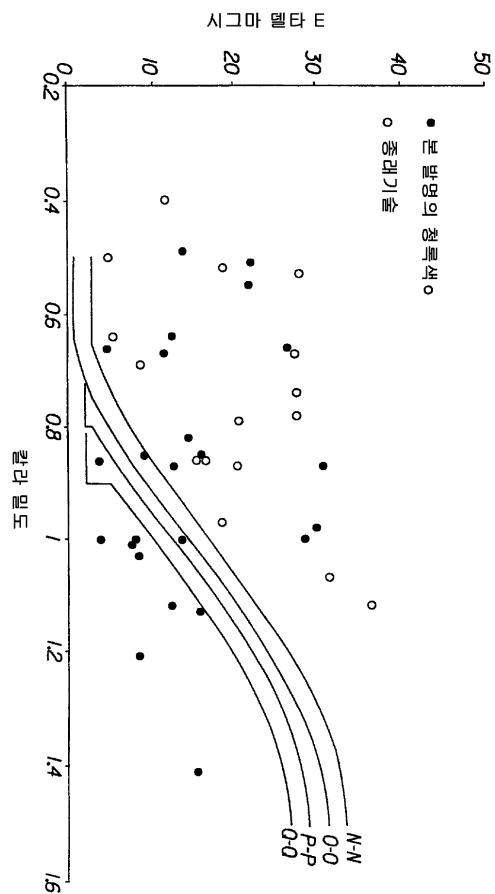
7



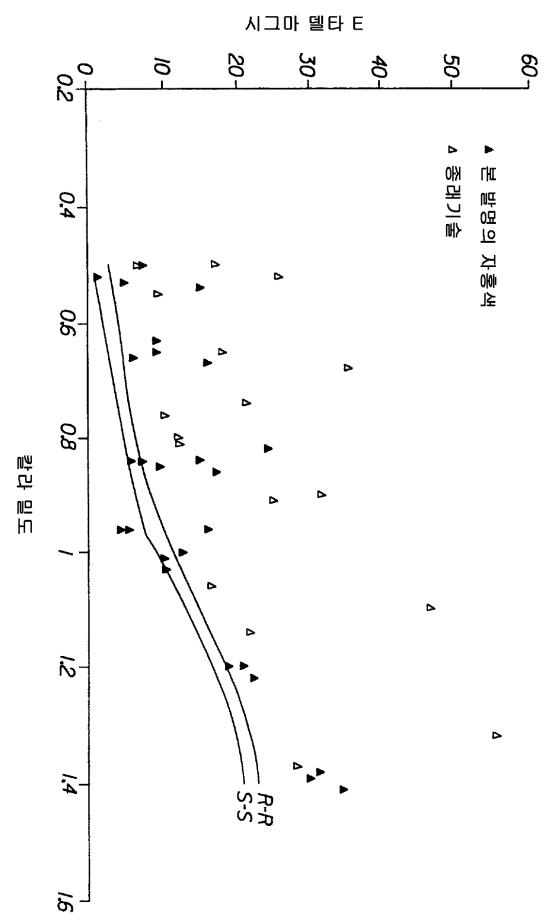
8



6



10



11

