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(87)

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10/052,162

2001 08 09

2002 01 16

(US)

(US)

(71)

, 94607-5200, ,12 ,1111 ,

(72)

95616 1111

95616 1111

95616 608

95616 #18 920

95616 3114

95616 506

(74)

:

(54)

가 (, 가 ,)
(,)가 0.30 ,

, / 가 .

가 ,

가 ,

2

4 μ m

5

22

가 .

가 .

(Valeri et al., Blood, 43, 131-136, 1974) , 'DMSO' (Bock et al., Transfusion, 35, 921-924, 1995) (cryoprotectant)

DMSO alloon)

(b

35%

-80

DMSO

1

가

al., Proc. Natl. Acad. Sci. USA, 92, 397401, 1995). 1999 5 11 (Read et al., Proc. Natl. Acad. Sci. USA, 92, 902,608) (Read) 5, 가

1998 4 7 (Spargo) 5,736,313

10

100mM

37 ,가

1.5M

25

1998 10 27

(Beattie)

5,827,741

가

22

, 15

(Crowe et al., Anhydrobiosis. Annu/. Rev. Physiol., 54, 579-599, 1992).

50 , 30 40 (25 , 50) /
(,)
25

가

25
293H

25

30

42

25

10mM

30

50

10mM

50mM

0.15 (

, 0.20

0.75)

가

30

40

34

37

10mM
30

(50mM ,)
50

50mM

0.40

0.40

0.15

가

가

가

50

1

25

1

2

(, 30

,)

2

가

가

가

가

(,)

가

가

가

가

가

가

가

(,)

(,)

가

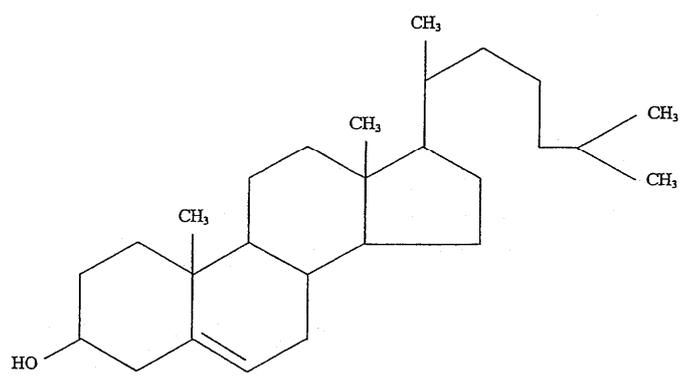
가

가

가

가

가 (,) ; 가
 ; (,) ;
 가 (,) ; 가
 0.30 (,) ;
 0.30
 ;
 ;
 30 ;
 0.00 ; 0.
 (,) ;
 10mM ;
 ;
 ;
 ; 80% 가 0.3
 ; 가
 가 (,) 가
 , 가
 가
 가 (,) ,
 가
 가
 10mM (,)
 mM 200mM 가 10
 0.30
 , 8 10
 , 25 27
 ;



2, 2, 20, 30, 30, 50

30, 40, 32, 38

1

2

3

4 가

5 30mM 1% HSA

6 FITC LYCH (4)

7 가

8 가 (1U/M ℓ), 37 (A) 3 500 $\mu\ell$
 (B) 0.5 x 10⁸ /M ℓ

9 가 (1U/M ℓ) 가 3 2
 50 x 10⁶ /M ℓ 2 x 10⁶ /M ℓ

10 (FTIR)

11 LYCH ()

12a 12b LYCH 30 (Zeiss) 630X 12b 12a
 , 12a 가
 30 LYCH

12c 12d LYCH 1 630X 12d 12c
 , 12c 가
 1 LYCH

12e 12f LYCH 2 630X 12f 12e
 , 12e 가
 2 LYCH

12g 12h LYCH 3.5 630X 12h 12g
 , 12g 가
 3.5 LYCH

12i 12j (LYCH , 12j 12i 630X) LYCH , 12i 가
 LYCH

13 90mM 24 90mM 가

14a 100X

14b 14a 320X

15a (cake)' 100X BSA

15b 100X BSA

16a 100X

16b 400X

16c , 400X

17a 2 가

17b 5

18a 293H 100X

18b 18a

19a 293H 400X 2 293H

19b 19a

20a (100% RH 45) (1:3 H : O:) 293H 100X

20b 20a

21a 24 293H 320X 가

21b 21a

22a (%) 293H

22b (%) 293H

23			293H	()	.
24	1		CH ₂	,	1
25	2		CH ₂	,	1
26	3		CH ₂	,	1
27		()	M CD	()	, 1
			(M CD	,).
28	4	()	CH ₂	FTIR	, 3000
		2800cm ⁻¹	.		
29	4	()	CH ₂	FTIR	, 2880c
m ⁻¹		2855cm ⁻¹		2	.
30	4	()	CH ₂	FTIR	, 2890
		2835cm ⁻¹	2	가	.
31			CH ₂	()	.
	CH ₃	()			
32	1		CH ₂	,	
	1		.		
33	2		CH ₂	,	
	1		.		
34	3		CH ₂	,	
	1		.		
35		()	M CD	()	,
1			(M CD	,).
36		(ghost)	()	M CD	()
	1		(M CD	,	
).
37	4	4	CH ₂	(
)	.			
38	4	1	()	5	() , ()
			.		
39	4	4	dil-C ₁₈	,	가
			.		
		(,)	(,)	,	
		,	,	12	20
		30	37	2	2

50mM , .

12 20 , 가
가 5,827,741

37 , 30 37 2

2 가
2

(
20 12 1
(Tablir et al., J. Cell. P
hysiol., 168, 305313, 1996)

6 , 6 가 2 ,
(FITC) 가 F

ITC
(plateau) 4 4 61% 가

0.1 25mM 61% 15mM 가
1000

가 30 37 가 가

가 0.1M

37 4 50mM ,
, 50mM 75mM
(Spargo) 5,736,313

100mM 1.5M 가

2 , 4

가
가 PGE1 (

E1)

가
100mM

(가)
가

, HES ()

. 3

2×10^6 /Me

가

가

가

,가

가

가

가

가

(

),가

가 (scab)

가

가

()

(

)

가

가

(

)

(

)

가 -10

24

(1

25

293H

)

2

가

50

2

30

30

40

50

,가

32

25

38

가

25

50

34

37

)

(

2

가

가

가

가

()

가

,25

50

-32

(

가

()

가

가 : Sigma Chemical Company (St. Louis, Mo., USA); Aldrich Chemical Company, Inc. (Milwaukee, Wis., USA); Gibco BRL Life Technologies, Inc. (Grand Island, N.Y., USA).
 (Basal Medium Eagle), CRGM- 30, CMRL -1066, F-10, F-12, (High Cell Density Medium), (Iscove) (Leibovitz) L-15, 5A (), 199, (Earle) NCTC 109, NCTC 135, RPMMI-1640, E, (Waymouth) MB 725/1 MB 705/1

가
 가
 + 가) 10mM 1.5M, 100mM 500mM 10mM 100mM 10mM 50mM M \emptyset 10⁻⁶ 10⁻⁹ ,가 M \emptyset 10⁻⁵ 10⁻¹⁰ 10⁻⁷ 10⁻⁸
 , 10mM 90mM, 가 10mM 50mM 100mM 100mM
 30 40 ,가 25 35 50 , 2
 가 1 , 1 가 25 50 50
 (,) (,)
 , 2 가 2 ,
 , 2
 CH₂ CaF₂ 가
 , 37 4 24
 35mM , 20mM , 가 50mM 50mM
 가 (,) 가 (,) (,) (,)
 ,) , 200mM , 100mM (

가 가).

HES

() -32 (,)

-30 -1 , -2 -5

-32 -40

가 95 % 10×10^{-6} -32

가 5 %

0.15 0.15

(,)

0.20 0.75

100%

0.15 80%

22a 293H

(%) 가 22a (, 80%), 22b (%)

0.15 (0) 293H () 23 (side arm)

0.15 23

293H 23

() - 0.15 23

(, SiOx

25 50 50mM

35 % 50 %가

가 16c, 17a 17b

가 ,가 37 1 50

3 % (,)

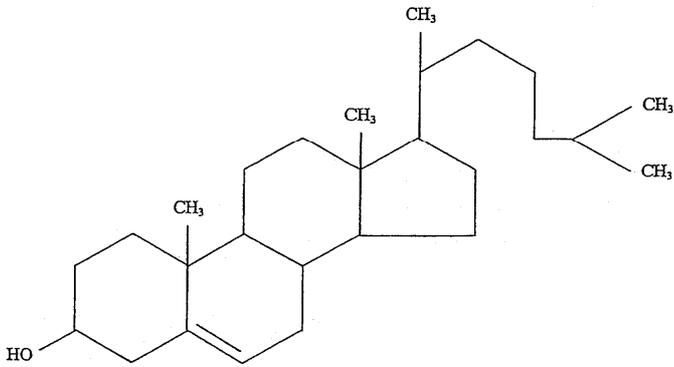
가 가

가

10 % 50 % 8 10
 10 % 50 % (: 5 - - 3 - -) , C₂₇H₄₅OH

(,) 가
 (4 -) 1가 2
 1
 D3

10 % 50 % ,



(,) ()
 가) 가)
 14.4 ± 1.3) 25 44 (, 34.2 ± 1.4) 2 7 21 (,
 가) 2 가)
 3 , 가) 2 가)
 , 20 % 30 % , 20 % 30 % (,) ,
 ,) 가)
 2 1 , 20
 30 20 (, 12 18 , 15.3 ± 0.8
) , 20 30 30 (, 23 2
 9 , 26.0 ± 0.8) , 32 38 , 30 35.4 ± 1.5)
 ,)
 가) 3 가)
 ,) (,)
)
 (lyoprotectant) (, 34)가
) 가)

가 () 가 () 가 ()

가 ()

가 () -32

3 , 3

가

3 / 가 / 가 (, 10

3) 25 50 , 34 40

mM (M CD) 1mM 10mM, 1mM 5

M CD

30 % , 가 10 % 20 50 % 30 % , 10 %

(, ,)

가 가 가 가 가

10mM 1.5M, 100mM 500mM 10mM

100mM , 10mM 50mM

10⁷ 10⁸ , 10⁶ 10⁹ 1mL 10⁵ 10¹⁰ /mL, 가

200mM , 10mM 150mM, 가 , 10mM 10mM 100mM 200mM

50 , 가 32 / 38 30 , 가 34 30

1 30 50 가 50 가

(,)
 / 가 /
 가 , 2
 가 FTIR CH2
 mM (20mM 가 50mM) , 가 35 50mM
 가 (, ,)
 (,)
 가)fmf 200mM , 100mM
 가)
 가 HES
 (,) (-32 -2 / -5 /)
 -32 , -30 / -1 / , -40
 가 , 95 %
 10x10⁻⁶ (torr) , -32
 가 5 % 가 ,
 g 0.30g , g 0.20g
 g 0.20g g 0.00g, (,) 0.05g
 gm , 0.3gm 100%
 가 가
 (vial)
 (, , SiOx)
 25 , 50 50mM

40 %가 20 % 50 %, 20 %

가

, 가 37 1 3 20 % 40 %가

(,)

DMSO=

ADP=

PGE1= E1

HES=

FTIR=

EGTA= (2-) N,N,N',N', -

TES=N- () -2- -

HEPES=N-(2-) -N'-(2-)

PBS=

HSA=

BSA=

ACD = ,

M CD = - -

_____1

_____ . (Sacramento blood center)

320xg 8

2 (22 480xg, 15 A (100mM NaCl, 10mM KCl, 10mM EGTA, 10mM , pH 6.8)

Miami, Florida) 480xg) (Coulter) T890 (Coulter, Inc.,

CH (Lucifer Yellow CH) 1-2 x 10⁹ /ml

14,000RPM 20x (), A , 20s (14,000RPM
 45s (10mM TES, 50mM KCl, p
 H 6.8) . 428nm(SW 10nm) 530nm(SW 10nm) - LSS
 (Perkin-Elmer LSS spectrofluorimeter)

LYCH 2000nm ml⁻¹ 1 LYCH (ng)

가 (fluorescein) 1% (Zeis
 s) LYCH -L-

1-2 10⁹ /ml 1-20mg/ml

4 37 0.5
 4 (20s 14,000RPM
) A 2) 80% 8
 (14,000RPM 45S)
 H₂O 가 (anthrone) [: Umbr
 eit et al., Mamometric and Biochemical Techniques, 5th Edition, 1972]. 3ml H₂O 6ml
 (10M 2g) , 620nm
 1 6μg 300μg

LYCH 1 LYCH
 () 가 1.2μg 50%가
 LYCH

1 50mM 4
 22 LYCH
 (5%), 37 4 35%
 37 (2).
 (0 2 2.8x10⁻¹¹ mol/m² s), 2 3.3x10⁻¹⁰ mol/m² s
 가 4 61% 가

가 50mM 가 0 30mM . 가
 . 50mM
 75mM 4

4 5mM 37 4 . 2
 가 4 (

gated) . 4 (3%) (

[: Owners et al., Trans. Med. Rev., 8, 27-44, 1994].
 53 (gp53,), PECAM-1 (-1,), P-

_____ 2

_____ .
 xg 8 320
 10mM EGTA, 10mM , 10µg/ml PGE1, pH 6.8) 2 A (100mM NaCl, 10mM KCl,
 xg). T890 (Coulter, Inc., Miami, Florida) (22 480xg, 15 480

_____ . 1 , . 1-2x10⁹
 /ml 37 가 35mM , A .
 4 (25), (9.5mM HEPES, 142.5mM NaCl, 4.8mM KCl, 1mM
 MgCl₂, 30mM (, 1% , 10µg/ml PGE1) PGE1
 (Sigma) 가 (Pfahnstieh1)

_____ . 0.5ml 2ml (Nunc cryogenic vials)
 , (Cryomed controlled freezing device) . -30 /
 -1 / , -5 / -2 / 22 -44 . -80
 30 (Virtis Iy
 philizer)
 20x10⁻⁶ (Torr) , 가
 -45 , 1 (thermocouple)
 -40 . 1 Tg ()
 -32).

_____ . 0.5ml 1ml PBS / (1/1) . PBS
 9.4mM Na₂HPO₄, 0.6mM KH₂PO₄, 100mM NaCl, pH 7.2) , PGE1
 10µg/ml 가 / (1/1)

_____ . 37
 0 3 .

_____ . T890 (Coulter, Inc., Miami, Florida)
 , () .
 45 , 2% (glutaraldehyde)
 -L-

550nm 1.0x10⁸ /ml .
 _____ . , 1/1 (3800xg 5 ml
 가) 2 (2) (37 ml (1U/ml)
 가 가 .3 ,

_____ . , 가 10⁹ /ml
 /ml , 가 3x10⁸ /ml . 3x10⁸
 70% ,

90 가 가 , 35% 50% . 50%
) . (

1 , , 35mM A 4 37
 , 가 15-25mM .

30mM 1% HSA
 85% (25-50%)
 가 1x10⁹ /ml
 25%
 75% 50%

3

가 35
 30mM 가 65% 30mM
 1% 85%
 4
 0.5ml 2ml
 -30 / -1 / -5 / -2 / 22 -40
 -80 30
 (Virtus lyophilizer)
 가 20x10⁻⁶ (Torr)
 -45 , 1
 -40 . 1 Tg
 (-32)
 2 / 5 /

5

(1U/ml)
 0.5x10⁸ /ml . 500μl 가 , 37
 3 . 3
 lb-(GPIIb) 가 GPIIb
 (1U/ml) (1 2) , 37 3
 8 (A) (B)
 (B)

6

50x10⁶ /ml
 가 %
 20 μ M ADP 5 , 1.5mg/ml %가
 5 , 0 2 x 10⁶ /ml 5
 95 100%
 %

7

(Nalge - Nunc) (Osiris Therapeutics) (MSC) T-185
 o's Modified Eagle's Medium) 10% v/v (FBS) (D-MEM; Dulbecc

37 5% CO₂

MSCs 2ml 30
 2 CaF₂ 2000
 3600 900cm⁻¹ .2 / (Peltier) -7 50 2

CH- MSCs , 1 5.7 x 10⁶ /mL
 CH(LYCH) 10.6mM 가 , 3.5 37
 DPBS 2 2
 , 428nm 530nm LS 50B
 가 , 1% , -L-
 , ICM 405

(Nalge - Nunc) T-25
 0.22μm 가

70% (laminar flow hood)

90mM 가 24 MSC
 0.5 x 10⁶ /ml (130mM Na
 Cl, 10mM HEPES(pH 7.2), 5mM KCl, 150mM 가 , 5.7% BSA(w/v))
 2.5mL 가 , (Lyostar) 5 /
 0 2 / -60 180 -25 12
 -30 가

H₂O 가 37 1:3 (45 ')
 가 (Kodak Ektachrome ASA 400) 100%

MSCs FTIR , 10 2
 1 , CH₂ , (FTIR)
 10
 가 1 .1 , 15 35 가
 .2 MSC

(+/-)

8

가 CH(LYCH) 11

LYCH ()
 () 11 (LYCH) (70%)
 3.5 LYCH 11 2.5 70% 가
 (,)
 LYCH- 12a 12j 12a
 12b LYCH 30 630X 12a
 , LYCH 30 가 12c 12d LYCH- 1 12a
 630X 12c 12d LYCH 1 12c
 가 , 12e 12f LYCH 2 630X
 , LYCH 12e 가
 12f 12e LYCH 2 12g 12h L
 YCH 3.5 630X 가 12h 12g LYCH
 H 3.5 12i 12j (LYCH LYC
) LYCH 가 가 12j
 LYCH 가 가 12i

MSC (0.189mL/cm² 5900 /cm²) T-185
 3 12 2
 13 90mM 가 가
 가 3 24 90mM 가 가
 , , 2
 MSC
 90mM 37 24 , LYCH
 MSCs 293H , MSCs
 2 T-25 가
 가 가

14a 100 14b 15a
 BSA 14a 가 100
 15b BSA 가 100
 100 16a 100
 16b 400 17a 16c
 400 가 2
 17b 5

9

293H

, FTIR

293H

T-75

, 90mM

가 가
390 mOsm
72

130mM NaCl, 10mM HEPES (Na), 5mM KCl, 150mM

14.2g BSA(5.7%) w/v

T-25
-60
180

(Lyoflask)

가

-30 180
12

18a

가

293H 100

18b

18a

19a

293H

29

400
3H

19a

가

19b

가

1:3 H₂O

, 45 1

00%

ASA 400

(Kodak Ektachrome ASA 400 film)
(Zeiss inverted microscope)

100X, 320X, 400X

20a

(45 @ 100%)

(1:3 H₂O:)

293H 100

21a

가 가

20b 20a

293H 320

21b

가

24

21a

FTIR

(Perkin-Elmer Spectrum 2000)

: 가

CaF₂

2 /
(285

3600 900cm⁻¹

0) CH₂

293H

293H

293H

(, 18a, 18b, 19a 19b)

가

(, 20a 20b).

가

10%

가

(, 20a 20b).

24

293H

(, 21a 21
가

b).

, 6 7% 가

10

(FTIR) (M CD)
 14 34 가 , 25
 (4) 5
 1,1'- -3,3,3',3'- (dil-C₁₈)가
 , FTIR -II
 가
 34 가 가

ACD(가) 320x g
 8 () 가 PBS (100mM NaCl, 9.4mM Na₂HPO₄ 1mM
 4, 0.6mM KH₂PO₄, pH 7.4) 3 37 1
 (M CD)

FTIR (Perkin-Elmer 2000 Fourier transform IR-spectrometer) IR- CaF₂
 2000 (cm⁻¹) 15 가
 -5 45
 5 / 가 -5 45
 9 IR- 80% 2850cm⁻¹
 -1
 .CH₂ (cm⁻¹)

FTIR FTIR , 2850cm⁻¹
 (, 24 가 26).
 14 34 가
 24 25 26 24
 1.5cm⁻¹ (-5 45) 25 26 0.8cm⁻¹ 24 ()
 (LIPITOR: Pfizer Pharmaceuticals, CT)
 14 34 0.036 0.031cm⁻¹ /
 가

M CD
 27 -5 45
 0.7 2.9cm⁻¹ 가 ,
 가 , ()
 1 FTIR (2850cm⁻¹) M CD
 :

I

	()		
	14.4 ± 1.3		34.2 ± 1.4

M CD	15.3 ± 0.8	26.0 ± 0.8	35.4 ± 1.5
------	------------	------------	------------

II FTIR (2850cm⁻¹)
:

MBCD

II

	(cm ⁻¹ /)		
	0.036 ± 0.013		0.031 ± 0.010
M CD	0.051 ± 0.004	0.095 ± 0.015	0.091 ± 0.020

15, 26, 35 가 가 ,
 , 15 가 ,
 0.031 0.091cm⁻¹ / 가 , 26 35 가
 가 0.095cm⁻¹ / 가 .

11

FTIR

2850cm⁻¹ CH₂

0

FTIR

15

22

3

FTIR

FTIR -II

1600

1700cm⁻¹

-I

1600

1500cm⁻¹

FTIR

4

dil-C₁₈

FTIR

IR

PBS

3

IR 3000 2800cm⁻¹ 가
 2870 2950cm⁻¹ (28) CH₂ 가 2850cm⁻¹
 1 29 CH₃ 가 가
 (30), 가 가 가
 CH₃ (CH₂)
 31 (Savitzky-Golay routine)
 , 1 CH₂ 32 3
 2 33 34 가 2 33 34 CH₃
 14 34 가 3
 32 33 34 0.8cm⁻¹ 32 32 ()
 1.5cm⁻¹ (-5 45) 33 34 2 32 32
 (LIPITOR: Pfizer Pharmaceuticals, CT)
 33 34

III 5

III

	()		
	14.4 ± 1.3		34.2 ± 1.4
M CD	15.3 ± 0.8	26.0 ± 0.8	35.4 ± 1.5
	(cm ⁻¹ /		
	0.036 ± 0.013		0.031 ± 0.010
M CD	0.051 ± 0.004	0.095 ± 0.015	0.091 ± 0.020

III 5 FTIR (2850cm⁻¹) M CD

. 14 34 가 (,) 0.036 0.031cm⁻¹ /
 M CD 35
 0.7 2.9cm⁻¹ 가 , -5 45 ,
 가 , ()
 15, 26 35 가 ,
 . 15
 0.031 0.091cm⁻¹ / 가

가 . 26
 0.095cm⁻¹ /
 CH₂ 가 3, 15, 24 36 가 -5 45 가 36 가 28
 52.6cm⁻¹ 가 1 2851.7 가
 M CD 4, 12, 20 30 ()
 가 4 가 (ACD)
 FTIR 가 PBS 3 37 가 5
). 1 가 , 5 가 (38
 dil-C₁₈ (regrouping) FTIR
 dil-C₁₈ 39 4 4
 (4 dil-C₁₈ 가),

V :
 IV

	FFA	Chol.	PE	PS	PC	SM
		48.1 ± 2.2	6.2 ± 2.7	2.6 ± 0.2	24.2 ± 0.4	18.9 ± 0.3
1	5.0 ± 0.5	36.7 ± 0.1	7.2 ± 0.2	5.1 ± 0.2	25.8 ± 0.0	20.2 ± 0.0
5	2.4 ± 0.2	43.6 ± 1.3	6.4 ± 0.2	4.2 ± 0.2	24.2 ± 0.5	18.8 ± 0.3

IV , 2
 % ; PS, ; PC, ; SM, (shingomyelin). IV ; PE,
 (24 %). PE PS 6 % 3
 19 % 50 %
 가 , 4
 IR -II ,
 FTIR 1550cm⁻¹ 1535cm⁻¹ 1565cm⁻¹ -II 가 -II
 -II 4 9
 가 FTIR 가 , 2

(leaflet) PS PE가

PC SM

(, 50 %)

가
가
(50%)

가

가

34

가

25

45

26

35

가

15
15

30

가

26

가

, FTIR

가

12

ACD (

) 320 x g

8

가

4

10mM

(M CD)

37

1
(Falcon)

ACD

가
3

가

PBS

4 15M

(100mM NaCl, 9.4

M Na₂HPO₄, 0.6mM KH₂PO₄, pH 7.4)

(1:2, v/v)

1

(Latroscan) TH-10 (Lantron Laboratories of Tokyo, Japan)

(Sigmapol; Jandel Scientific of

San Rafael, CA)

%

FTIR

2000

IR-

CaF₂

-5

5 / 가
900⁻¹

15

-5

+45

가

.4

.40

4cm⁻¹

50

3600

9

(smoothing favor)

IR-

2

band arpimd 2850 cm⁻¹

. CH₂

(cm⁻¹)

1

(Peakfit; Jandel Scientific, San Rafael, CA)

1

1600 1500cm⁻¹
 -II
 1x10⁸ /Mℓ
 (Molecular Probes, Inc.; Eugene, OR)
 37 dil-C₁₈ (2.5μg/Mℓ)
 60
 2 1%
 ICM405 (Planachroma
 (Ektachrome) 400
 t 100X/1.4 n.a. objective) (Rochester, NY)

가

가 ()

293H 15 35
 (Lucifer yellow) CH

3
 가

가

5

15 , 26

35

가

35

(

가

(57)

1.

;

가 가

2.

1

3.

2

8 10

4.

1

25 27

5.

1

- 1 6. , 가 .
- 1 7. , 가 .
- 8. 가 ;
가 , .
- 8 9. , .
- 9 10. , 8 10 .
- 8 11. , 25 27 .
- 8 12. , .
- 8 13. , 가 가 .
- 8 14. , 가 가 .
- 8 15. , 가 가 .
- 16. ;
, , ;
(loading) ,
- 16 17. , .
- 16 18. , 가 가 가
가 .
- 17 19. , 가 가 가
가 .

- 16 **20.** , 가 가 가 가 .
- 17 **21.** , 가 가 가 가 .
- 16 **22.** , 가 .
- 16 **23.** , 가 2 .
- 16 **24.** , 가 , .
- 16 **25.** , 가 20 .
- 16 **26.** , 가 30 .
- 16 **27.** , 가 .
- 16 **28.** , 가 20 30 .
- 16 **29.** , 가 30 50 .
- 23 **30.** , 가 2 20 .
- 29 **31.** , 가 30 40 .
- 26 **32.** , 가 32 38 .
- 16 **33.** , 가 .
- 26 **34.** , 가 .
- 35.** , 가 .
- 36 **36.** , 가 , .

37.

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가 ,

0.30

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0.30

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가

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42.

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0.30

0.00

43.

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가

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가

44.

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45.

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46.

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가

47.

43

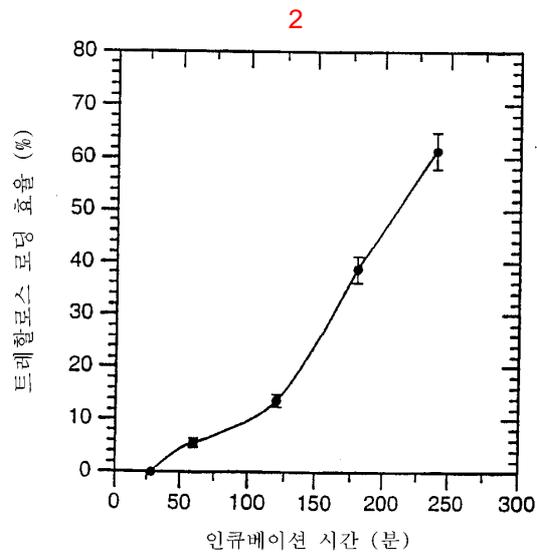
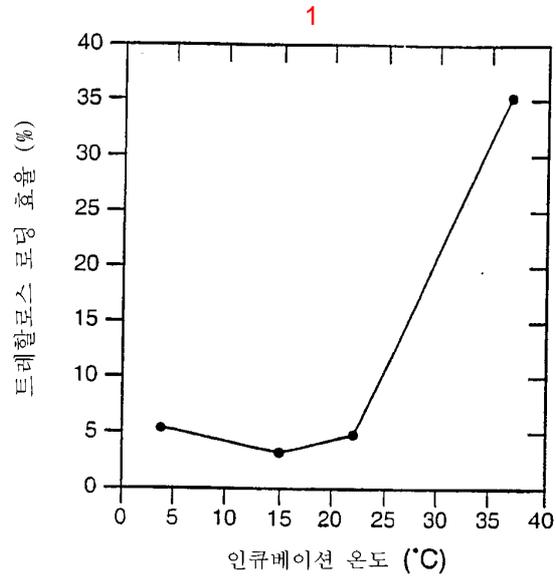
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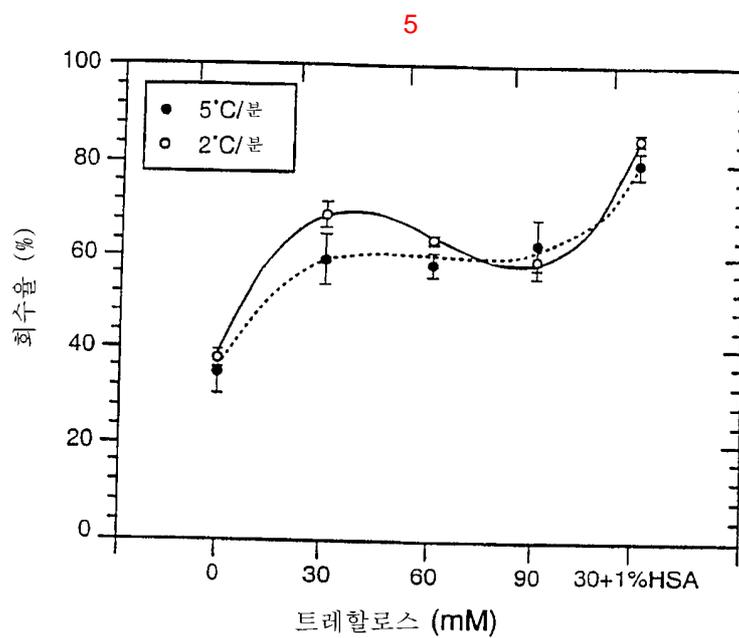
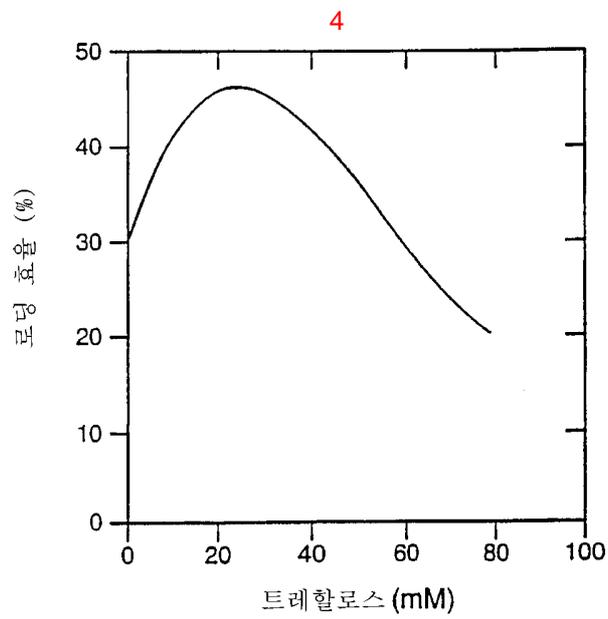
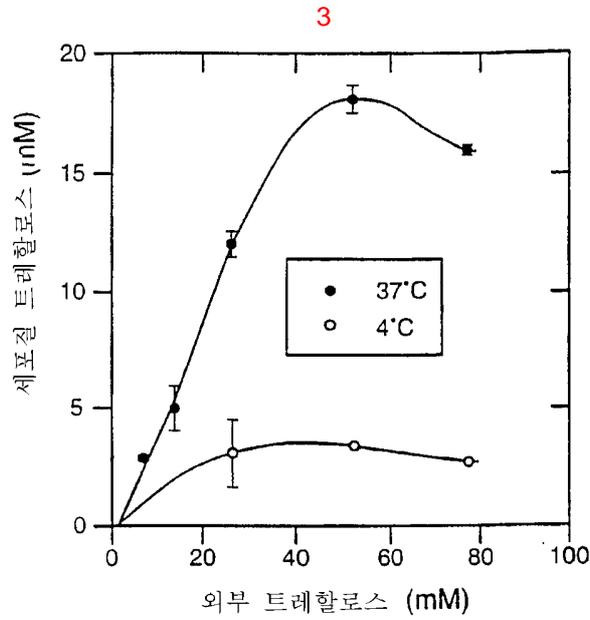
- 43 48. , 가 .
- 43 49. .
- 가 50. ; , .
- 50 51. , 가 가 .
- 50 52. , 가 30 50 .
- 53. 10mM 가 .
- 53 54. , 10mM 200mM .
- 53 55. , 0.30 가 가 , .
- 53 56. , , 가 .
- 53 57. , 가 .
- 58. ; , 10mM , ; ; .
- 58 59. , 가 0.3 가 .
- 58 60. , 80% 가 .

61.

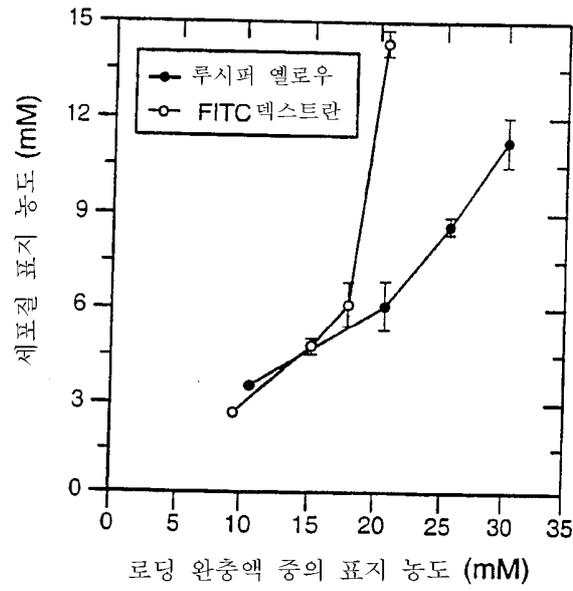
58

가

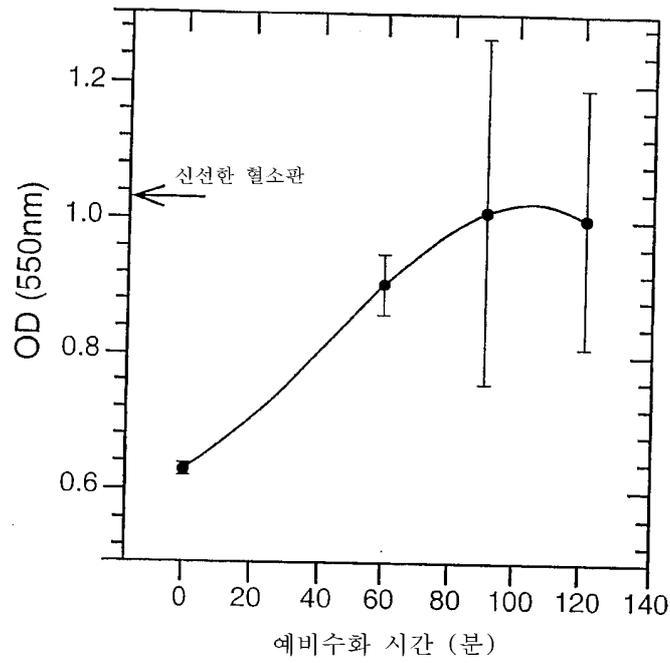




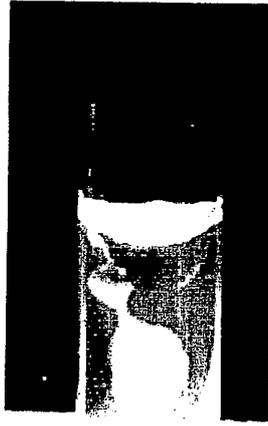
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7

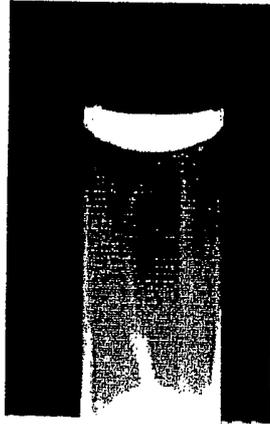


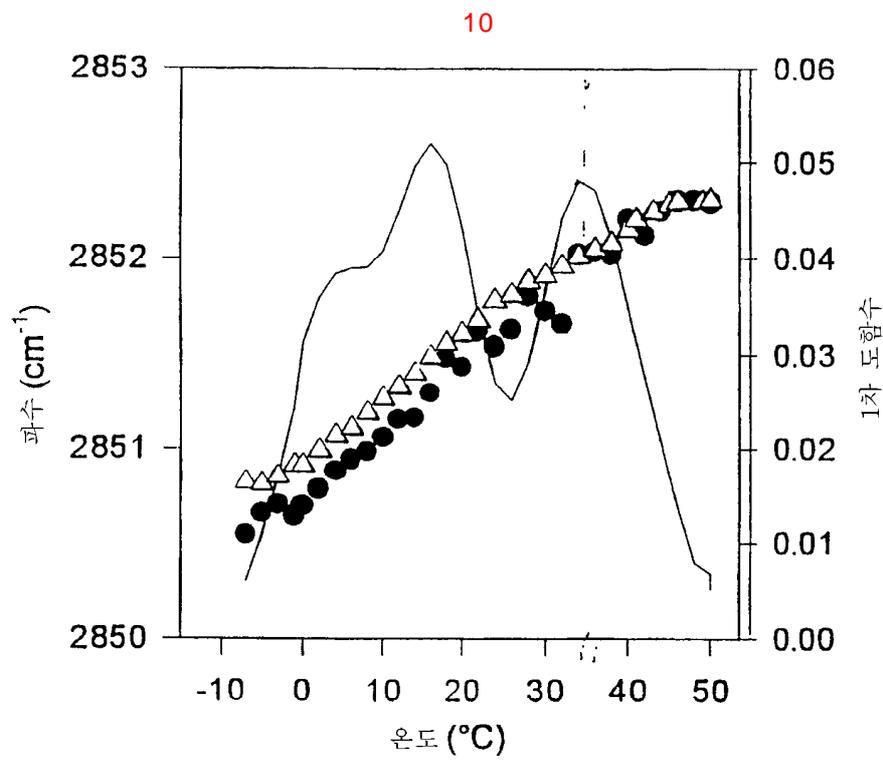
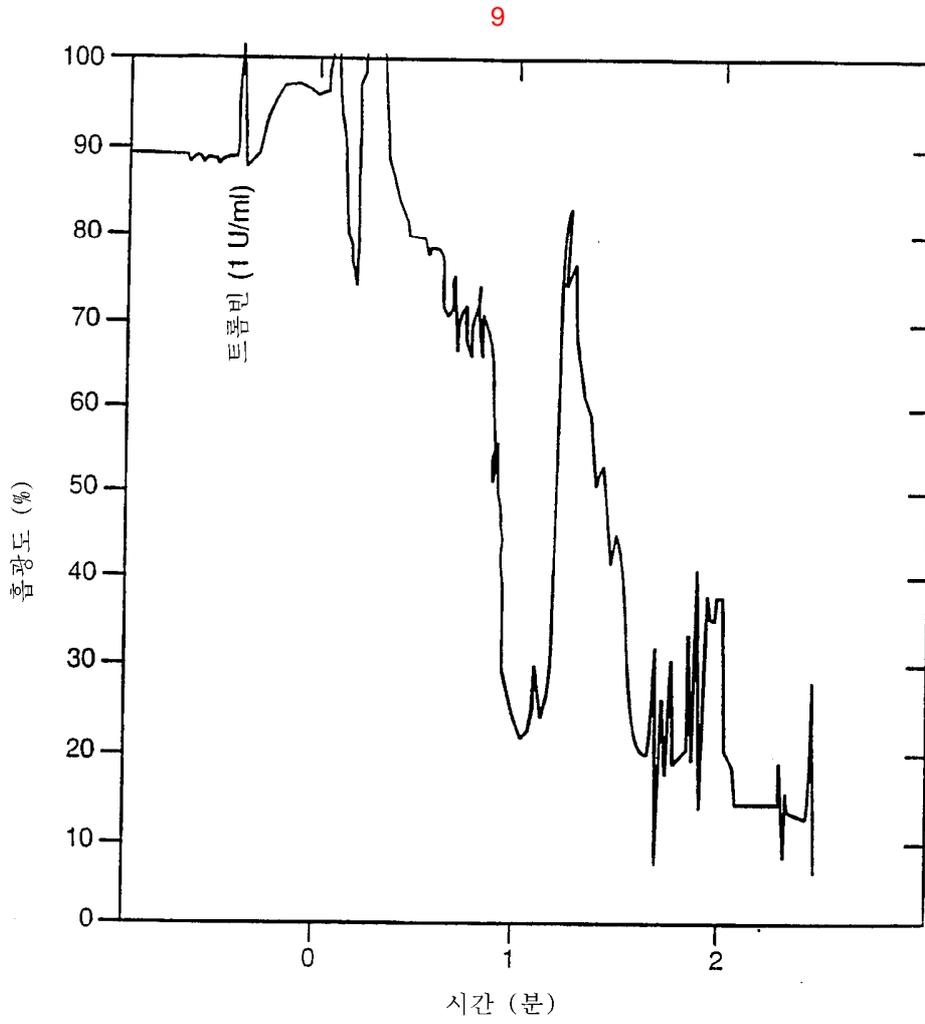
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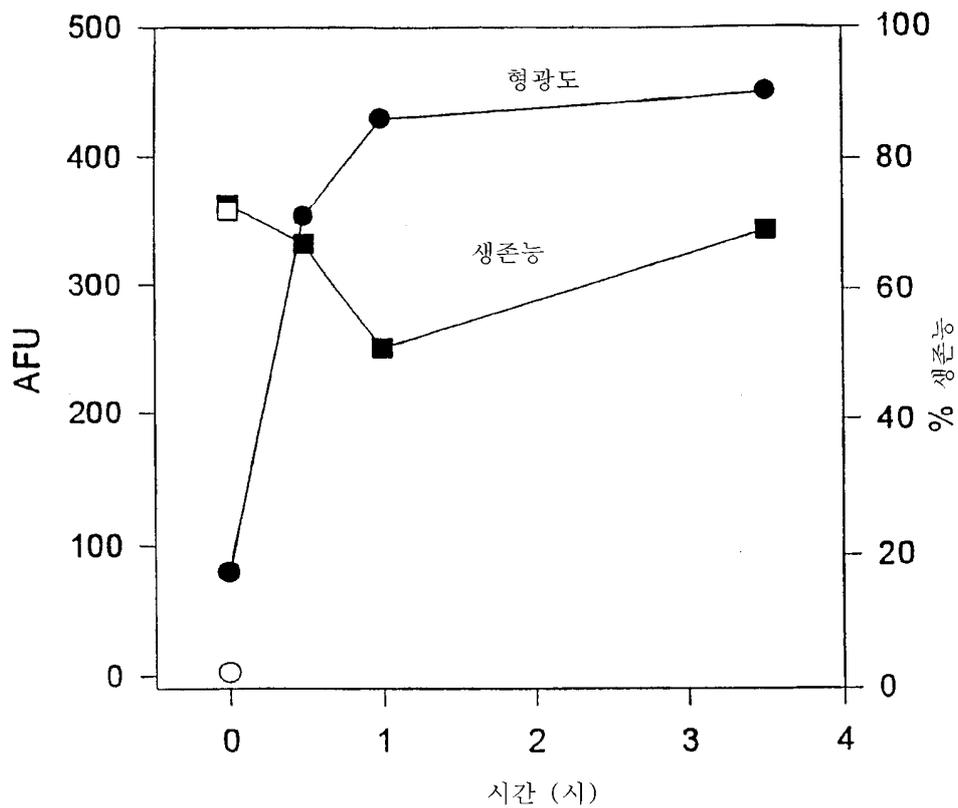
(종래 기술)

8b





11



12a

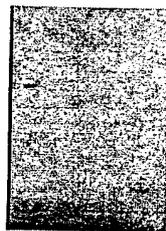


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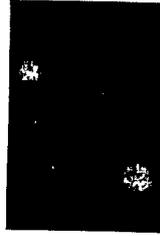
A. 30분



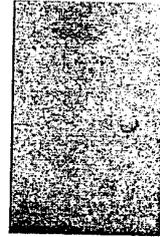
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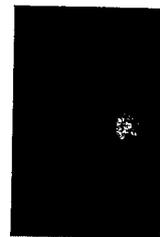
12d
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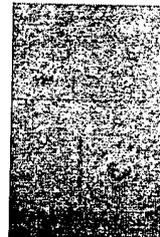
12e



12f
C. 2 시간



12g



12h
D. 3.5 시간



12i

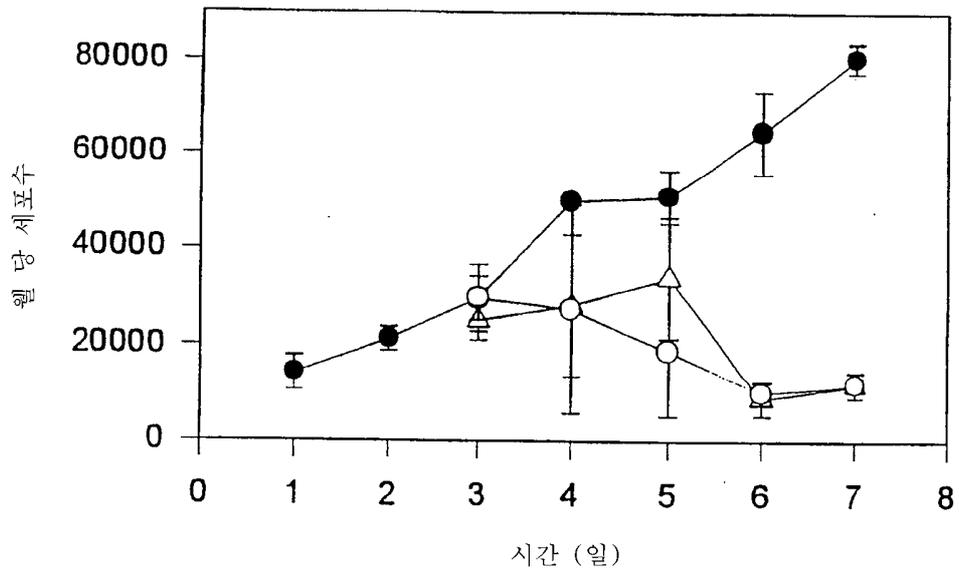


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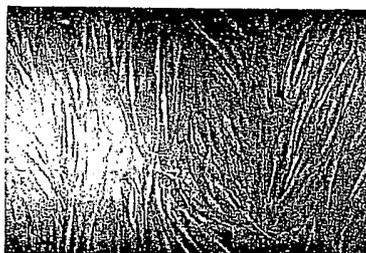
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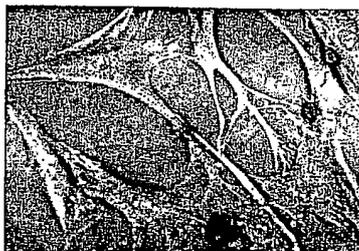
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14a



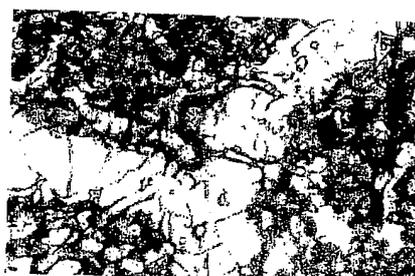
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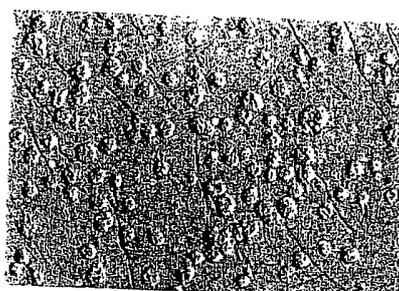
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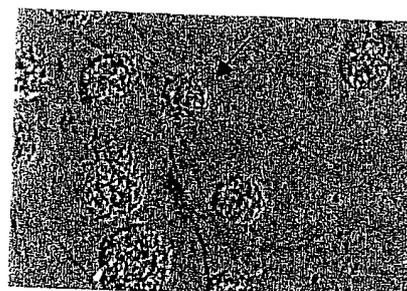
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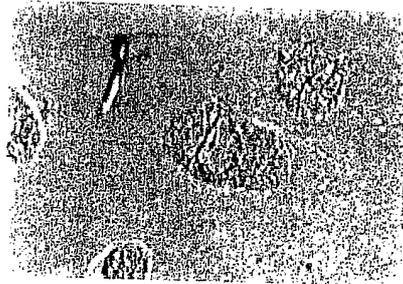
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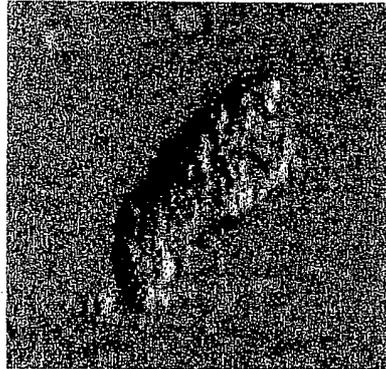
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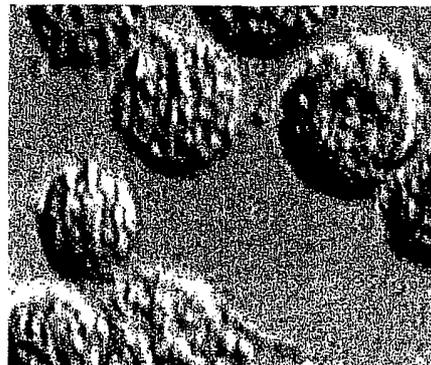
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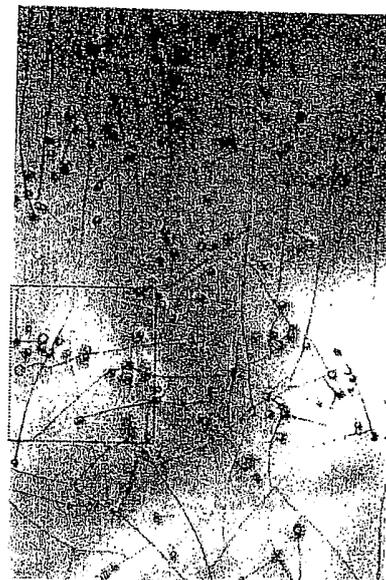
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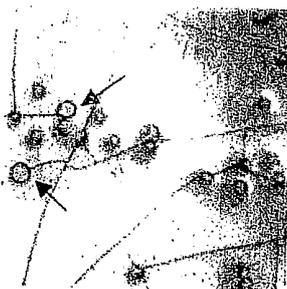
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18a



18b



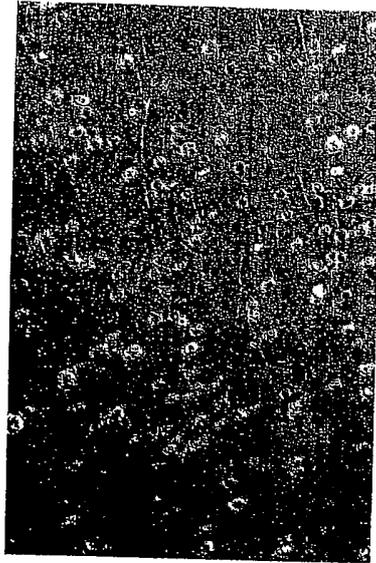
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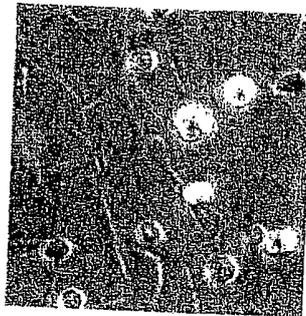
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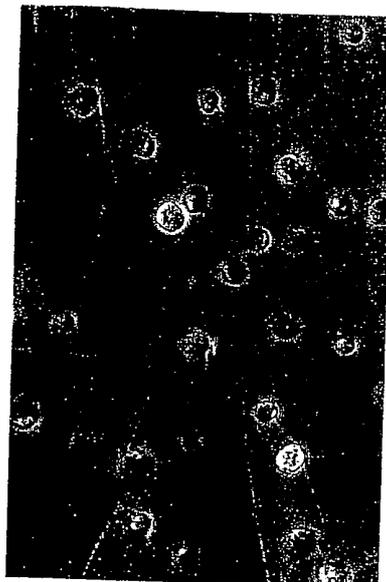
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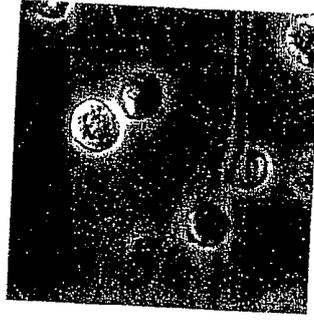
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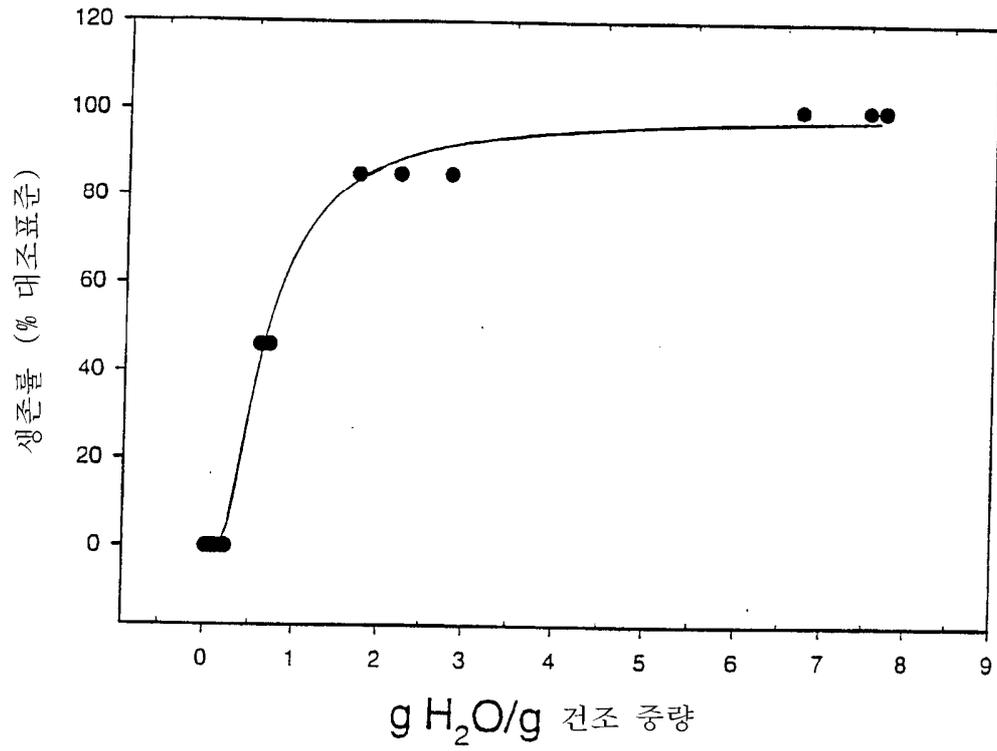
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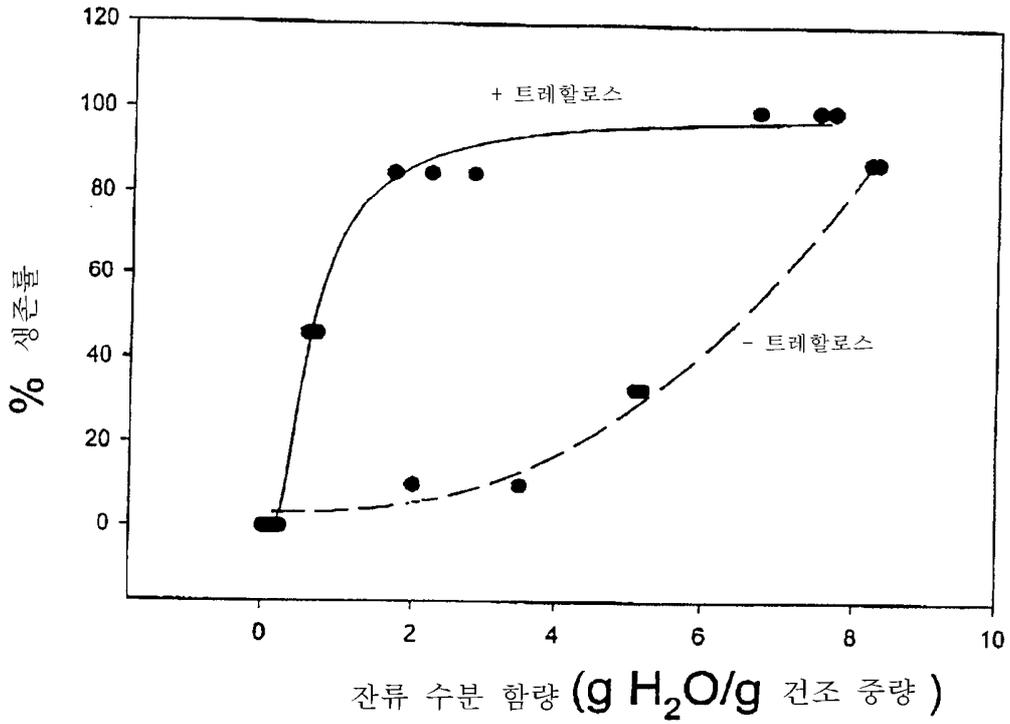
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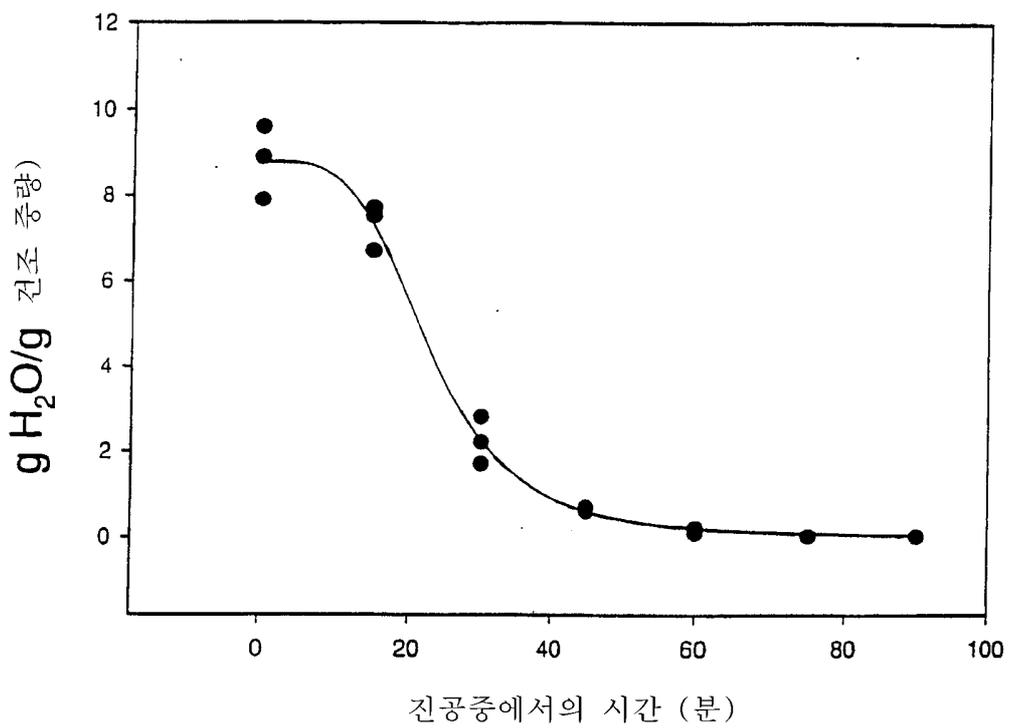
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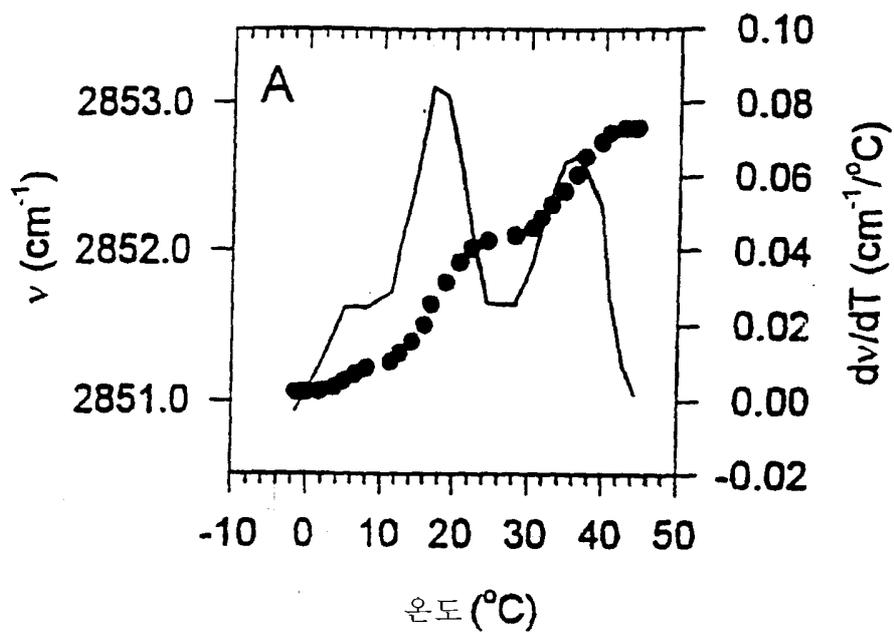
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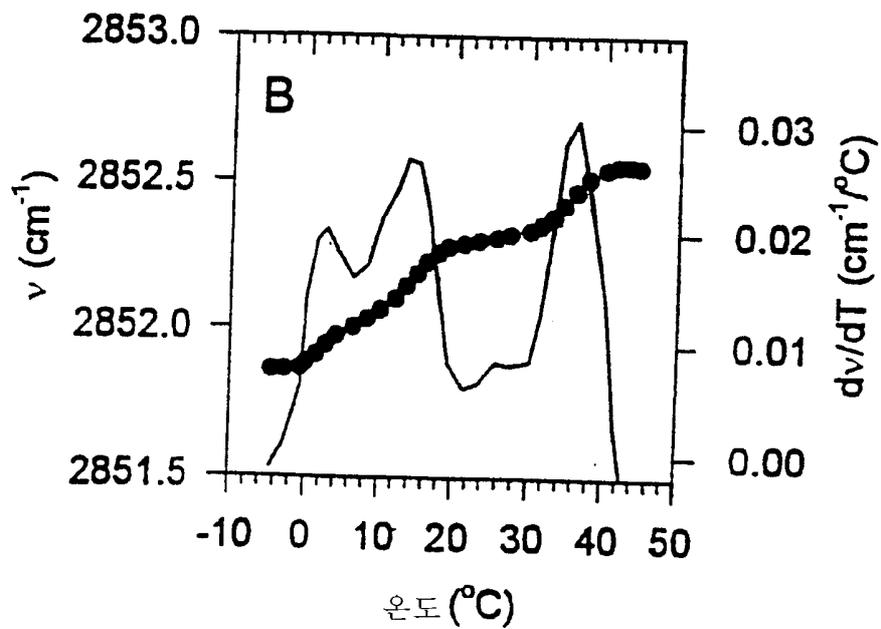
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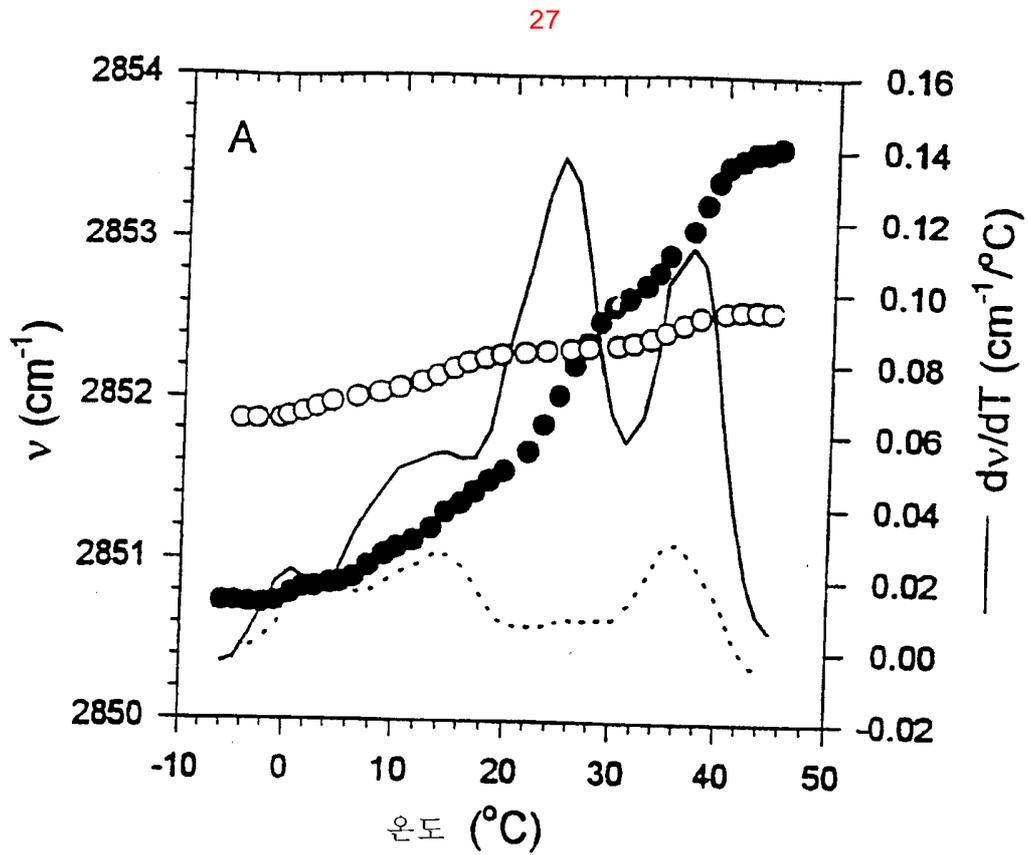
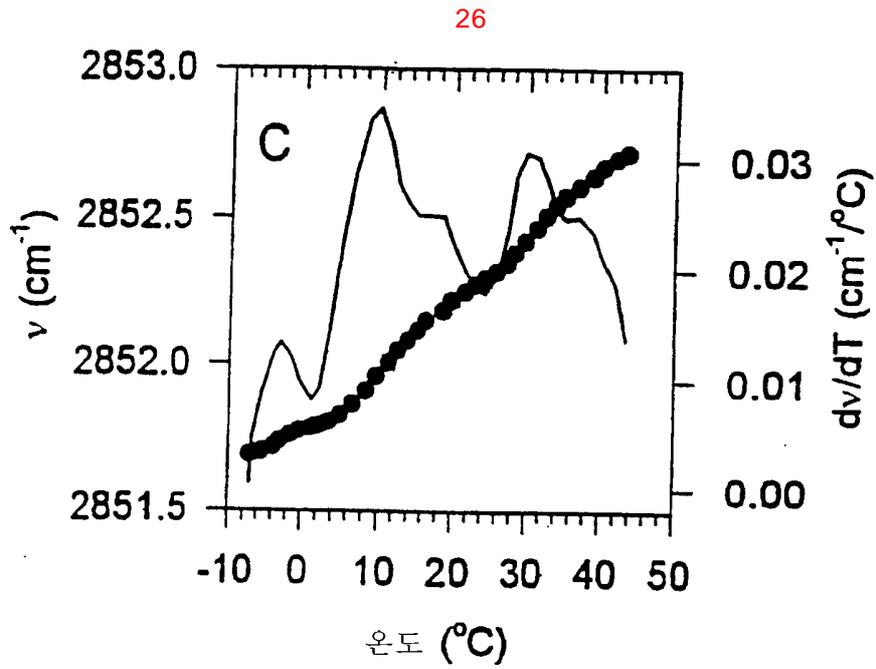


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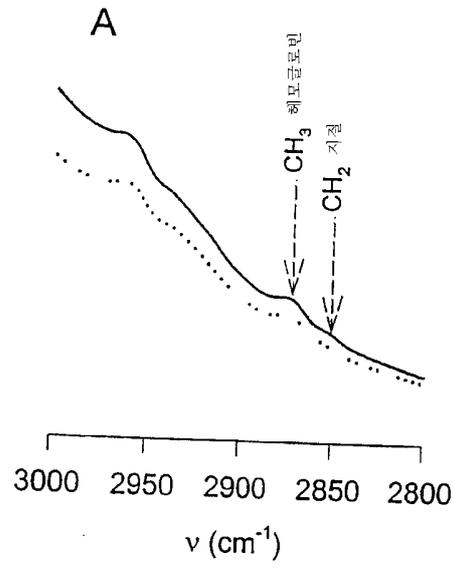


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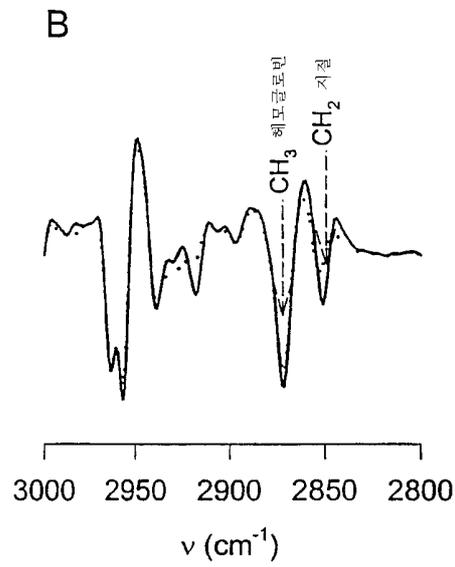




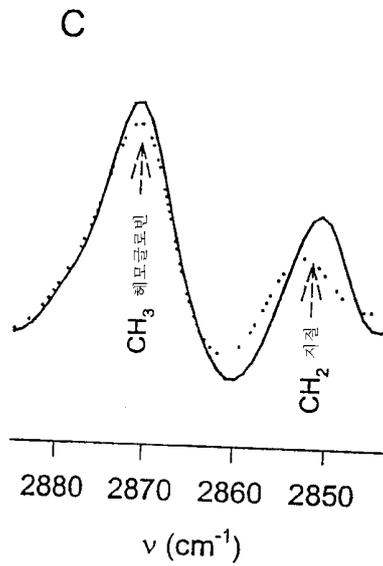
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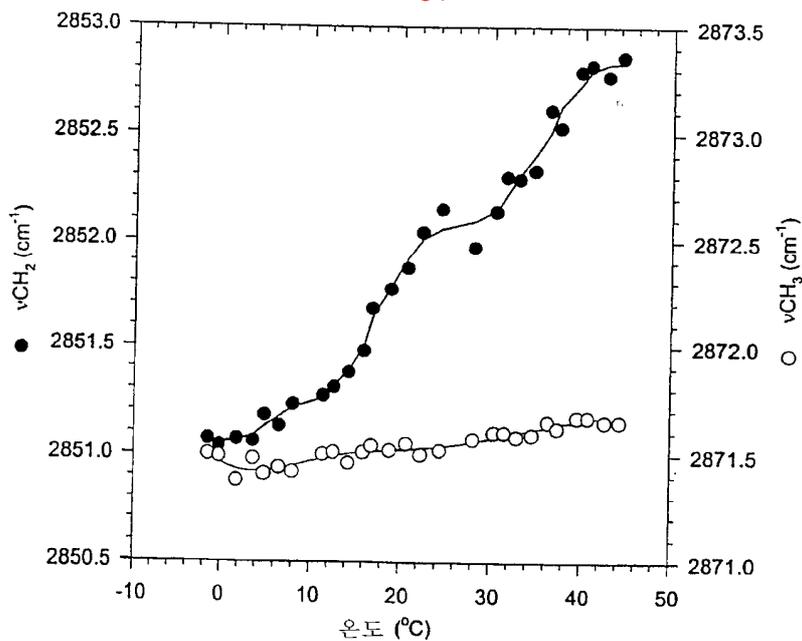
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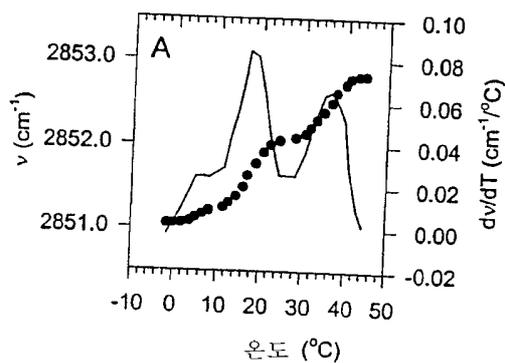
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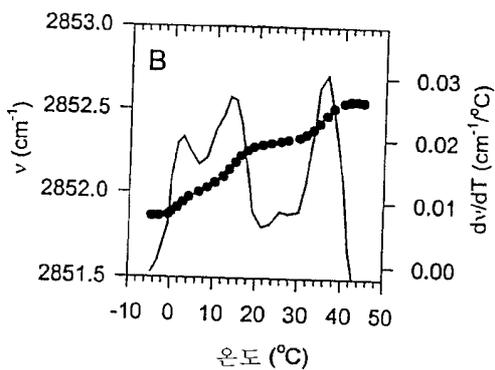
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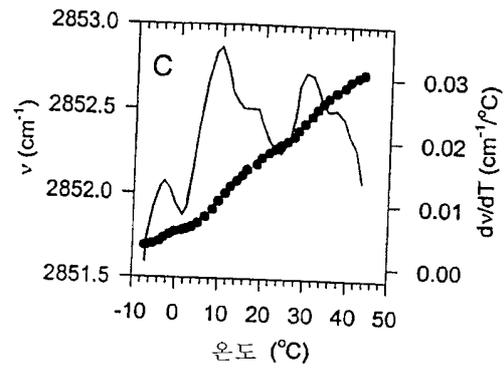
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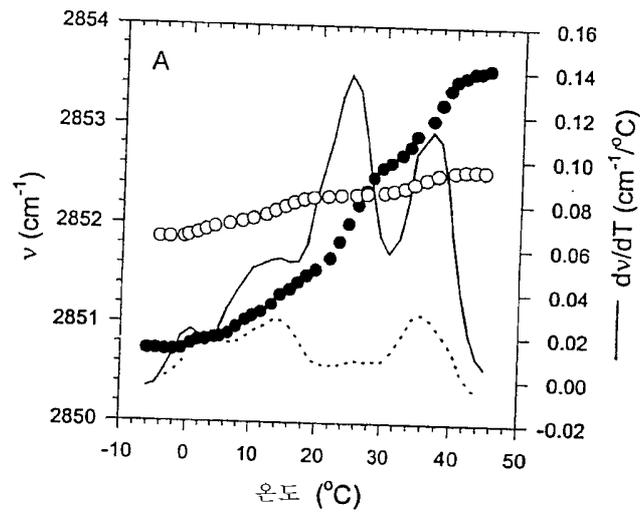
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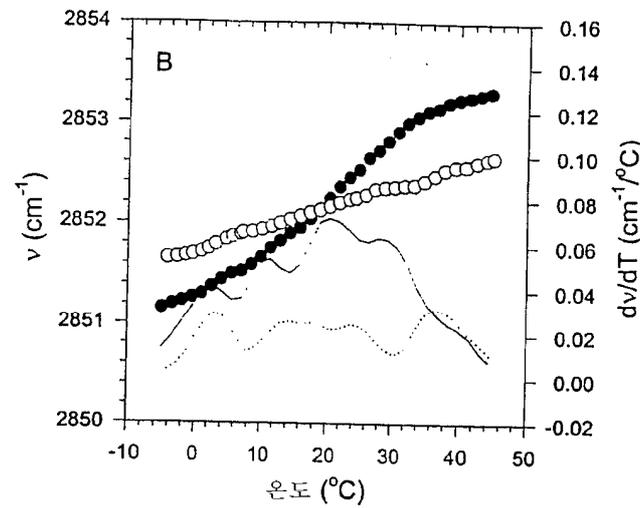
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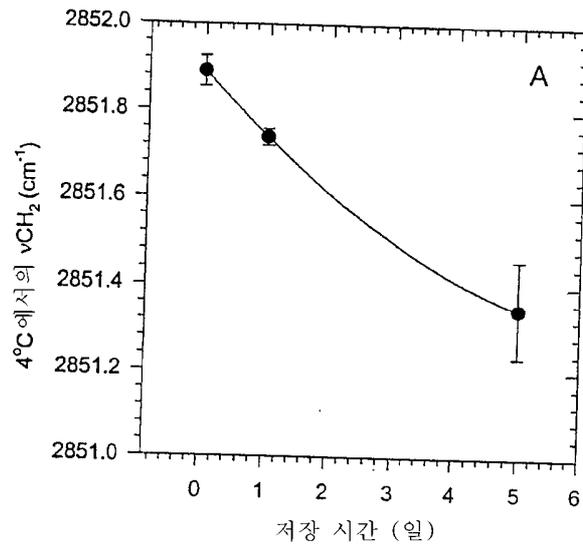
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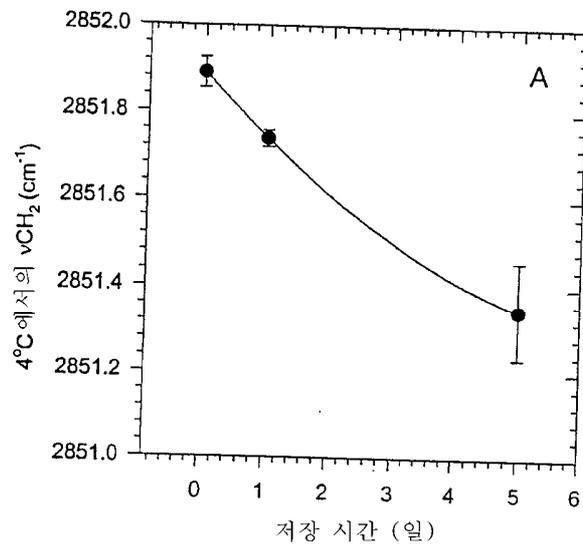
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