

(19)
(12)(KR)
(A)(51) 。 Int. Cl.⁷
C09K 19/20(11)
(43)2003-0091768
2003 12 03(21) 10-2003-0032865
(22) 2003 05 23

(30) 10223061.7 2002 05 24 (DE)

(71) 64293 250

(72) 69502 7

63762 21

64285 25

64380 18

64372 - 10

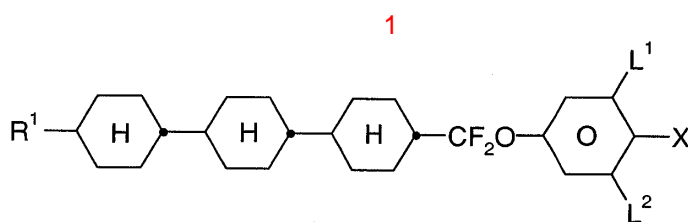
63814 14

(74)

:

(54)

1



R¹ 1 15
H₂ -C C-, -CH=CH-, -O-, -CO-O- -O-CO- O C

X F, Cl, CN, SF₅, 6

L¹ L² H F .

가
가
E() / OMI()
Schadt-Helfrich effect)

가
TN , STN(supertwisted nematic,) , SB
.가 - (

가 . 가 ,

가 가 가
가 . 가
가 . 가
(MLC , UV

(,)가 . ' ' 2가

1. MOS() .
2. (TFT).
(modular assembly)

가 2 : , CdSe , TFT, TN . 2
TFT.

TFT . TFT ,
가 가 가 , , , ,

TFT TN .

MLC (varistor) (passive) (MIM = - -)

MLC TV (, TV) () ,

MLC [: TOGASHI, S., SEKIGUCHI, K., TANABE, H., YAMAMOTO, E., SORIMACHI, K., TAJIMA, E., WATANABE, H., SHIMIZU, H., Proc. Eurodisplay 84, Sept. 1984: A 210-288 Matrix LCD Controlled by Double Stage Diode Rings, p. 141 ff, Paris; STROMER, M., Proc. Eurodisplay 84, Sept. 1984: Design of Thin Film Transistors for Matrix Addressing of Television Liquid Crystal Displays, p. 145 ff, Paris]. , MLC

가 - MLC 가 가 가 ()
가 가 , 가 / 가 가 / 가 가
가 MLC

- MLC 가 .

TN (-) .

- ()

-

- (,)

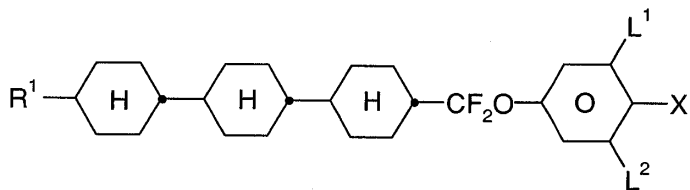
- UV 가 ()

(STN) , / (/)
(,) , 가 (, -)

MLC, TN STN .

1

1



R¹ H₂ 1 15 -C C-, -CH=CH-, -O-, -CO-O- -O-CO- O C

X F, Cl, CN, SF₅, 6

L¹ L² H F

1

1

가

1

5, 6 1 R¹ 7 / , 2, 3, 4,

4- 2- (=), 2- (=) 3- (= 2-), 2-, 3-
 -, 3-, 4-, 5-, 6-, 7- 5- , 2-, 3-, 4-, 5- 6- , 2-, 3-, 4-, 5-, 6- 7- , 2
 -, 3-, 4-, 5-, 6-, 7- 8- , 2-, 3-, 4-, 5-, 6-, 7-, 8- 9-

R¹ , -CH=CH- CH₂ , -1- -2- , -1-, -2-
 - 2- 10 -3- , -1-, -2-, -3- -4- , -1-, -2-, -3-, -4- -5- , -1-, -2-, -3-, -
 4-, -5- -6- , -1-, -2-, -3-, -4-, -5-, -6- -7- , -1-, -2-, -3-, -4-, -5-, -6-, -7-
 - -8- , -1-, -2-, -3-, -4-, -5-, -6-, -7-, -8- -9-

R¹ , -O- CH₂ -CO- CH₂ -CO-O- -O-CO-
 2 6 , , ,
 , 2- , 2- , 2- , 3- , 3-
 , 4- , 2-() , 2-() , 2-()
) , 3-() , 3-() 4-()

R¹, -CH=CH- CH₂ CH₂ CO, CO-O
 O-CO 4 12
 , 4- , 5- , 6- , 2- , 3- , 8-
 , 9- , 10- , 7- , 2- , 3-
 - , 4- , 5- , 6- , 3-
 , 8- , 9- , 7-

R¹, CN CF₃
 CN CF₃

R¹, F Cl F

(wing) R¹

, 2- (= 1-), (= 2-), 2- (= 3-), 2- , 3-
 3- , 2- , 2- , 1- , 2- , 2- , 3- , 2- , 3-
 가

R¹, 2 CH₂ -O- / -CO-O-
 3 12
 2,2- , 3,3- , 4,4- , 5,5- , 6,6- , 7,7-
 , 8,8- , 9,9- , 10,10- () , 2,2-
 () , 3,3- () , 4,4- () , 5,5- ()
 , 6,6- () , 7,7- () , 8,8- () , ()
 2,2- () , 3,3- () , 4,4- () 5,5- ()

1 ('Houben-Weyl, Methoden der organischen
 Chemie [Methods of Organic Chemistry], Georg-Thieme-Verlag, Stuttgart)

667 DE 10105314 1 DE 4006921 , WO 01/64

(, 2 2 -
 STN MLC)

UV 가

ZLI-3119

+3

60

-20

-30

-40

60

65

70

6

8

STN MLC

TN

2.0 V

1.7V , 1.3V .

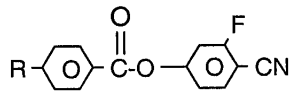
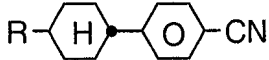
(, 110) 가 , 가 (Gooch and Tarry transmission minimum)('C.H. Gooch and H.A. Tarry, Electro n. Lett. 10, 2- 4, 1974'; 'C.H. Gooch and H.A. Tarry, Appl. Phys., Vol. 8, 1575-1584, 1975')

MLC (30 22 818) , 2 가 1 MLC

20 20 20 (90 °) , 100 ° 60mm² · s⁻¹ , 160mPa · s , 50mm² · s⁻¹ , 150mPa · s -20 ° +80 °

(refresh) 1 20% , 2.5 , 3.0 25ms (t_{on} + t_{off}) (1) 가 (Merck KGaA) ZLI-4792

(holding ratio, HR) [(S. Matsumoto) 'Liquid Crystals 5 , 1320(1989)'; (K. Niwa) 'Proc. SID Conference, San Fransisco, June 1984, P. 304(1984)'; (G. Weber) 'Liquid Crystals 5 , 1381(1989)'] 1

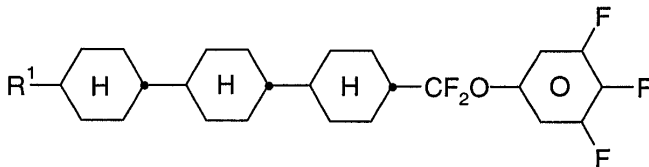


가 HR

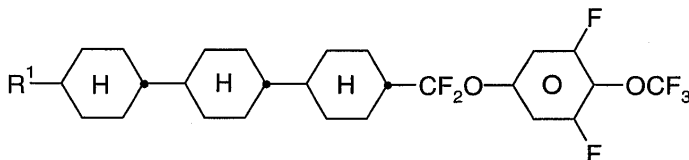
UV , UV HR

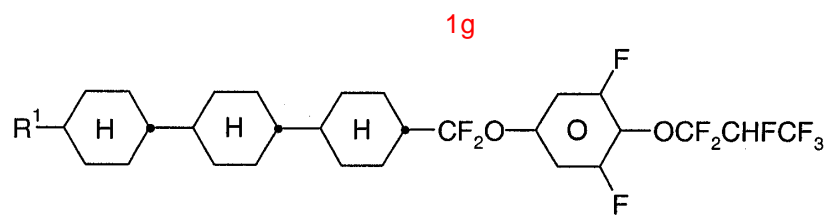
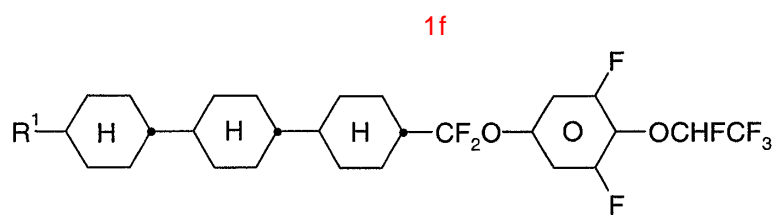
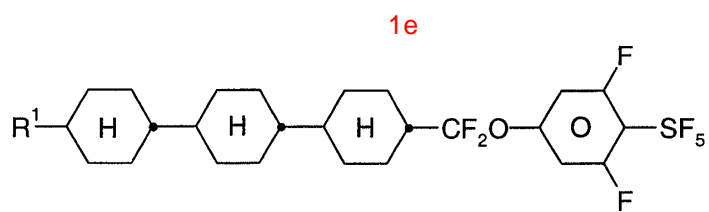
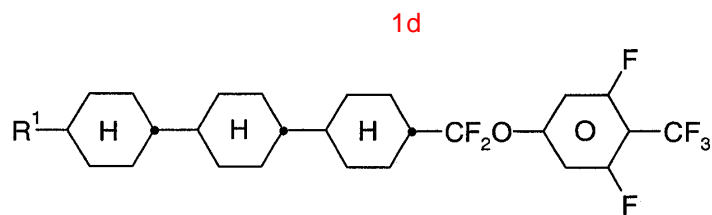
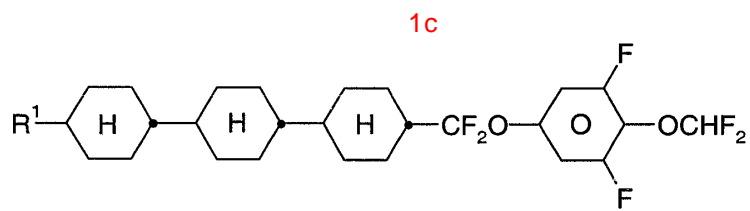
1 1a 1i .

1a

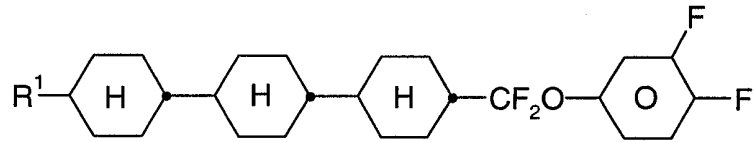


1b

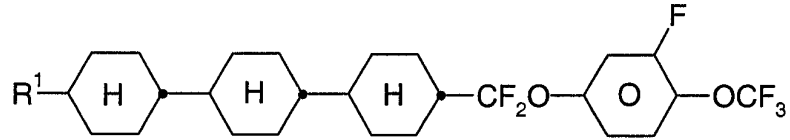




1h



1i

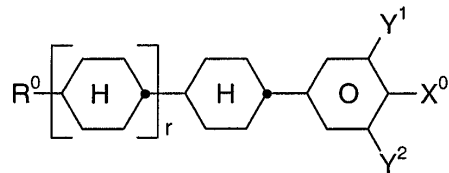
R¹ 1

1a, 1b, 1c 1d , 1a 1b가

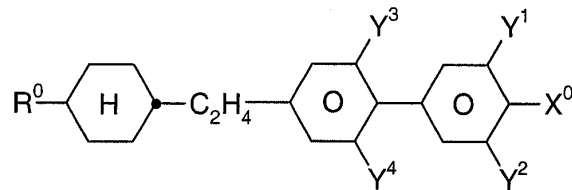
- 1a 1i 2

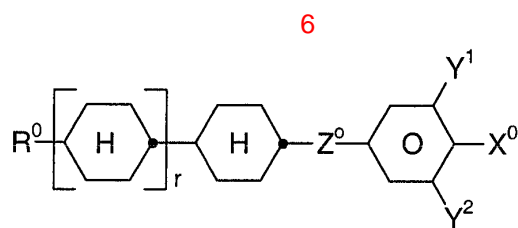
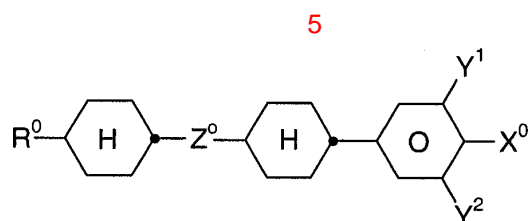
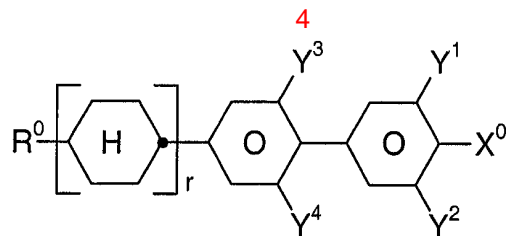
- 2 6 4a 4e 가 , 4

2

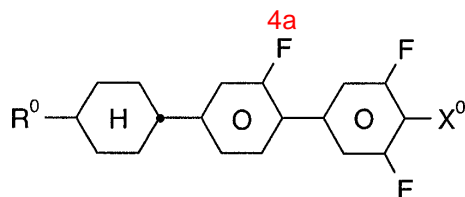


3

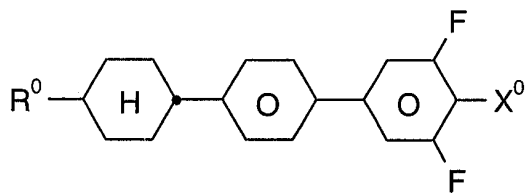




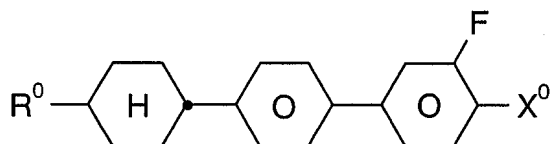
R⁰ ,
 9 n- , , ,
 X⁰ F, Cl, 6 , , ,
 Z⁰ -C₂F₄-, -CF=CF-, -C₂H₄-, -(CH₂)₄-, -OCH₂-, -CH₂O-, -CF₂O- -OCF₂-
 ,
 Y¹ Y⁴ H F ,
 r⁰ 1 .



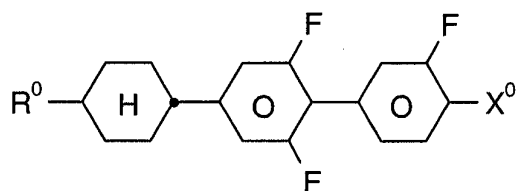
4b



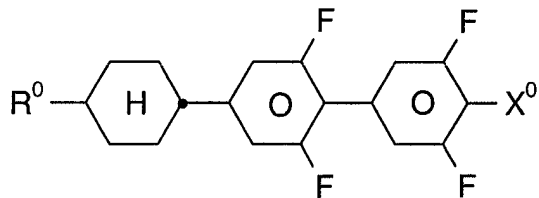
4c



4d



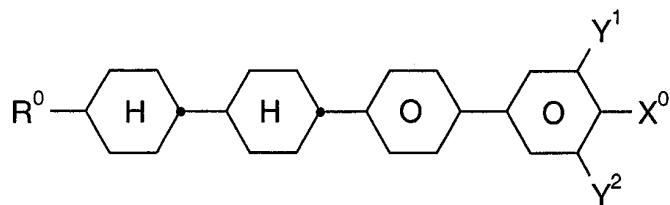
4e



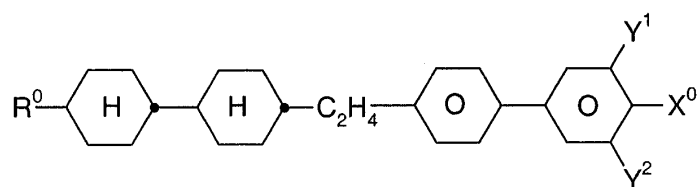
7 13

가

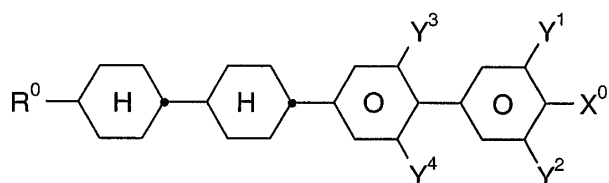
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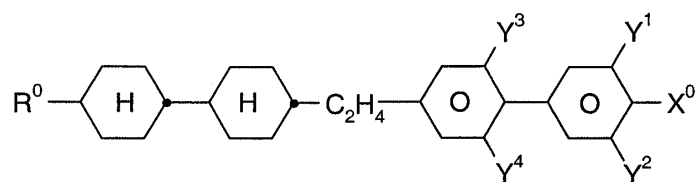
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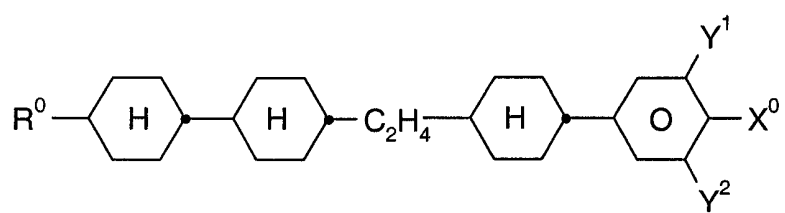
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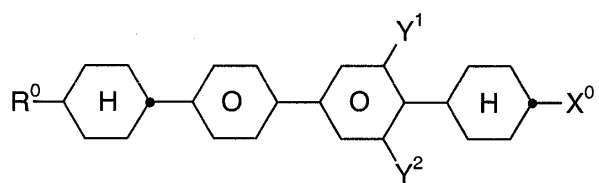
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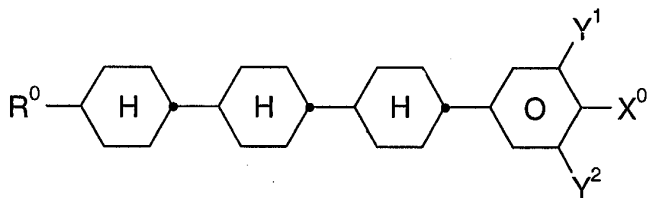
11



12



13



R⁰, X⁰ Y¹⁻⁴

3

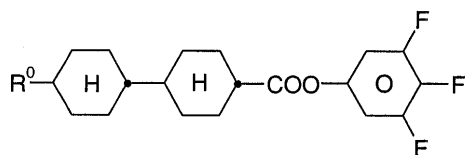
X⁰ F, Cl, CF₃, OCF₃ OCHF₂

R⁰

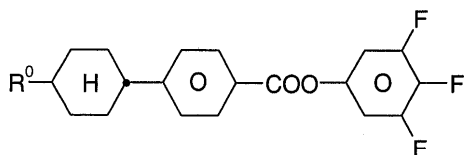
6

E-a E-d

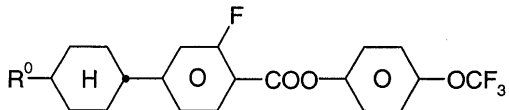
가



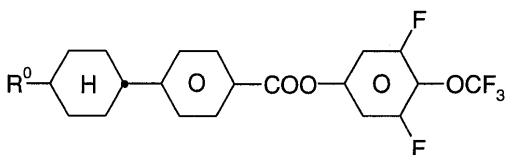
E-a



E-b



E-c



E-d

R⁰ 3

E-a E-d

10 30 %

15 25 %

1 6

50 %

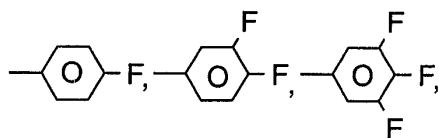
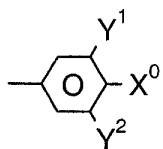
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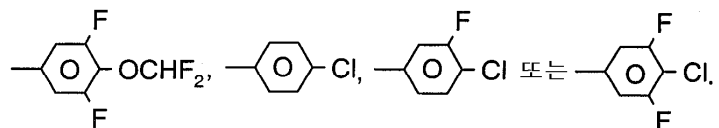
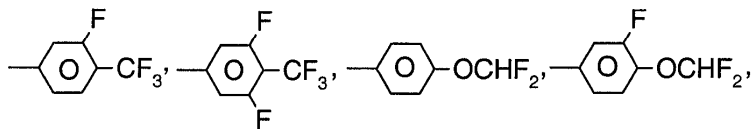
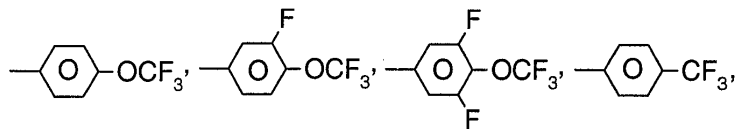
0.5 40 %

1 30 %

2 6

30 80 %





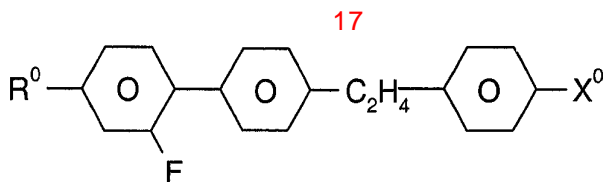
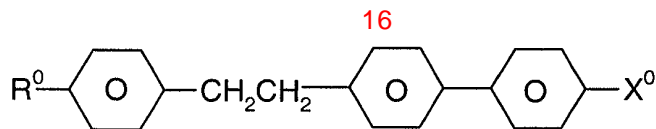
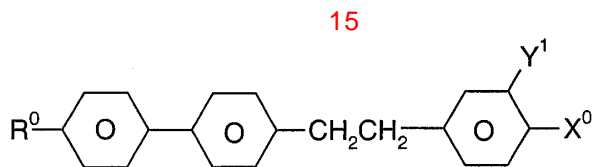
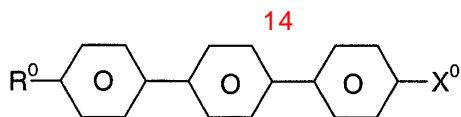
- 2, 3, 4, 6 / 6

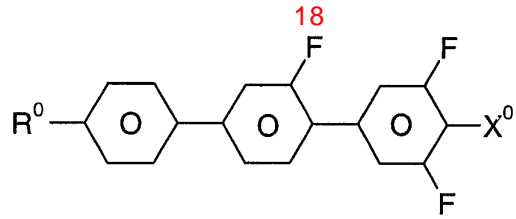
- R⁰ 2 7

- 1 6 13

- 14 18

가

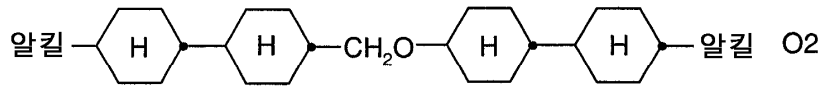
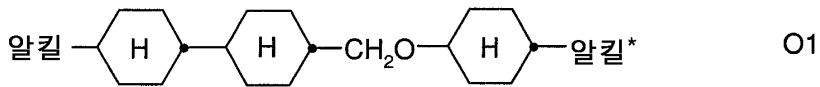




R⁰ X⁰

1,4- CN, 가 ,

- O1 O2 1, 2, 3 , 2 3 가 .

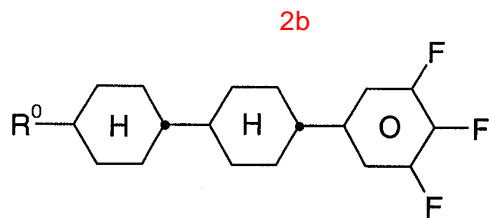
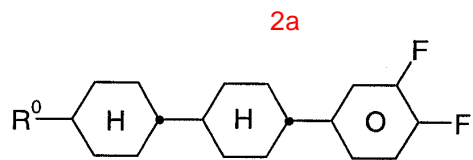


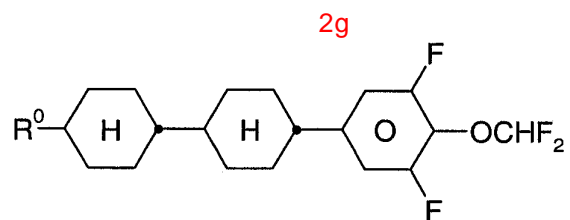
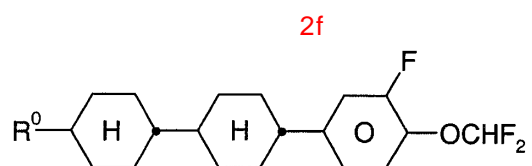
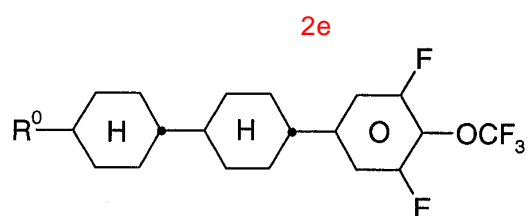
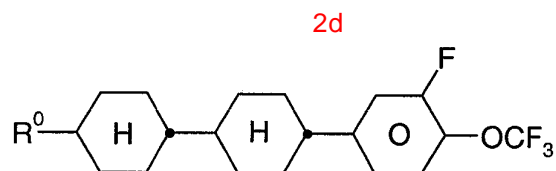
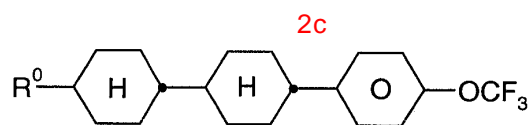
O1 O2 5 10 % .

- 4a 5 35 % .

- X⁰ F OCF₃ 4a 1, 2 3 .

- 2a 2g .



R⁰, R⁰

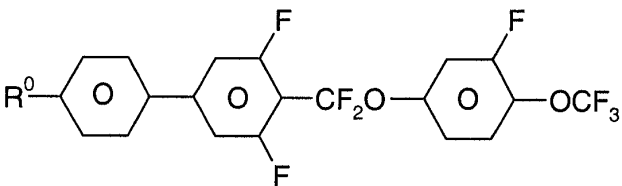
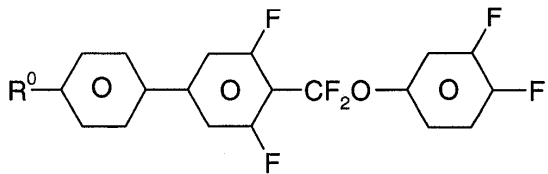
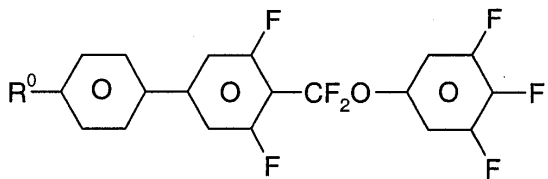
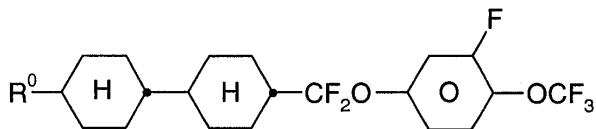
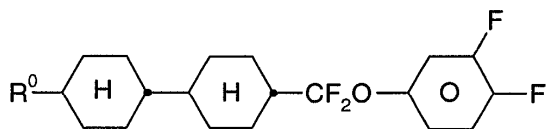
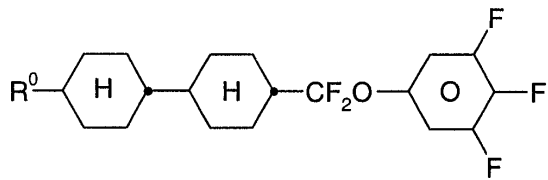
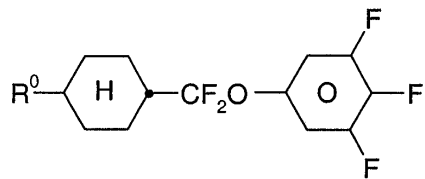
,

, n-

, n-

n-

.



R⁰

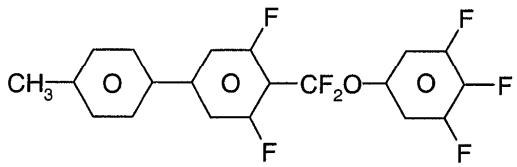
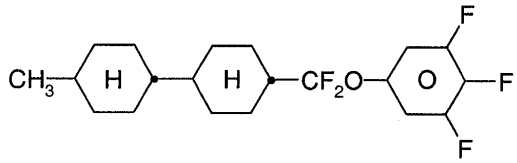
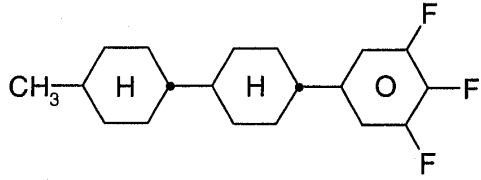
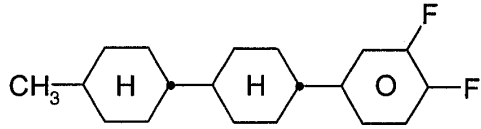
1 : 2 + 3 + 4 + 5 + 6

1:10 10:1

1 13

H₉ n-C₅H₁₁ 4b 4c (, X⁰ , R⁰ CH₃, C₂H₅, n-C₃H₇, n-C₄) 2 20 % , 2 15 % .

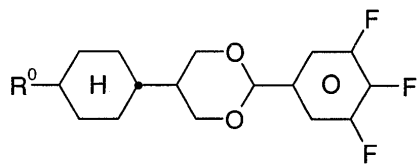
R⁰ 2 6



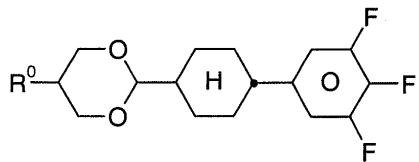
D1 D2

1, 2

, 1 2



D1



D2

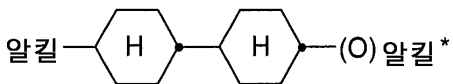
Z-1 Z-6

1, 2

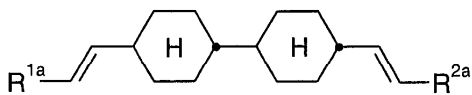
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, Z-1, Z-

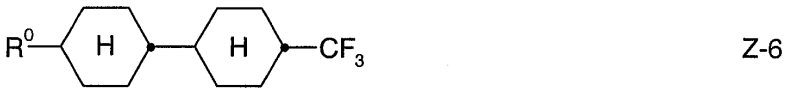
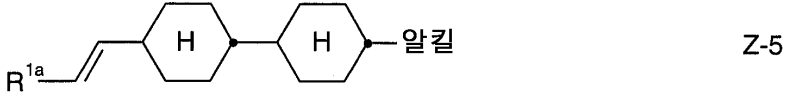
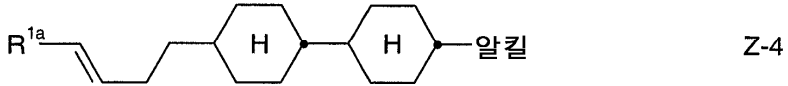
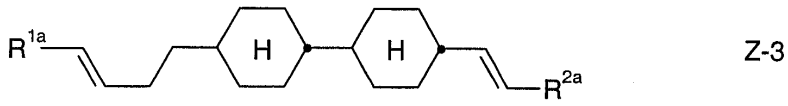
2, Z-5 Z-6



Z-1



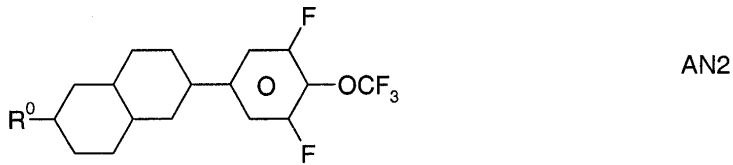
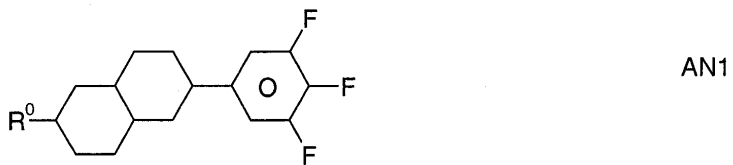
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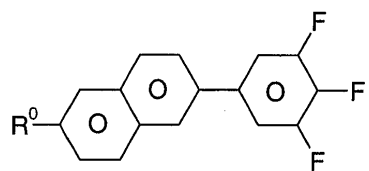


R^{1a}, R^{2a} H, CH₃, C₂H₅, n-C₃H₇,

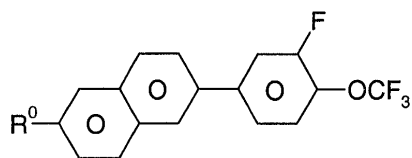
R⁰, * 3 .

- AN1 AN11 1, 2 가 .

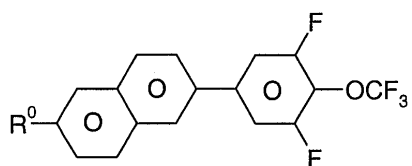




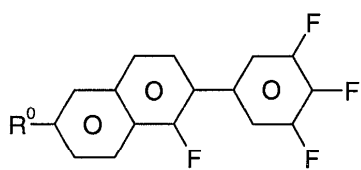
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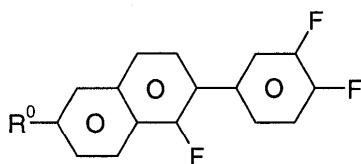
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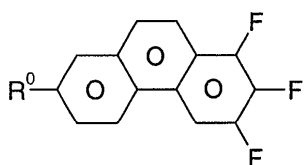
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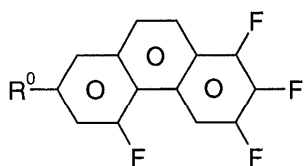
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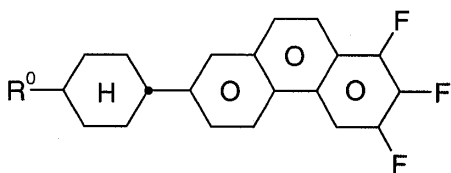
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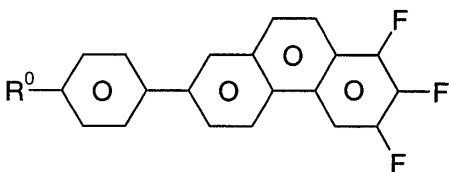
AN8



AN9



AN10



AN11

R⁰

, 2, 3, 4, 5 / 6 1
 X⁰ F OCF₃ 4a 1 1 6⁴

1 7
 2 5
 C₂-C₇-1E-² C₄-C₇-3E-⁷ C₅-C₇-4- C₆-C₇-5- C₇-6-
 C₂-C₇-1E- C₄-C₇-3E- C₅-C₇-4-
 1E- 1E- 1E- 1E- 1E- 3- 3E- 3E- 3E-
 4- 4Z- 4E- 4Z- 5- 6- 5

4- 5- 6- 7- 2- 3-
 가

C_nH_{2n+1}-O-(CH₂)_m (n m 1
 6) n 1 m 1 6

R⁰ X⁰ 1E- 3E- 2E-
 play)) 4- 3- k₃₃() k₁₁((s
 k₃₃/k₁₁

-CH₂CH₂- 90° TN k₃₃/k₁₁ k₃₃/k₁₁
), STN, SBE OMI 가 ((shade)
 가 (multiplexability)),

1 2 + 3 + 4 + 5 + 6 1, 2, 3, 4, 5
 / 6

1 13 가 가 1 13 가

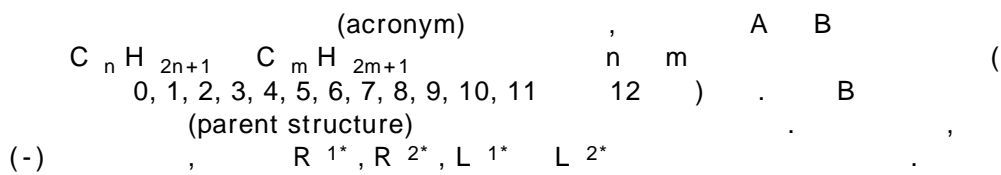
OCF₂-CF₂H₁ 2 6(X⁰ F, OCF₃, OCHF₂, OCH=CF₂, OCF=CF₂
 2, 3 / 4, 4a) 1
 4a

1 18

MLC
 -Si TFT MIM , MLC

가

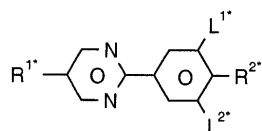
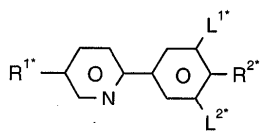
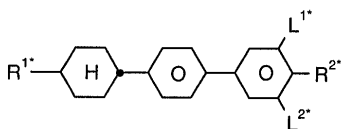
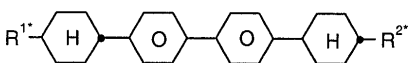
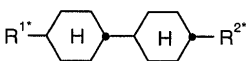
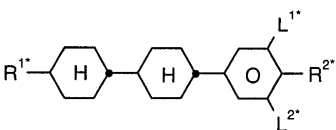
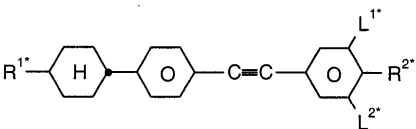
0, 15% 가 가
 C, S, S, C, C, N, I
 $V_{10, t_{on}} = 10\%$ ()
 $V_{10, t_{off}} = 20\%$ ()
 d · n) TN (, 0.5

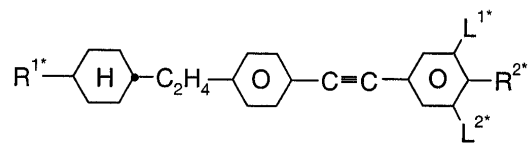
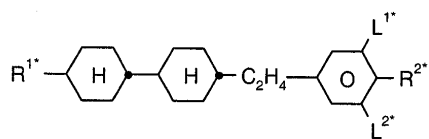
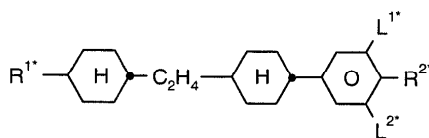
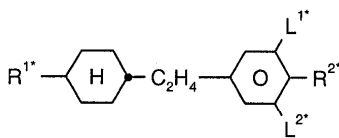
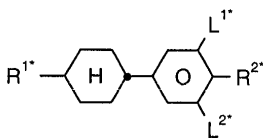
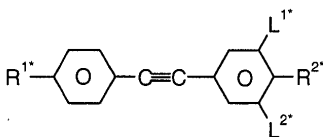


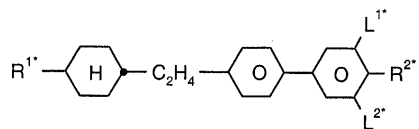
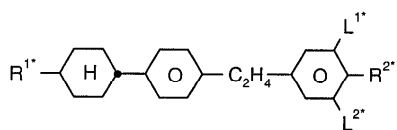
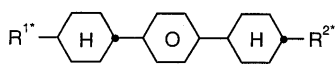
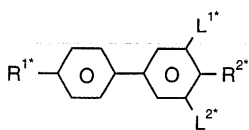
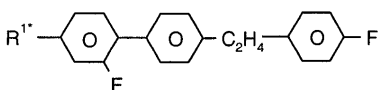
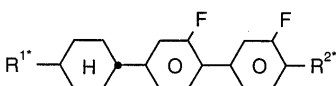
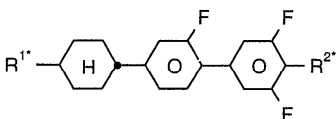
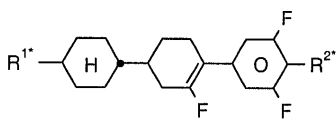
$R^{1*}, R^{2*}, L^{1*}, L^{2*}$ 의 부호	R^{1*}	R^{2*}	L^{1*}	L^{2*}
nm	$C_n H_{2n+1}$	$C_m H_{2m+1}$	H	H
nOm	$OC_n H_{2n+1}$	$C_m H_{2m+1}$	H	H
nO.m	$C_n H_{2n+1}$	$OC_m H_{2m+1}$	H	H
n	$C_n H_{2n+1}$	CN	H	H
nN.F	$C_n H_{2n+1}$	CN	F	H
nN.F.F	$C_n H_{2n+1}$	CN	F	F
nF	$C_n H_{2n+1}$	F	H	H
nCl	$C_n H_{2n+1}$	Cl	H	H
nOF	$OC_n H_{2n+1}$	F	H	H
nF.F	$C_n H_{2n+1}$	F	F	H
nF.F.F	$C_n H_{2n+1}$	F	F	F
nmF	$C_n H_{2n+1}$	$C_m H_{2m+1}$	F	H
nOCF ₃	$C_n H_{2n+1}$	OCF ₃	H	H
nOCF ₃ .F	$C_n H_{2n+1}$	OCF ₃	F	H
n-Vm	$C_n H_{2n+1}$	-CH=CH- $C_m H_{2m+1}$	H	H
nV-Vm	$C_n H_{2n+1}$ -CH=CH-	-CH=CH- $C_m H_{2m+1}$	H	H

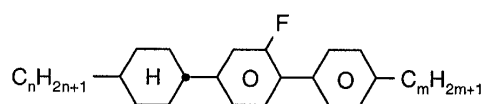
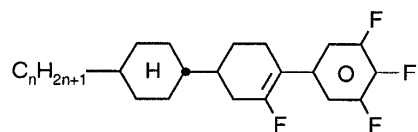
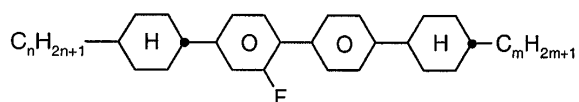
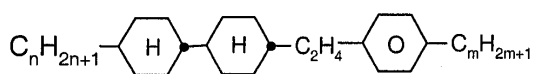
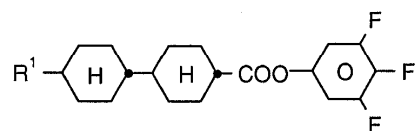
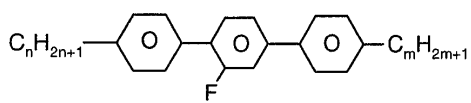
A B

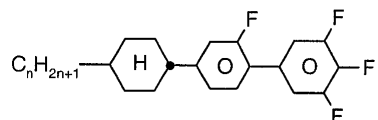
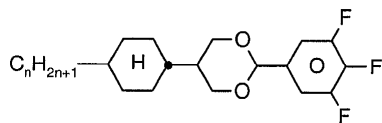
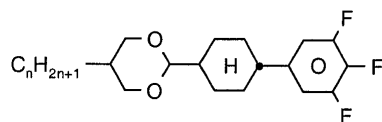
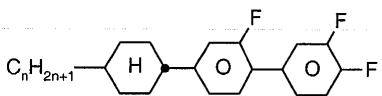
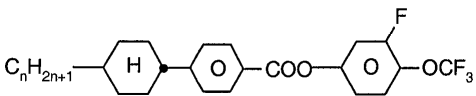
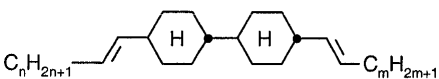
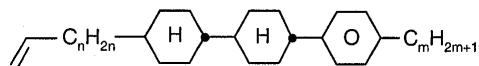
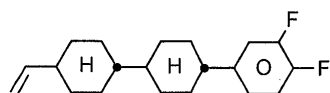
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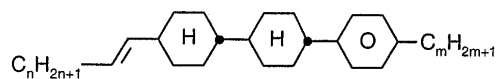
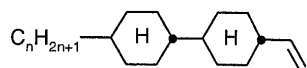
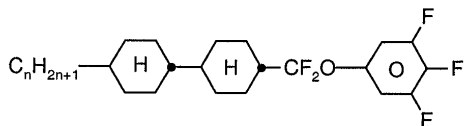
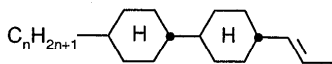
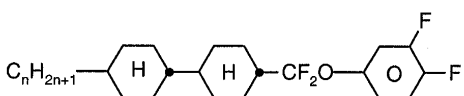
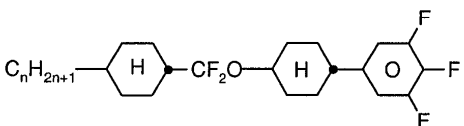
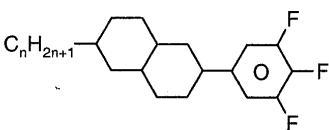
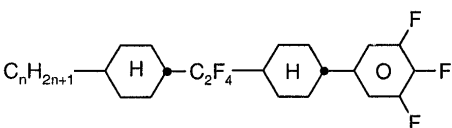
**PYP****PYRP****BCH****CBC****CCH****CCP****CPTP**

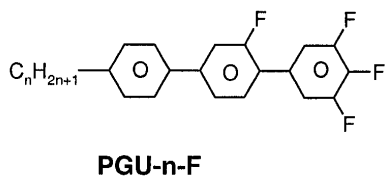
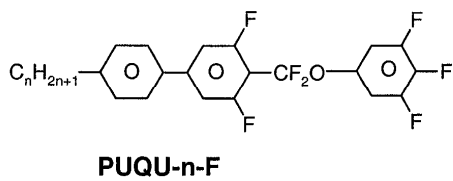
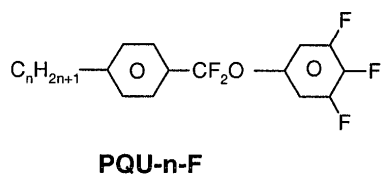
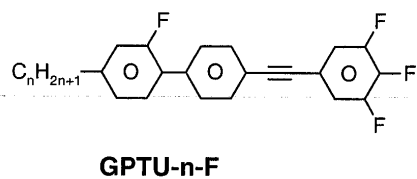
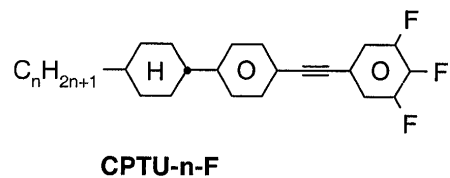
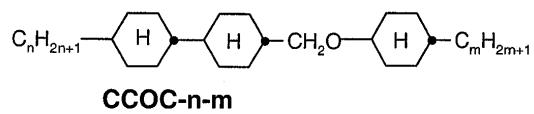
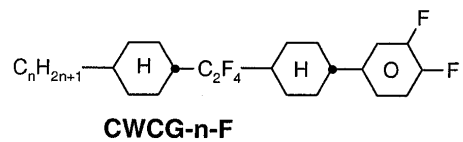
**CEPTP****ECCP****CECP****EPCH****PCH****PTP**

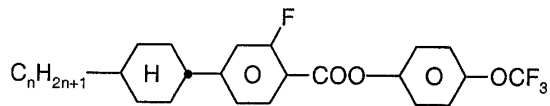
**BECH****EBCH****CPC****B****FET-nF****CGG****CGU****CFU****B**

**BCH-n.Fm****CFU-n-F****CBC-nmF****ECCP-nm****CCZU-n-F****T-nFm**

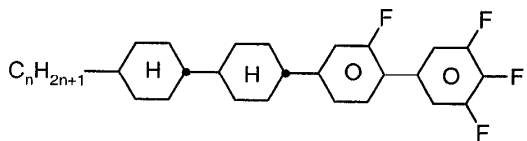
**CGU-n-F****CDU-n-F****DCU-n-F****CGG-n-F****CPZG-n-OT****CC-nV-Vm****CCP-Vn-m****CCG-V-F**

**CCP-nV-m****CC-n-V****CCQU-n-F****CC-n-V1****CCQG-n-F****CQCU-n-F****Dec-U-n-F****CWCU-n-F**

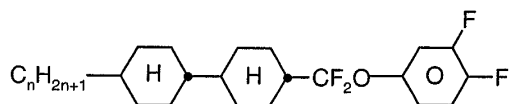




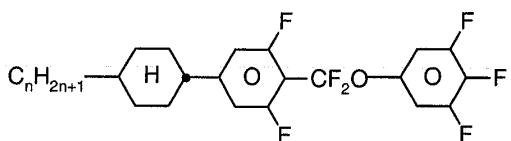
CGZP-n-OT



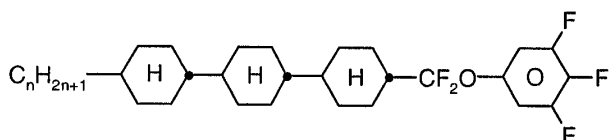
CCGU-n-F



CCQG-n-F



CUQU-n-F

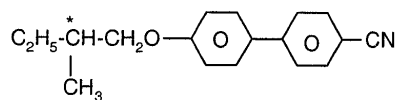
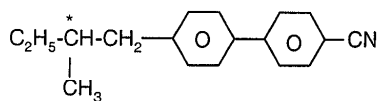
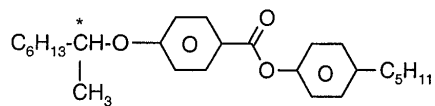
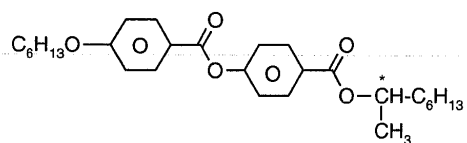
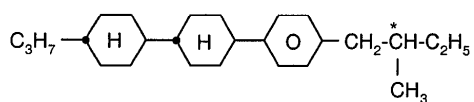
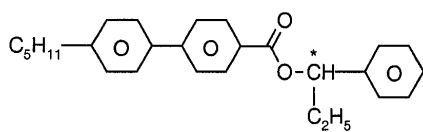
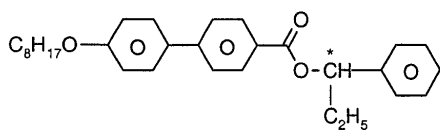


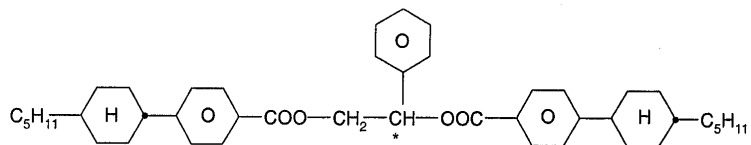
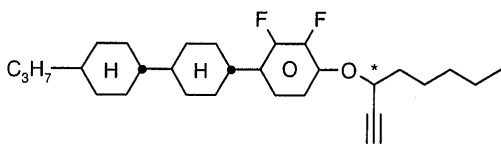
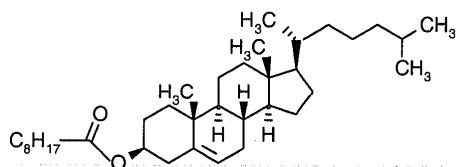
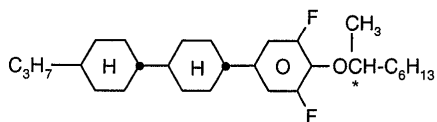
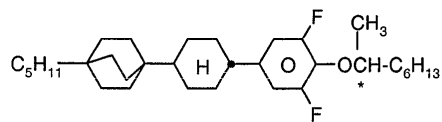
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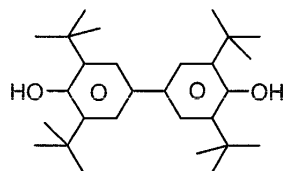
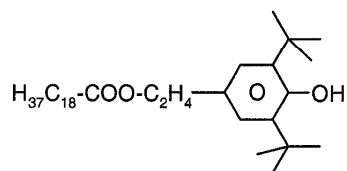
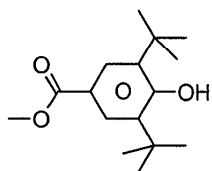
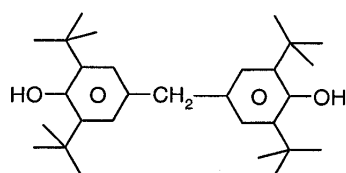
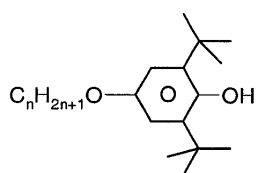
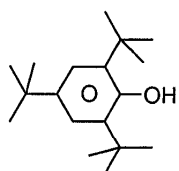
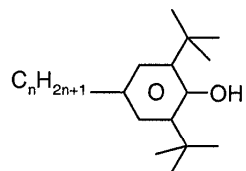
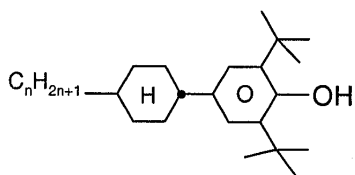
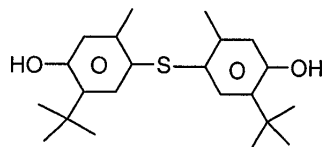
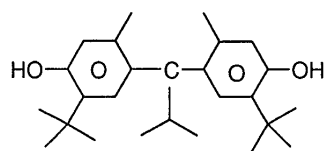
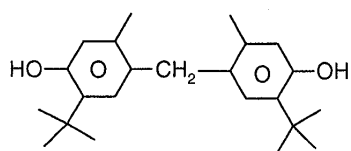
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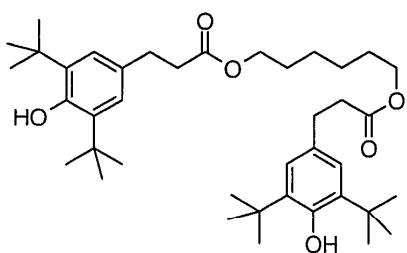
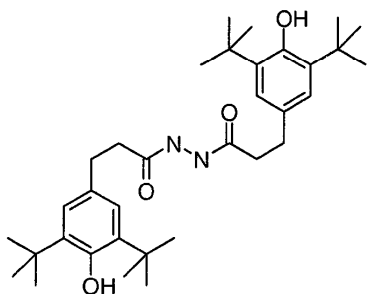
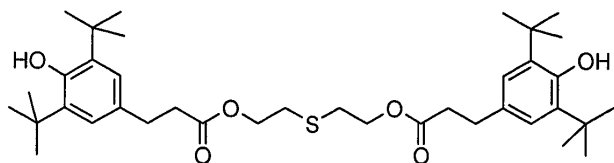
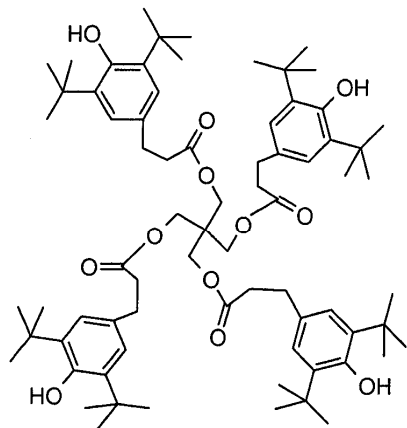
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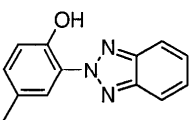
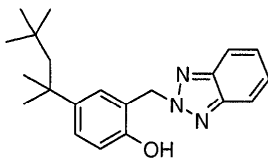
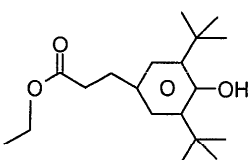
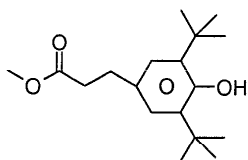
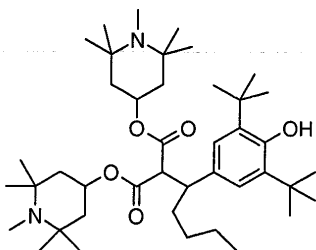
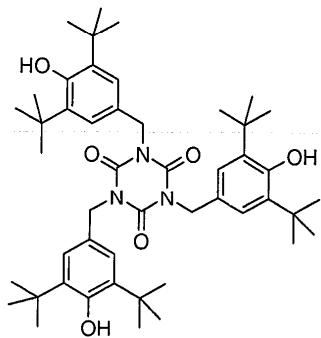
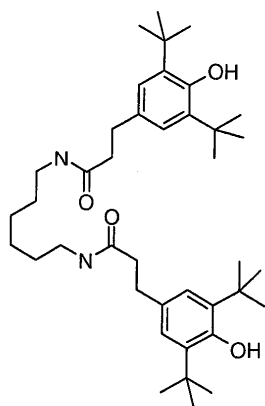
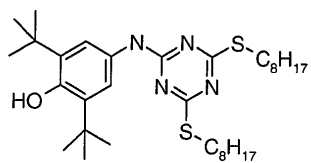
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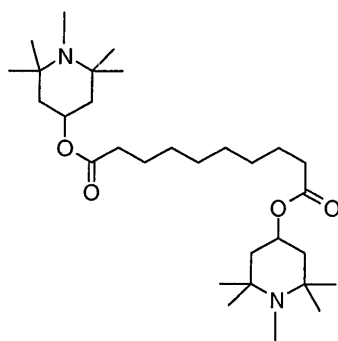
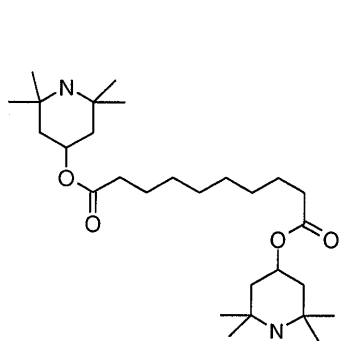
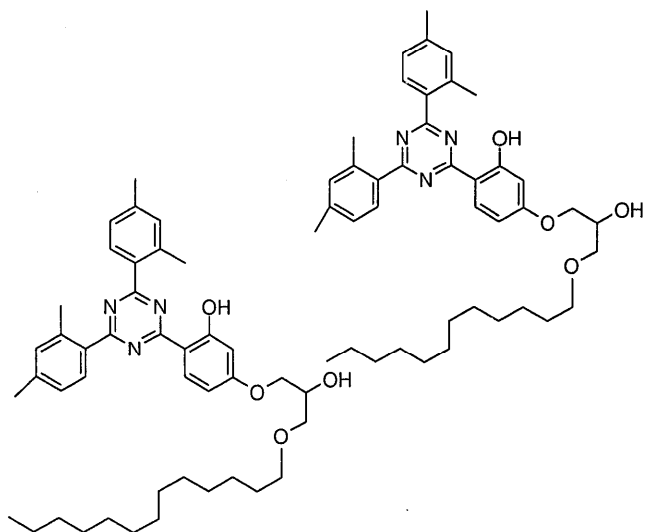
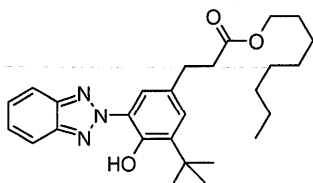
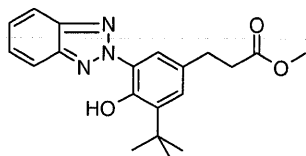
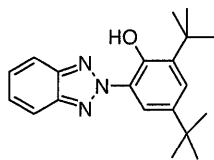
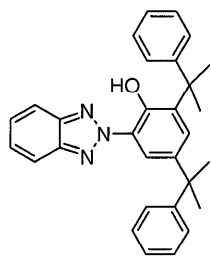
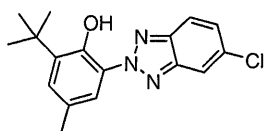
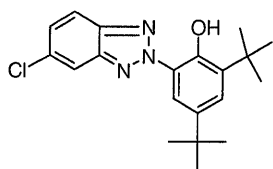
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 20) . 20 (mm²/) 1 [mPa · s] 20 . , S
 (589nm,

M1

CCH-5CF ₃	8.00%	청명점 [°C]:	83.0
CCP-1F.F.F	6.00%	Δn [589 nm, 20°C]:	0.0663
CCP-2F.F.F	8.00%	$\Delta \epsilon$ [1 kHz, 20°C]:	11.7
CCP-3F.F.F	8.00%	γ_1 [mPa·s, 20°C]:	157
CCOC-3-3	3.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCOC-3-5	3.00%	비틀림 각 [°]:	90
CCOC-4-3	4.00%		
CCQU-1-F	8.00%		
CCQU-2-F	9.00%		
CCQU-3-F	10.00%		
CCCQU-3-F	9.00%		
CDU-2-F	8.00%		
CDU-3-F	8.00%		
CDU-5-F	8.00%		

M2

CCP-2F.F.F	8.00%	청명점 [°C]:	83.0
CCH-34	12.00%	Δn [589 nm, 20°C]:	0.0659
DCU-3-F	6.00%	$\Delta \epsilon$ [1 kHz, 20°C]:	12.3
DCU-4-F	8.00%	γ_1 [mPa·s, 20°C]:	148
DCU-5-F	8.00%	$d \cdot \Delta n$ [20°C]:	0.50
CECU-2-F	7.00%	비틀림 각 [°]:	90
CECU-3-F	7.00%	V_{10} [V]:	1.16
CECU-5-F	8.00%		
CCQU-1-F	8.00%		
CCQU-2-F	8.00%		
CCQU-3-F	10.00%		
CCCQU-3-F	10.00%		

M3

CCP-2F.F.F	11.00%	청명점 [°C]:	85.5
CCP-3F.F.F	11.00%	Δn [589 nm, 20°C]:	0.0754
CCP-5F.F.F	6.00%	$\Delta \epsilon$ [1 kHz, 20°C]:	12.0
CCZU-2-F	4.00%	γ_1 [mPa·s, 20°C]:	155
CCZU-3-F	14.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCZU-5-F	4.00%	비틀림 각 [°]:	90
CGU-2-F	7.00%	V_{10} [V]:	1.11
CGU-3-F	4.00%		
CCH-5CF ₃	3.00%		
CCOC-4-3	3.00%		
CCQU-1-F	8.00%		
CCQU-2-F	10.00%		
CCQU-3-F	9.00%		
CCCQU-3-F	6.00%		

M4

CECU-2-F	8.00%	청명점 [°C]:	82.0
CECU-3-F	8.00%	Δn [589 nm, 20°C]:	0.0749
CECU-5-F	8.00%	$\Delta \varepsilon$ [1 kHz, 20°C]:	11.3
CCP-2F.F.F	9.00%	γ_1 [mPa·s, 20°C]:	156
CCP-3F.F.F	10.00%		
CCZU-2-F	3.00%		
CCZU-3-F	10.00%		
CCZU-5-F	3.00%		
CCQU-1-F	9.00%		
CCQU-2-F	6.00%		
CCQU-3-F	6.00%		
CCCQU-3-F	8.00%		
PCH-7F	5.00%		
BCH-3F.F.F	7.00%		

M5

CCP-2F.F	17.00%	청명점 [°C]:	83.0
CCP-3F.F	6.00%	Δn [589 nm, 20°C]:	0.0791
CCZU-2-F	3.00%	γ_1 [mPa·s, 20°C]:	100
CCZU-3-F	9.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCP-31	9.00%	Twist [°]:	90
CCH-34	12.00%	V_{10} [V]:	1.65
PCH-7F.F.F	8.00%		
CCP-3F	5.00%		
PCH-302	16.00%		
PUQU-3-F	7.00%		
CCCQU-3-F	8.00%		

M6

BCH-3F.F.F	18.00%	청명점 [°C]:	83.0
BCH-5F.F.F	10.00%	Δn [589 nm, 20°C]:	0.1032
BCH-2F.F	9.00%	γ_1 [mPa·s, 20°C]:	158
BCH-3F.F	9.00%	$d \cdot \Delta n$ [20°C]:	0.50
BCH-4F.F	5.00%	비틀림 각 [°]:	90
CCP-2F.F	8.00%	V_{10} [V]:	1.27
DCU-3-F	3.00%		
DCU-4-F	4.00%		
DCU-5-F	9.00%		
CCP-31	7.00%		
CCH-34	12.00%		
CCCQU-3-F	6.00%		

M7

CCH-34	5.00%	청명점 [°C]:	79.0
PCH-5CI	8.00%	Δn [589 nm, 20°C]:	0.0923
CCP-3F.F	13.00%	γ_1 [mPa·s, 20°C]:	160
CCP-2F.F.F	9.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCP-4F.F.F	6.00%	비틀림 각 [°]:	90
BCH-2F.F	7.00%	V_{10} [V]:	1.22
BCH-3F.F.F	15.00%		
BCH-5F.F.F	7.00%		
DCU-3-F	3.00%		
DCU-4-F	5.00%		
DCU-5-F	8.00%		
CCCQU-3-F	7.00%		
CCP-31	7.00%		

M8

CCH-34	6.00%	청명점 [°C]:	80.0
PCH-5CI	8.00%	Δn [589 nm, 20°C]:	0.0932
CCP-3F.F	14.00%	γ_1 [mPa·s, 20°C]:	135
CCP-4F.F	13.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCP-2F.F.F	9.00%	비틀림 각 [°]:	90
CCP-4F.F.F	8.50%	V_{10} [V]:	1.25
BCH-2F.F	4.00%		
CCCQU-3-F	8.00%		
CCP-31	9.00%		
PUQU-2-F	6.00%		
PUQU-3-F	8.00%		
PUQU-5-F	6.50%		

M9

CCP-2F.F	4.50%	청명점 [°C]:	78.5
CCP-3F.F	13.00%	Δn [589 nm, 20°C]:	0.079
CCP-2F.F.F	6.50%	γ_1 [mPa·s, 20°C]:	125
PCH-7F.F.F	9.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCZU-2-F	3.00%	비틀림 각 [°]:	90
CCZU-3-F	10.00%	V_{10} [V]:	1.24
CCZU-4-F	3.00%		
DCU-3-F	2.50%		
DCU-4-F	5.00%		
PUQU-2-F	6.00%		
PUQU-3-F	2.50%		
CCP-3F	3.00%		
CCP-31	9.00%		
CCH-34	5.00%		
PCH-302	10.00%		
CCCQU-3-F	8.00%		

M10

CCP-3F.F	12.50%	청명점 [°C]:	80.0
CCP-2F.F.F	5.00%	Δn [589 nm, 20°C]:	0.080
PCH-7F.F.F	8.00%	γ_1 [mPa·s, 20°C]:	140
CCZU-2-F	3.00%	$d \cdot \Delta n$ [20°C]:	0.50
CCZU-3-F	10.00%	비틀림 각 [°]:	90
CCZU-4-F	3.00%	V_{10} [V]:	1.25
DCU-3-F	3.00%		
DCU-4-F	5.00%		
DCU-5-F	8.00%		
BCH-3F.F.F	9.50%		
CCP-31	9.00%		
CCH-34	5.00%		
PCH-302	11.00%		
CCCQU-3-F	8.00%		

M11

BCH-3F.F	10.80%	청명점 [°C]:	107.5
BCH-5F.F	9.00%	Δn [589 nm, 20°C]:	0.0970
ECCP-30CF ₃	4.50%	ν [kHz, 20°C]:	5.9
ECCP-50CF ₃	4.50%		
CBC-33F	1.80%		
CBC-53F	1.80%		
CBC-55F	1.80%		
PCH-6F	7.20%		
PCH-7F	5.40%		
CCP-20CF ₃	7.20%		
CCP-30CF ₃	10.80%		
CCP-40CF ₃	6.30%		
CCP-50CF ₃	9.90%		
PCH-5F	9.00%		
CCCQU-3-F	10.00%		

M12

BCH-3F.F	10.91%	청명점 [°C]:	106.0
BCH-5F.F	9.09%		
ECCP-30CF ₃	4.55%		
ECCP-50CF ₃	4.55%		
CBC-33F	1.82%		
CBC-53F	1.82%		
CBC-55F	1.82%		
PCH-6F	7.27%		
PCH-7F	5.45%		
CCP-20CF ₃	7.27%		
CCP-30CF ₃	10.91%		
CCP-40CF ₃	6.36%		
CCP-50CF ₃	10.00%		
PCH-5F	9.09%		
CCCQU-3-F	9.10%		

M13

CCH-301	12.59%	청명점 [°C]:	97.5
CCH-3CF ₃	7.20%	Δn [589 nm, 20°C]:	0.0639
CCH-501	9.89%	ν [kHz, 20°C]:	7.3
CCP-2F.F.F	8.99%		
CCP-3F.F.F	11.69%		
CCP-5F.F.F	4.50%		
CCPC-33	2.70%		
CCZU-2-F	4.50%		
CCZU-3-F	15.29%		
CCZU-5-F	4.50%		
CH-33	2.70%		
CH-35	2.70%		
CH-43	2.70%		
CCCQU-3-F	10.06%		

MLC, TN

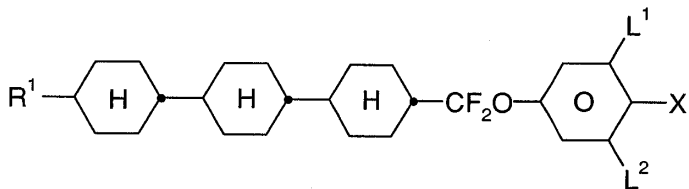
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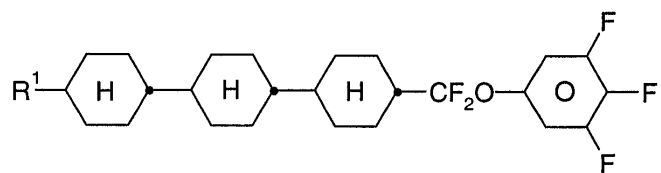
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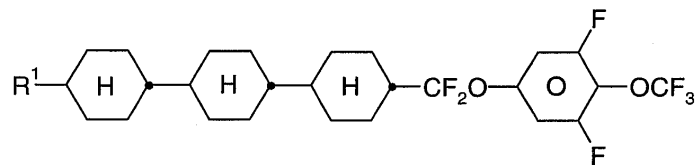
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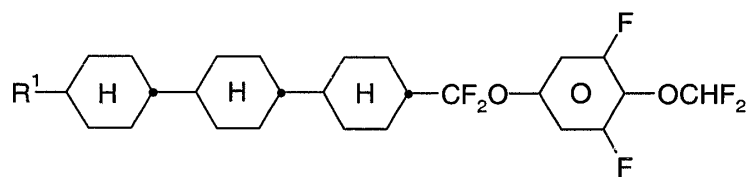
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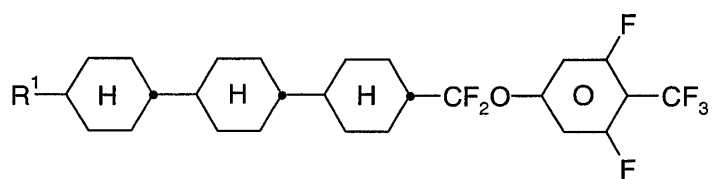
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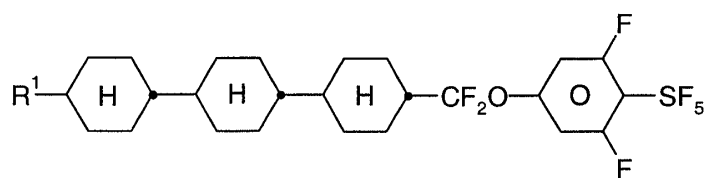
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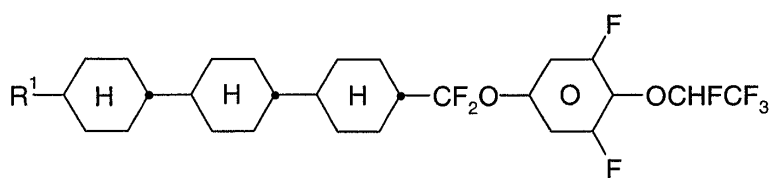
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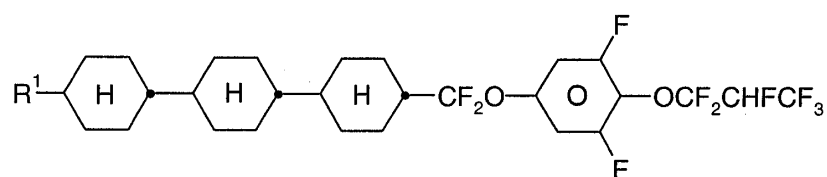
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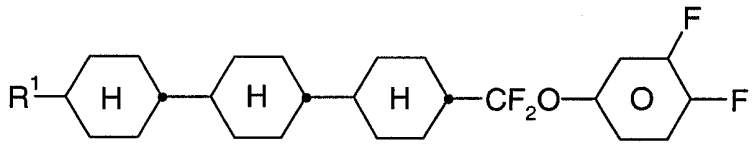
1f



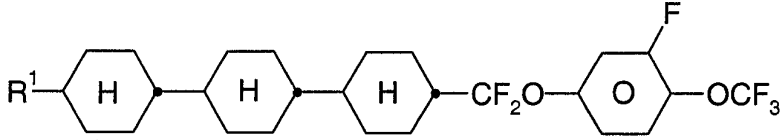
1g



1h



1i



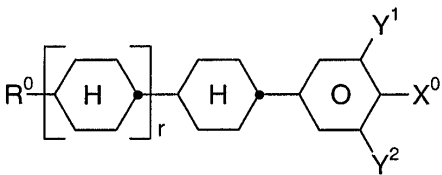
R¹ 1

3.

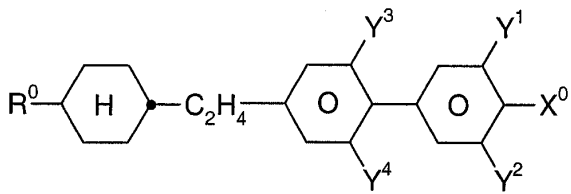
1 2 ,
2, 3, 4, 5 6

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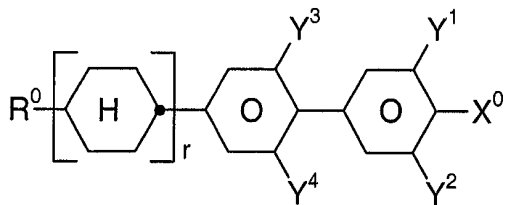
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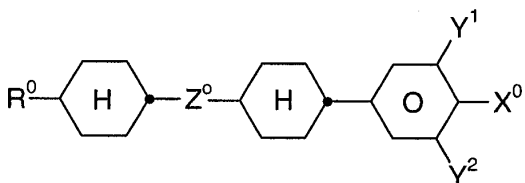
3



4



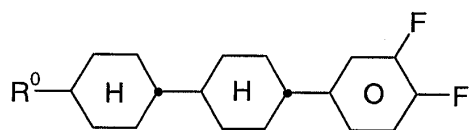
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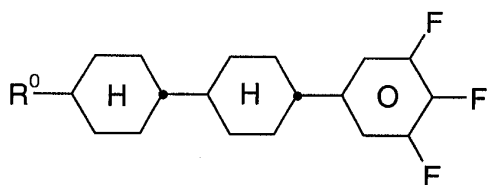
1 5

2a 2g

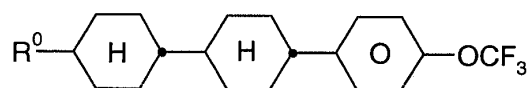
2a



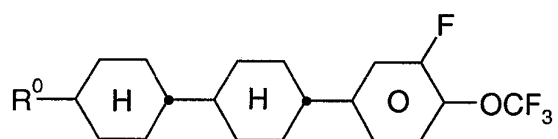
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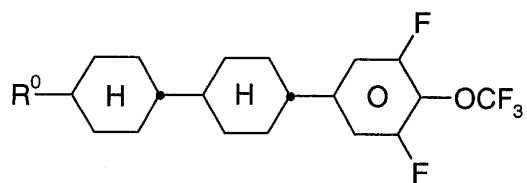
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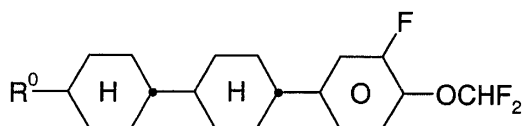
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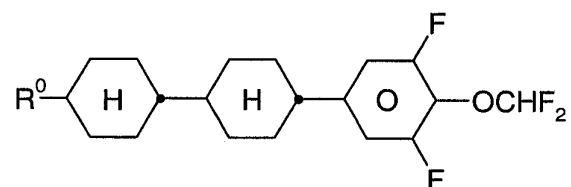
2e



2f



2g

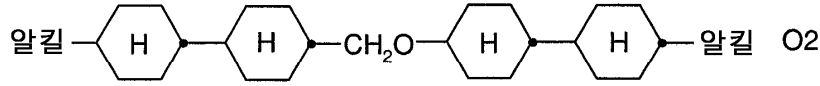
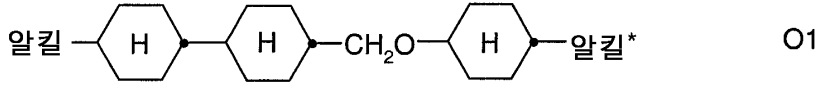


R⁰ 3

7.

1 6

O1 O2



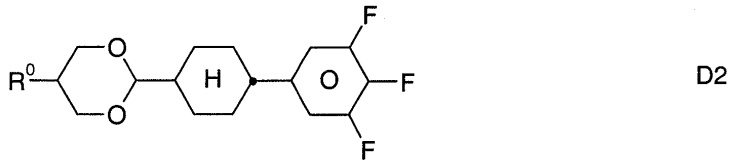
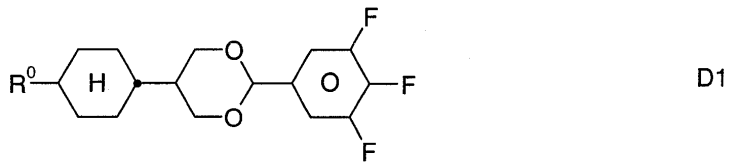
*

1 7

8.

1 7

D1 D2



R⁰ 3

9.

1 8

1 0.5 40 %

10.

1 9

11.

1 9