



(12)发明专利

(10)授权公告号 CN 103320142 B

(45)授权公告日 2017.06.13

(21)申请号 201310158999.8

(22)申请日 2013.02.08

(65)同一申请的已公布的文献号

申请公布号 CN 103320142 A

(43)申请公布日 2013.09.25

(30) 优先权数据

12001001.2 2012.02.15 EP

(73)专利权人 默克专利股份有限公司

地址 德国达姆施塔特

(72)发明人 H·亨泽尔 A·珀勒 尹彰峻

尹容国 李熙规 崔昌锡

(74) 专利代理机构 中国国际贸易促进委员会专

利商标事务所 11038

代理人 邓毅

(51) Int. Cl.

C09K 19/44(2006.01)

C09K 19/34(2006.01)

C09K 19/30(2006.01)

C09K 19/20(2006.01)

C09K 19/12(2006.01)

C09K 19/06(2006.01)

G02F 1/1333(2006.01)

(56)对比文件

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宙查员 胡建朝

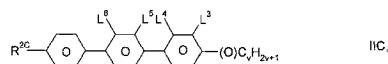
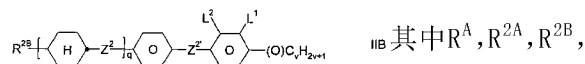
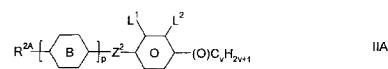
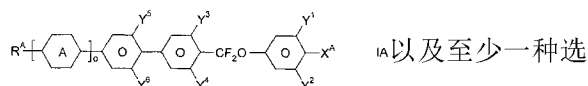
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(54)发明名称

液晶介质

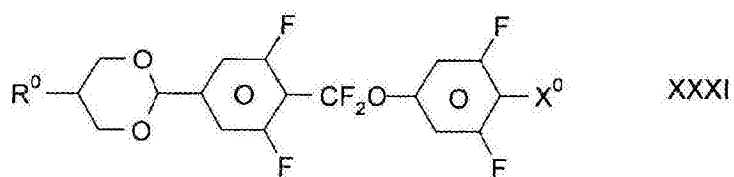
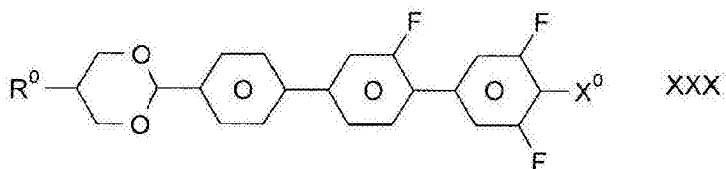
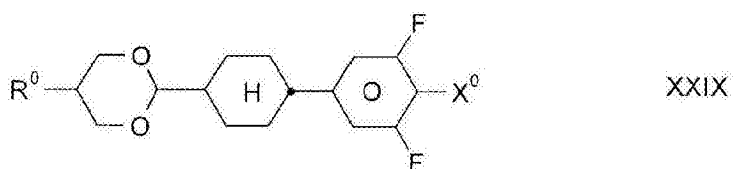
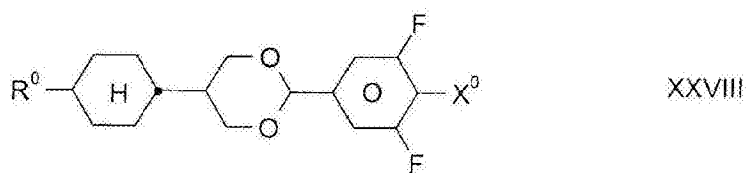
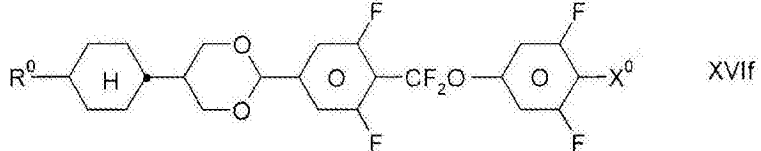
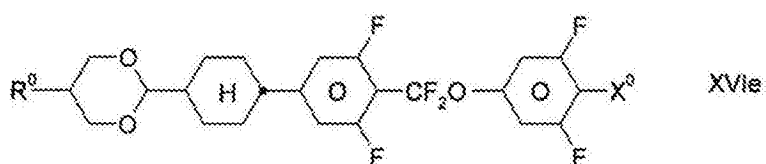
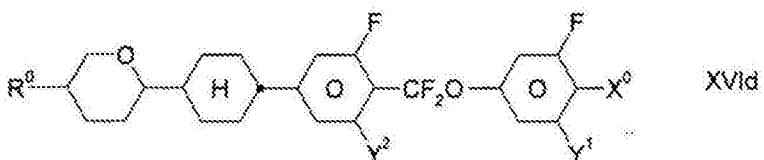
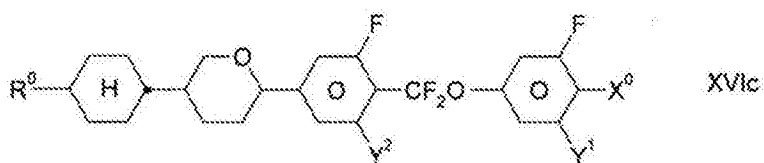
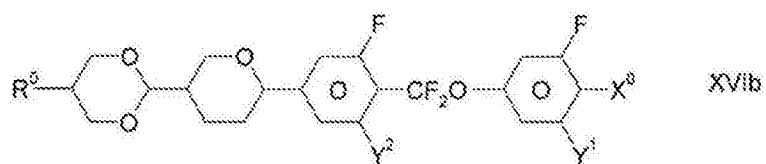
(57)摘要

本发明涉及一种液晶介质,特征在于其包含一种或多种式IA化合物,



R^{2C}, 环A, 环B, X^A, Y^{1 6}, L^{1 6}, Z², Z^{2'}, o, p, q, v和(O)
C_vH_{2v+1}具有权利要求1中所示含义, 本发明还涉
及所述介质用于电光目的的用途, 特别是用于快
门镜, 3D应用, 用于TN、PS-TN、STN、TN-TFT、OCB、
IPS、PS-IPS、FFS、PS-FFS和PS-VA-IPS显示器中。

Y^{1-6} 各自彼此独立地表示H或F,
 L^1 和 L^2 各自彼此独立地表示F,Cl,CF₃或CHF₂,
 L^{3-6} 各自彼此独立地表示H,F,Cl,CF₃或CHF₂,但 L^{3-6} 中的至少两个表示F,Cl,CF₃或CHF₂,
 Z^2 和 $Z^{2'}$ 各自彼此独立地表示单键,-CH₂CH₂-, -CH=CH-, -C≡C-, -CF₂O-, -OCF₂-, -CH₂O-, -OCH₂-, -COO-, -OCO-, -C₂F₄-, -CF=CF-, -CH=CHCH₂O-,
 p 表示1或2,并且在 Z^2 =单键的情况下, p 也可以表示0,
 o 和 q 各自彼此独立地表示0或1,
(0) C_vH_{2v+1}表示OC_vH_{2v+1}或C_vH_{2v+1},以及
 v 表示1-6,
在整个混合物中,式IIA、IIB和/或IIC化合物的比例为3-40重量%;
以及还包含一种或多种选自式XVIb到XVI f、XXVIII、XXIX、XXX和XXXI化合物的化合物,



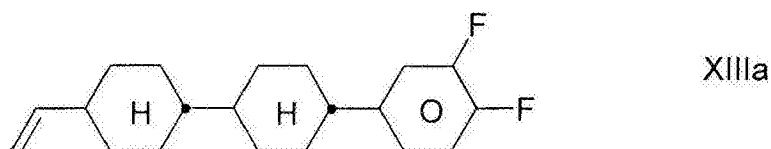
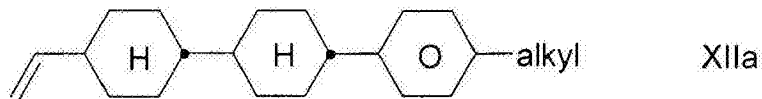
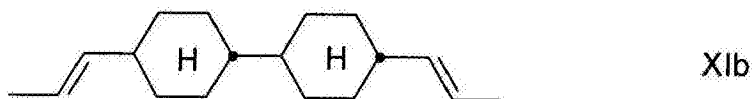
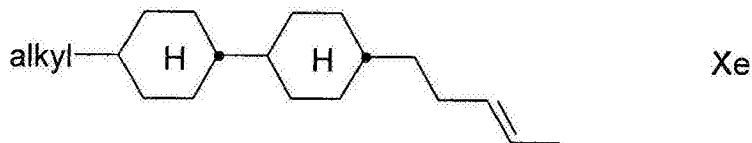
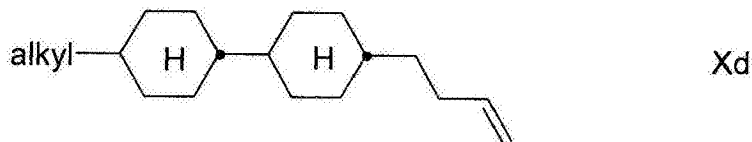
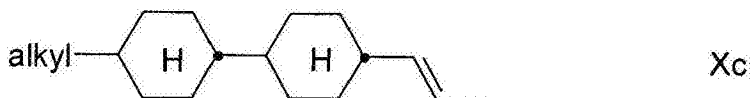
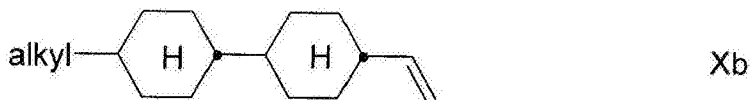
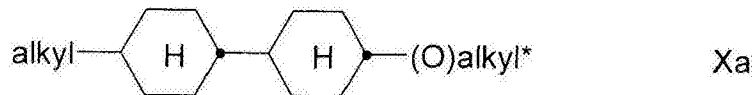
其中

R⁰表示具有1-15个C原子的卤代或未取代的烷基或烷氧基,其中另外地这些基团中一

个或多个CH₂基团可以各自彼此独立地被-C≡C-,-CF₂O-,-CH=CH-,-,-,-O-,-CO-O-或-O-CO-以O原子不彼此直接链接的方式代替,

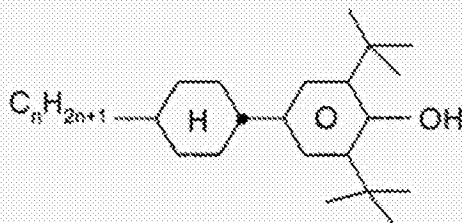
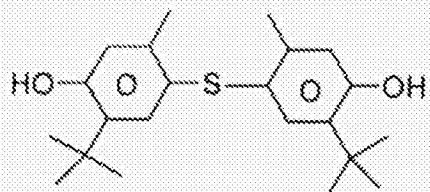
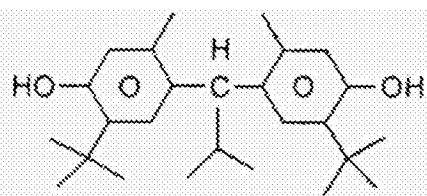
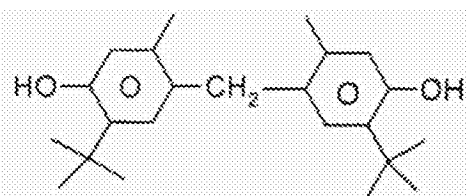
X⁰表示F,Cl,CN,SF₅,SCN,NCS,各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基;

额外包含一种或多种选自式Xa、Xb、Xc、Xd、Xe、XIa、XIb、XIIa、XIIIa的化合物,

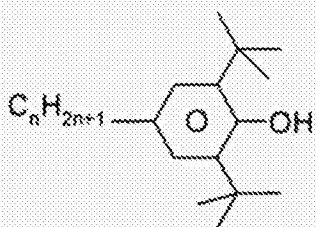


其中“alkyl”表示C₁₋₆烷基和alkyl*表示具有1-6个C原子的直链烷基,并且(O)alkyl*表示alkyl*或O-alkyl*;

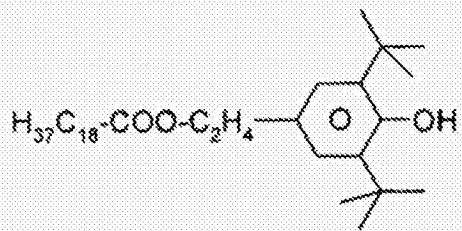
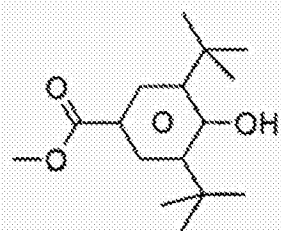
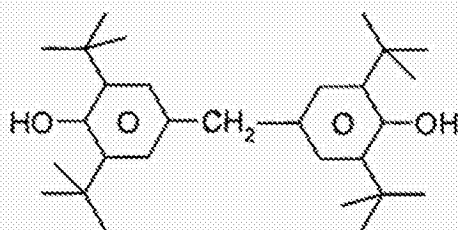
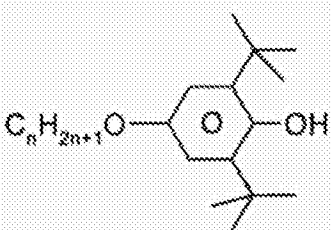
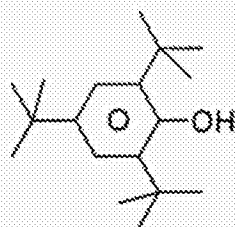
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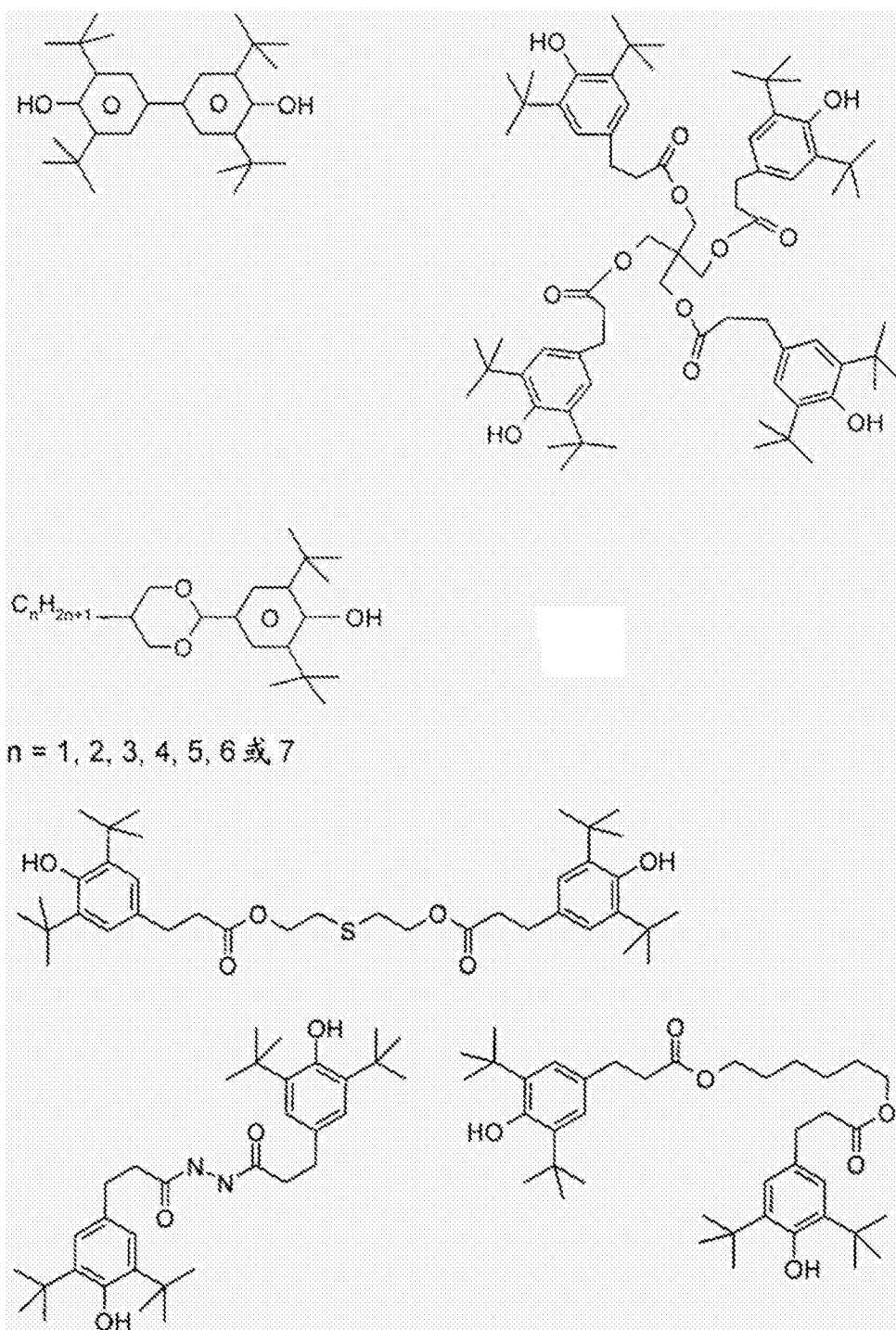


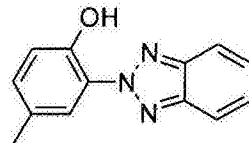
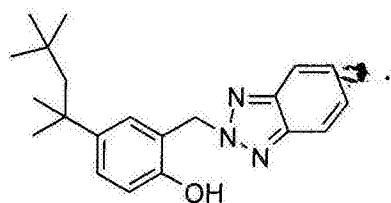
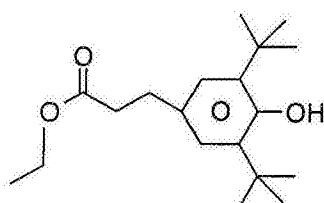
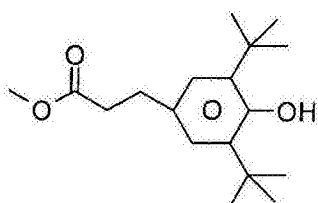
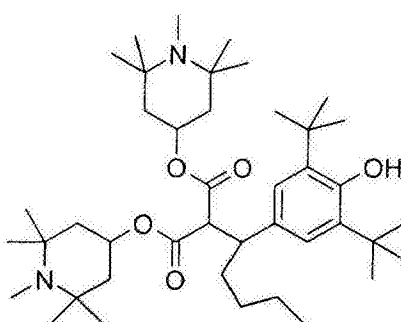
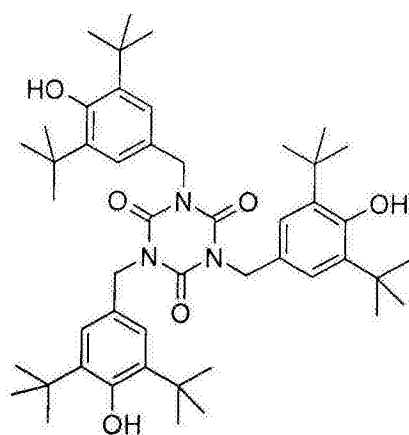
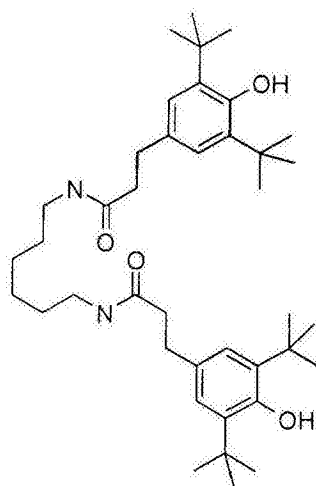
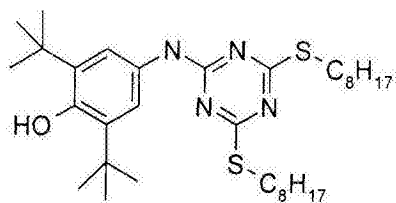
$n = 1, 2, 3, 4, 5, 6$ 或 7

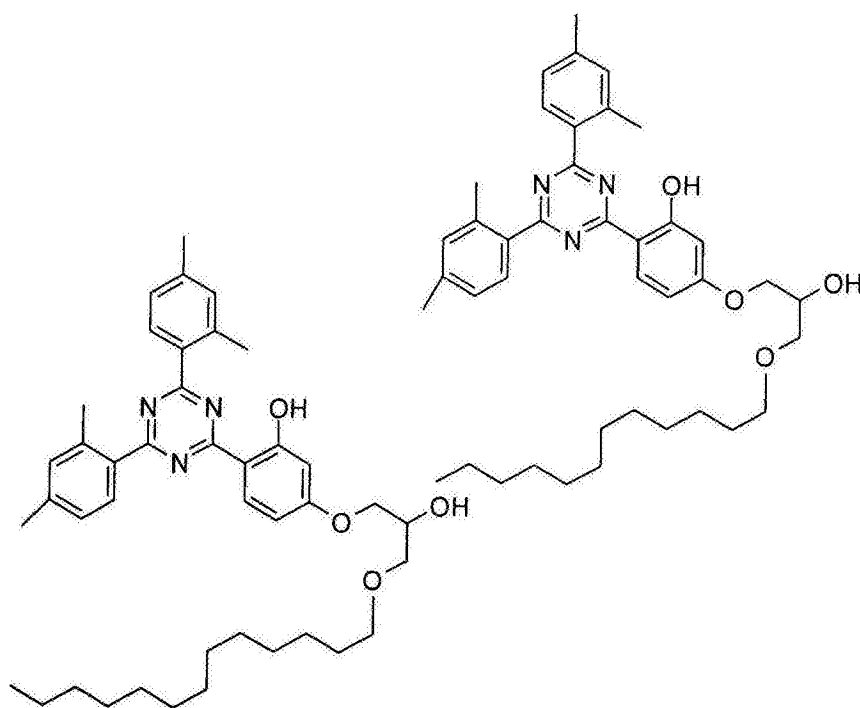
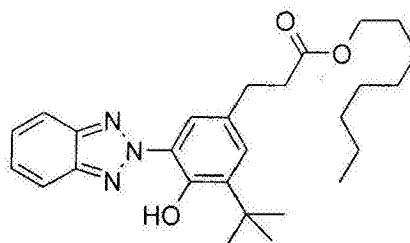
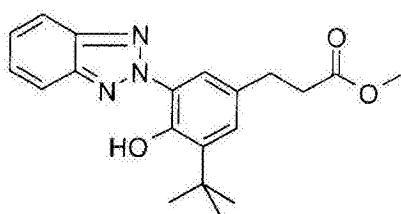
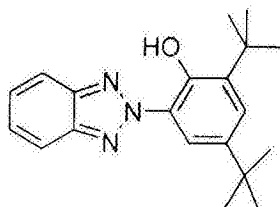
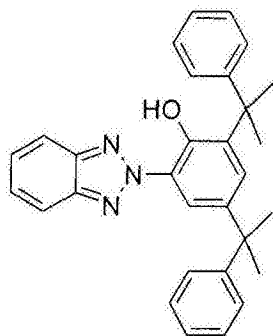
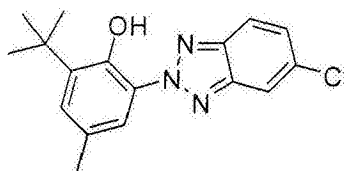
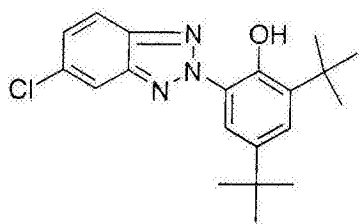


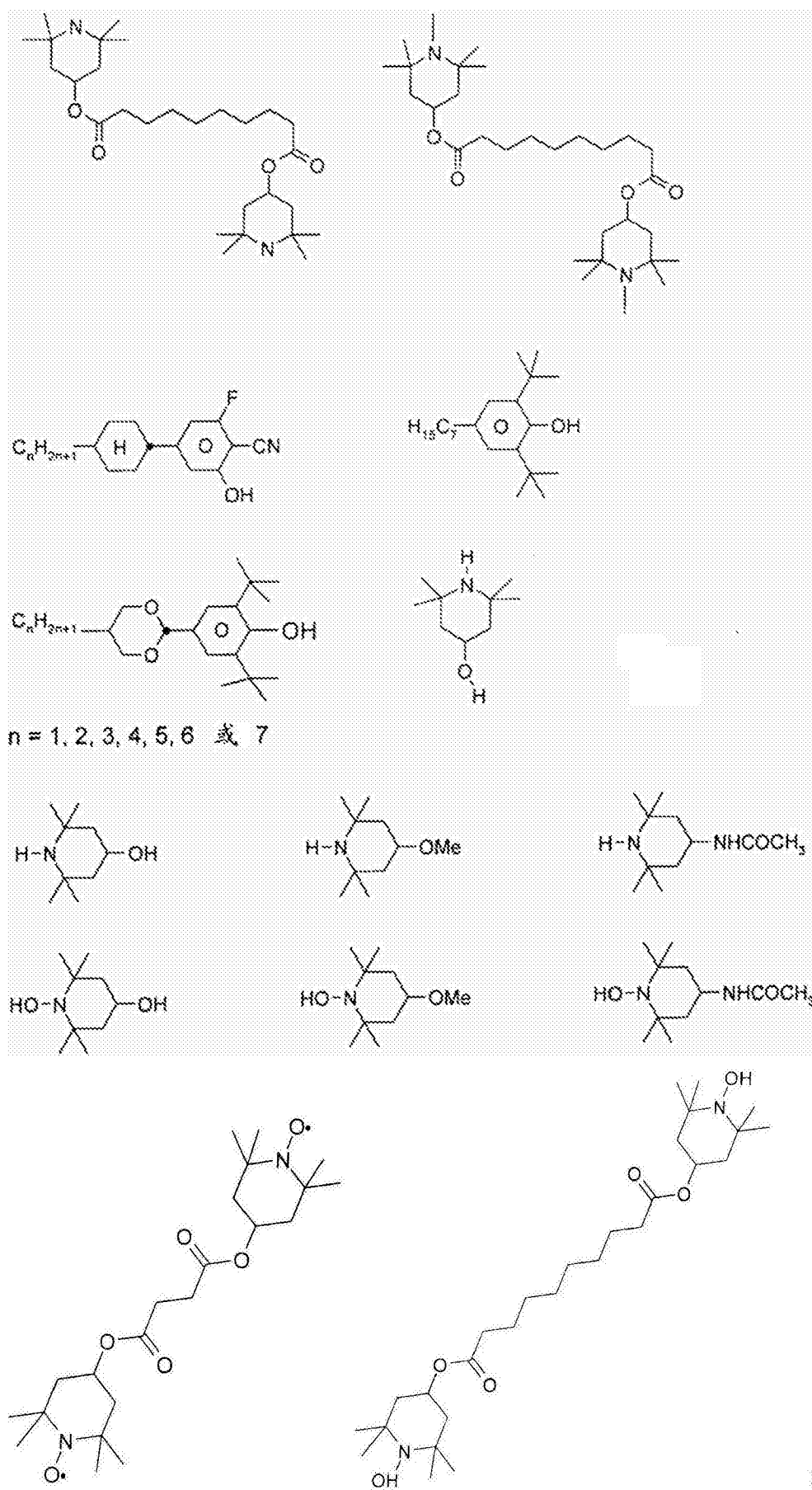
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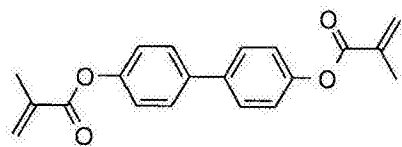




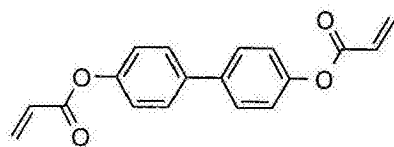




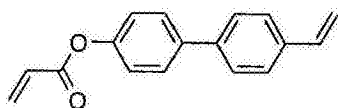
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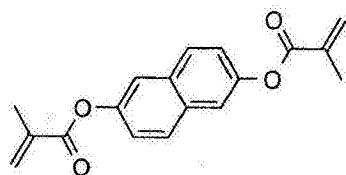
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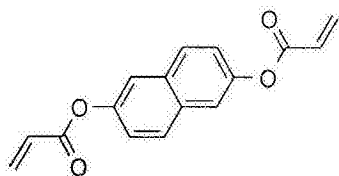
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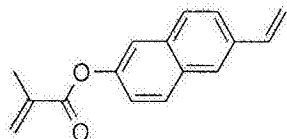
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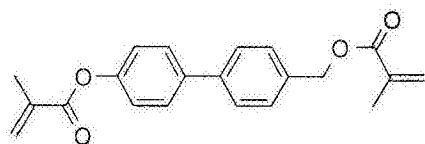
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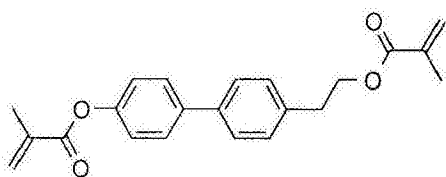
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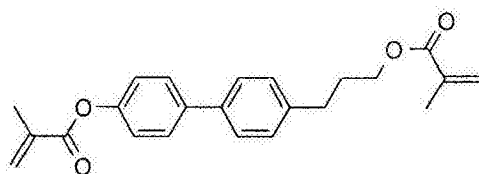
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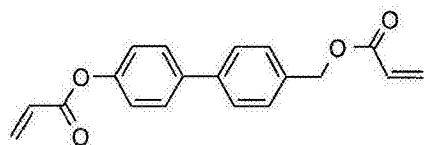
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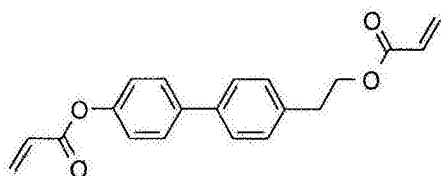
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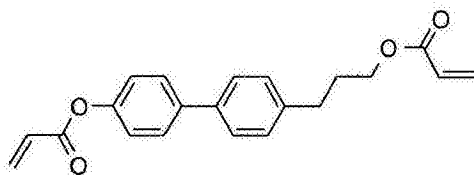
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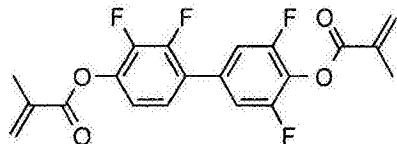
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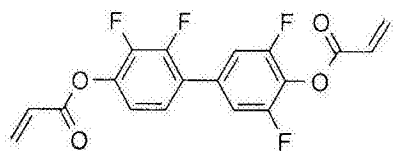
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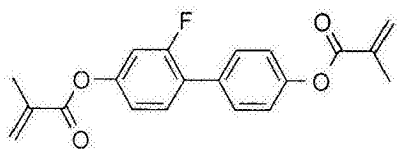
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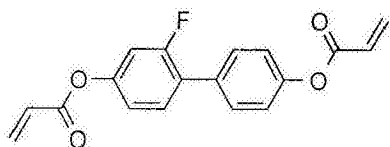
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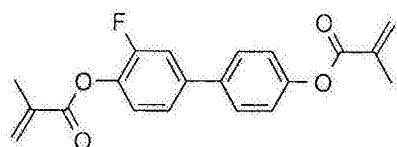
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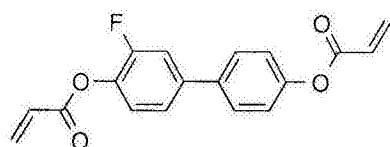
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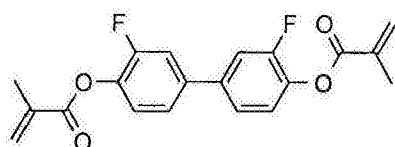
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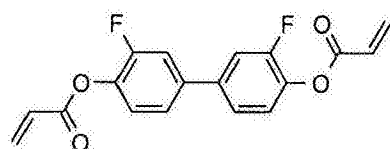
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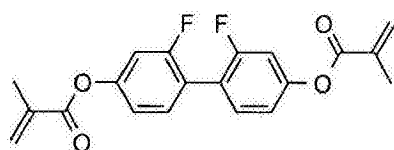
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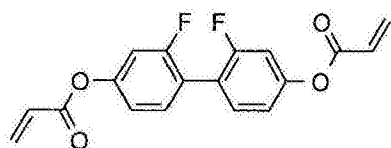
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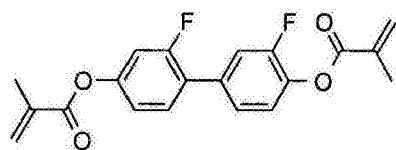
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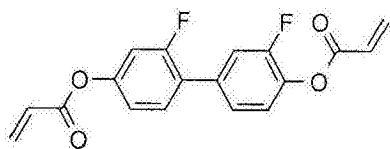
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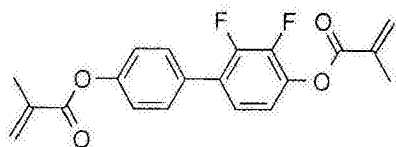
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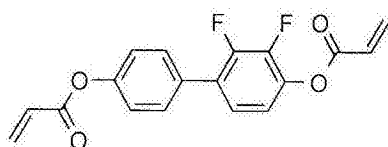
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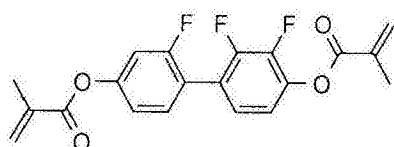
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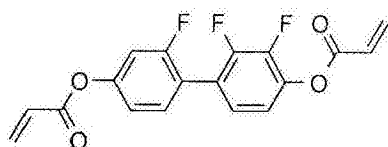
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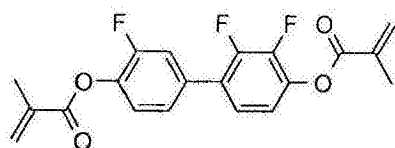
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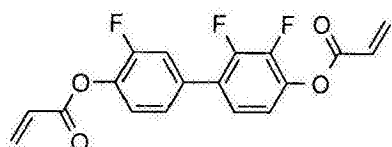
RM-27



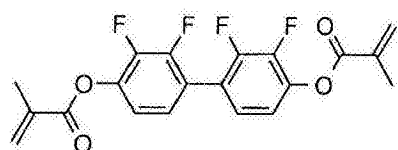
RM-28



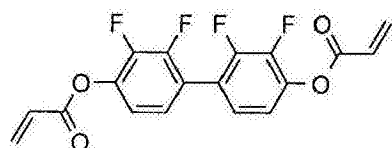
RM-29



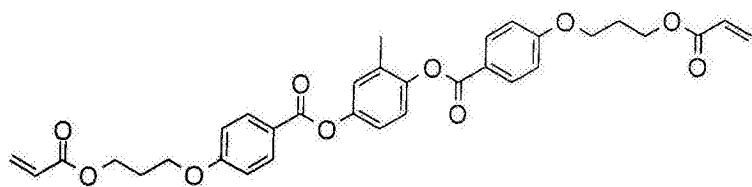
RM-30



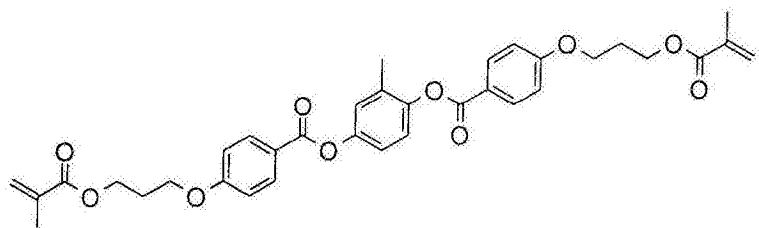
RM-31



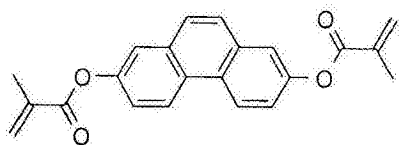
RM-32



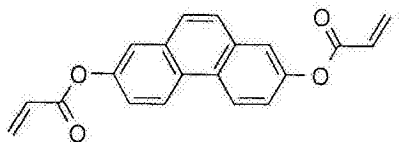
RM-33



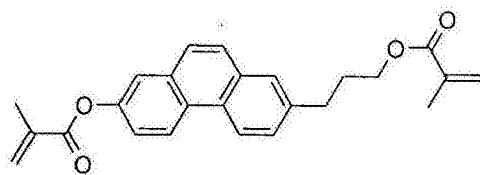
RM-34



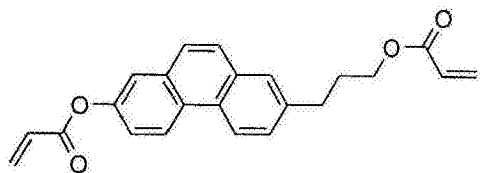
RM-35



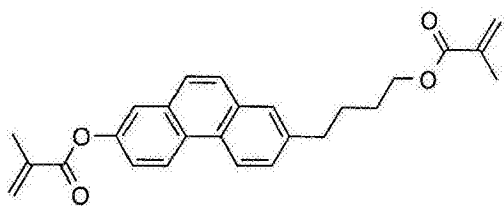
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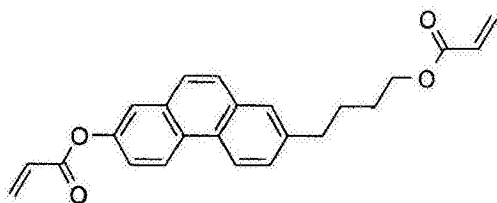
RM-37



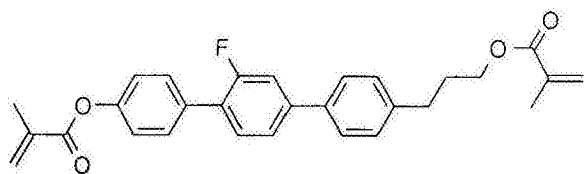
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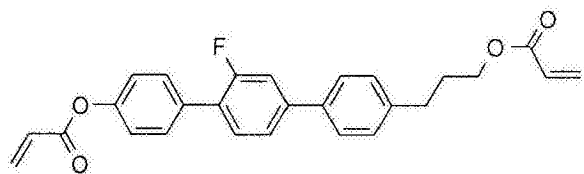
RM-39



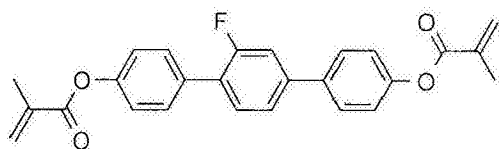
RM-40



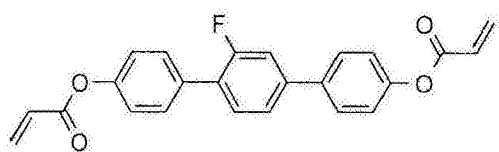
RM-41



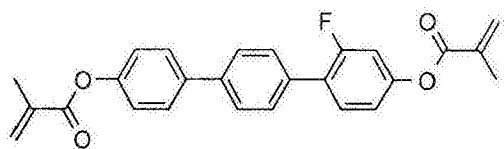
RM-42



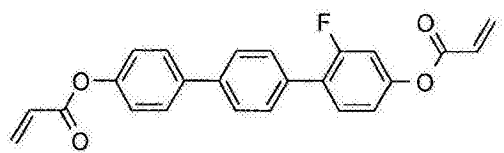
RM-43



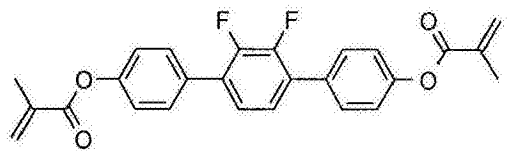
RM-44



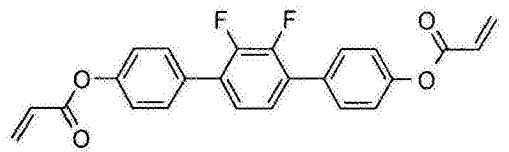
RM-45



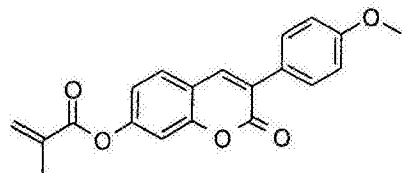
RM-46



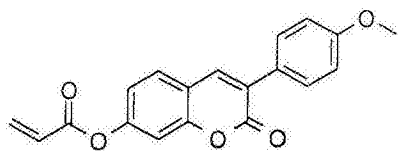
RM-47



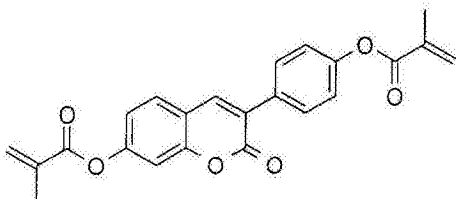
RM-48



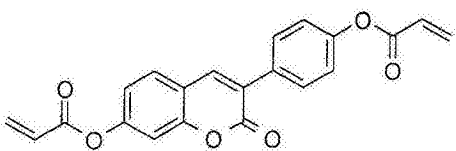
RM-49



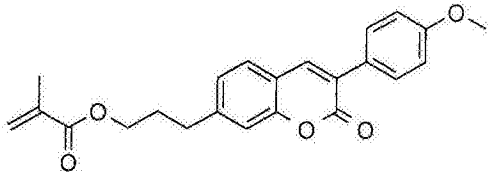
RM-50



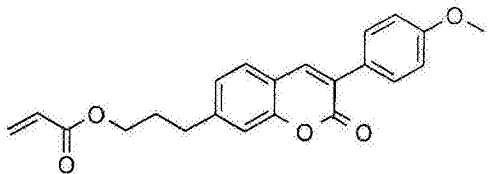
RM-51



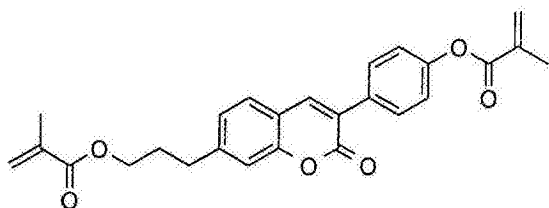
RM-52



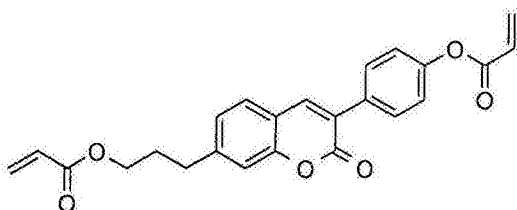
RM-53



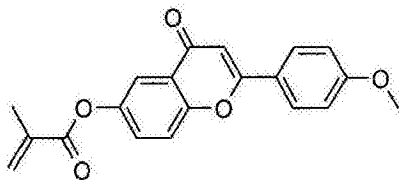
RM-54



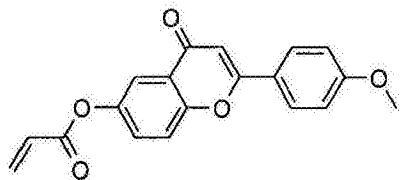
RM-55



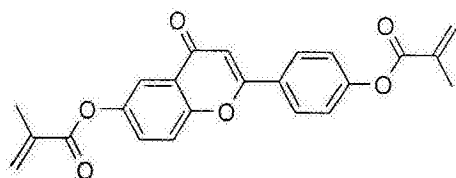
RM-56



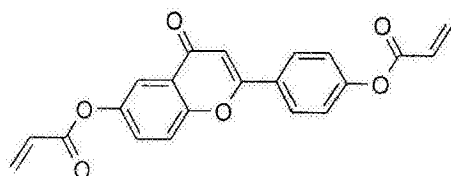
RM-57



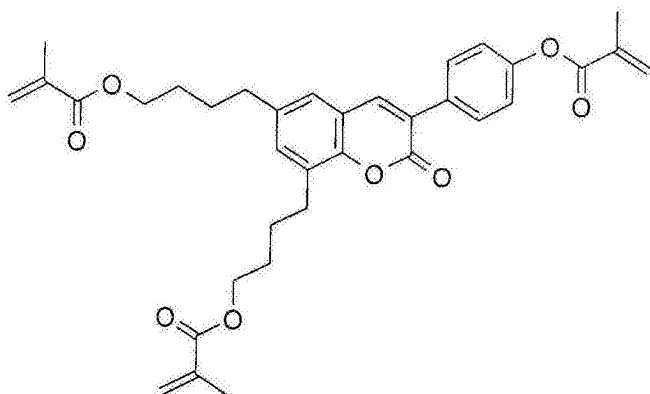
RM-58



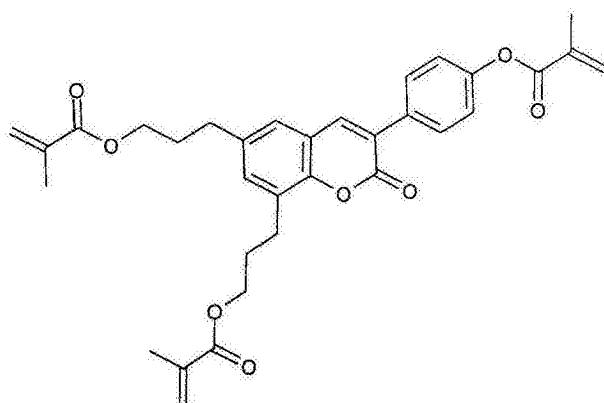
RM-59



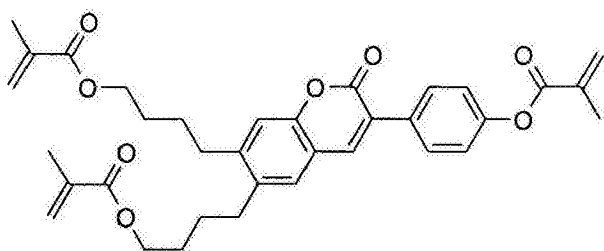
RM-60



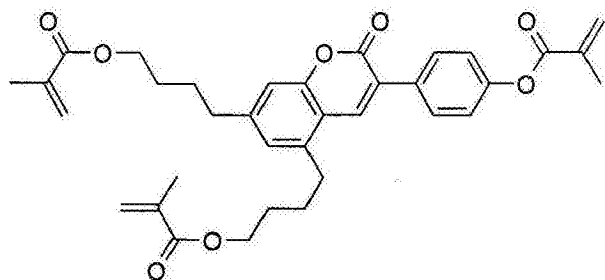
RM-61



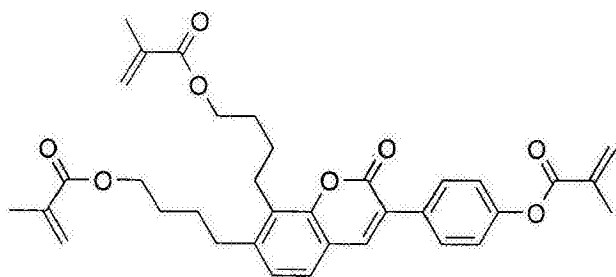
RM-62



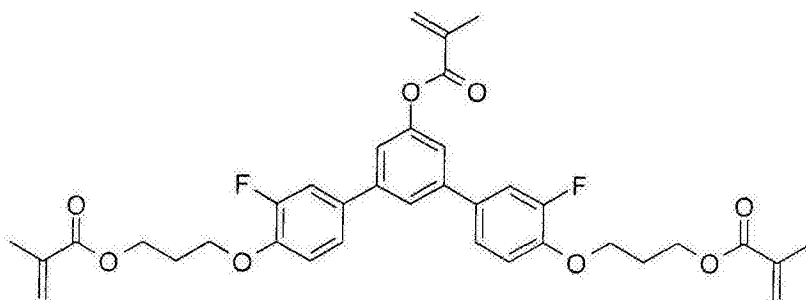
RM-63



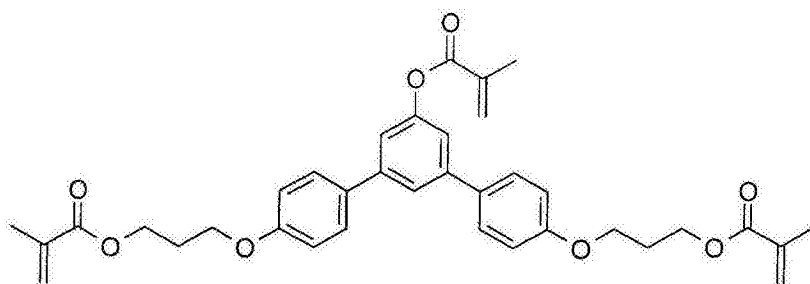
RM-64



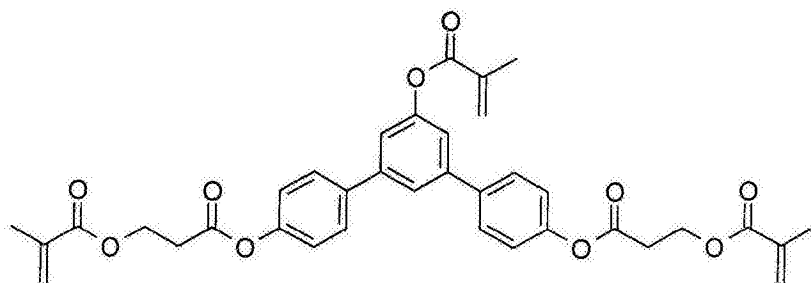
RM-65



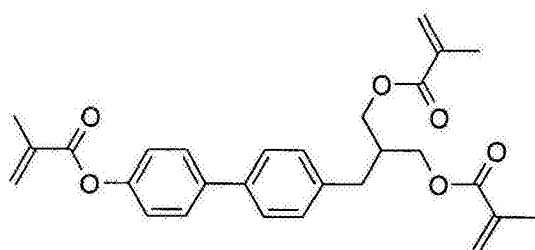
RM-66



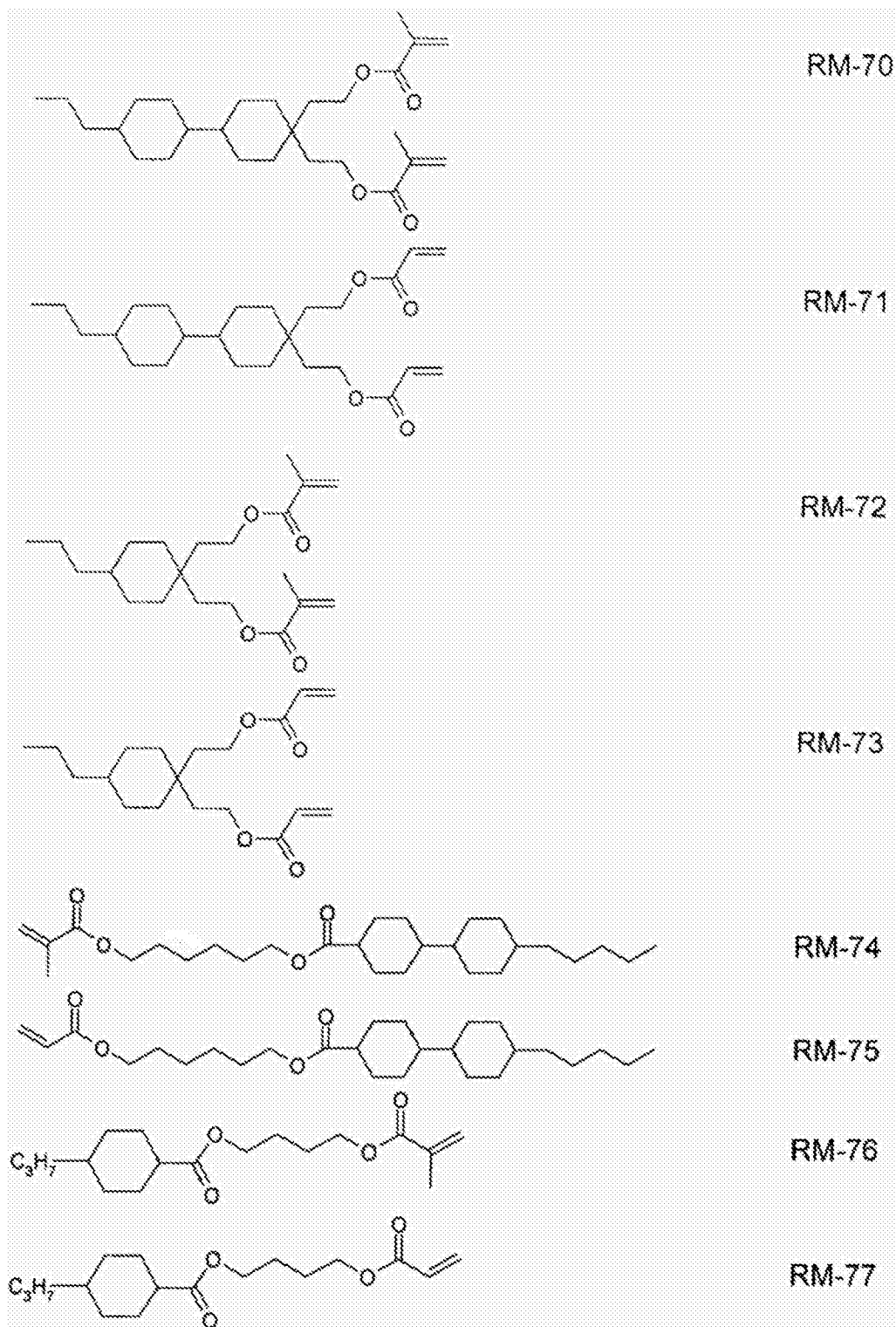
RM-67

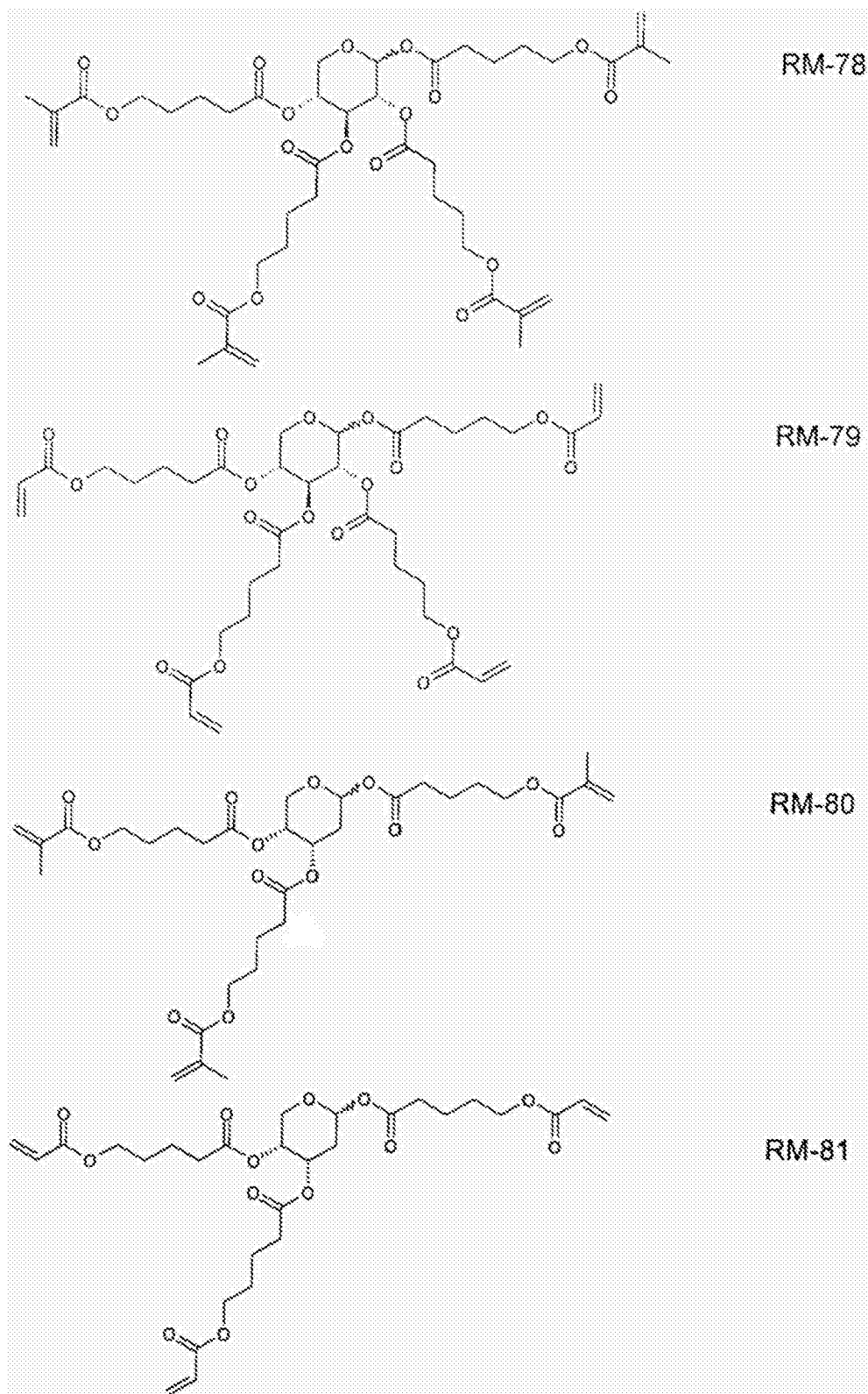


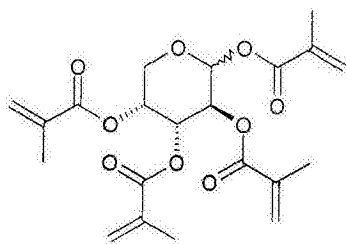
RM-68



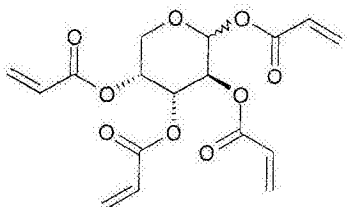
RM-69



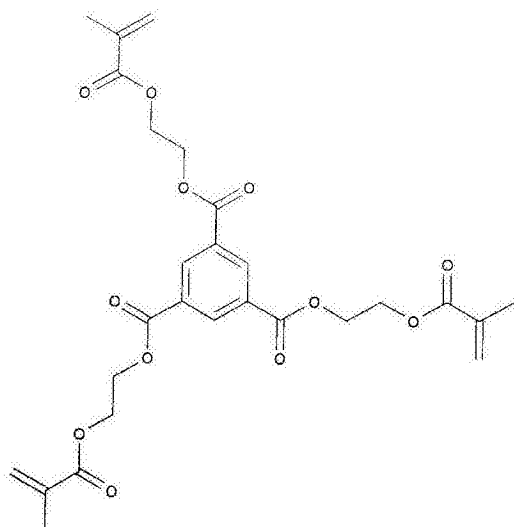




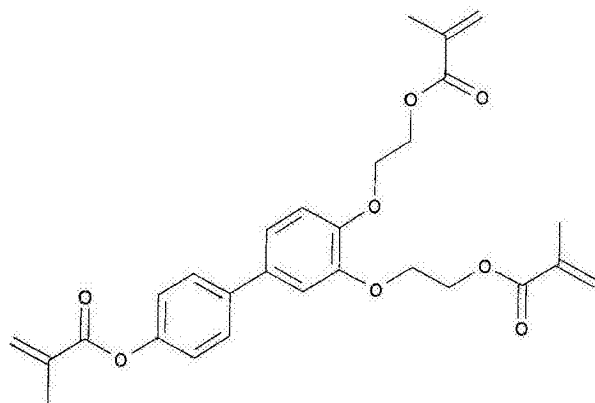
RM-82



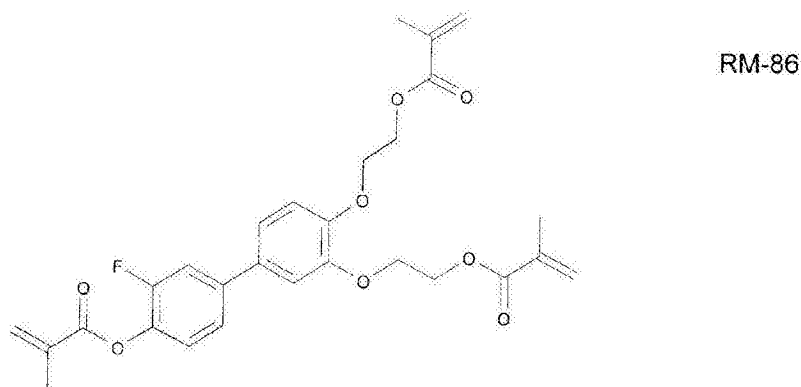
RM-83



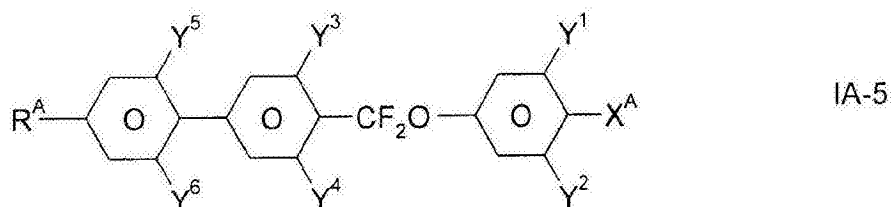
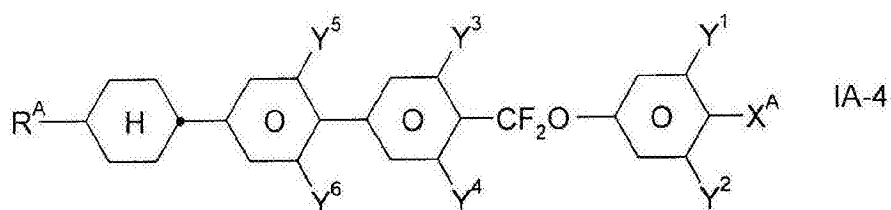
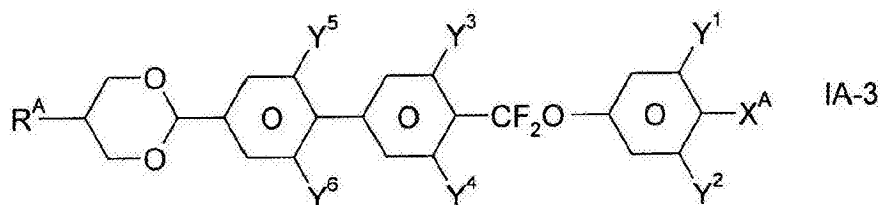
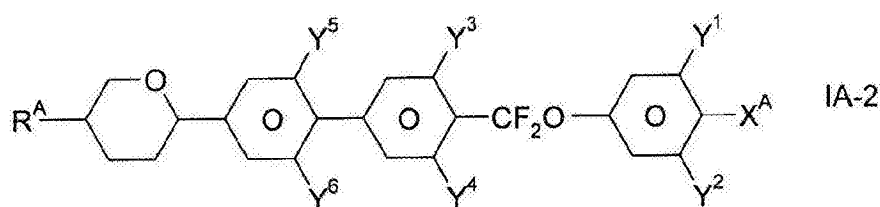
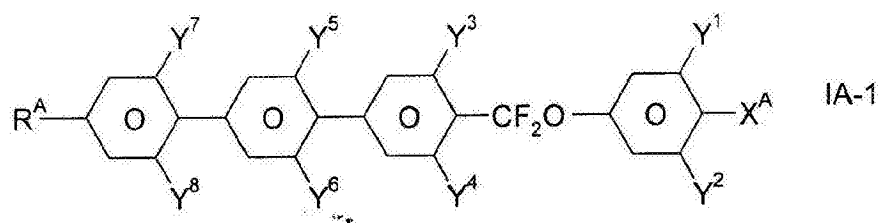
RM-84



RM-85

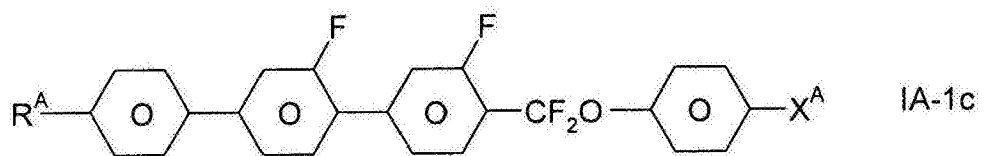
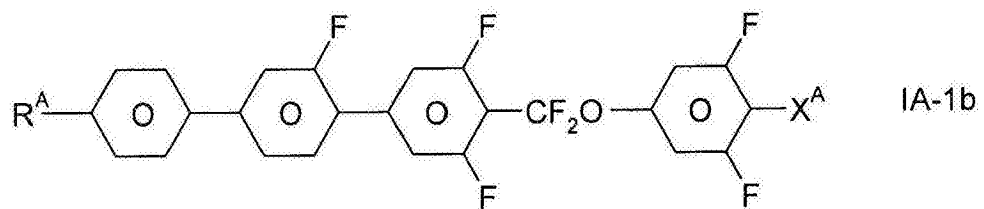
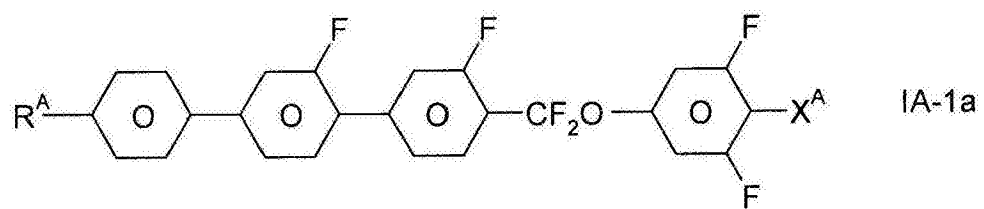


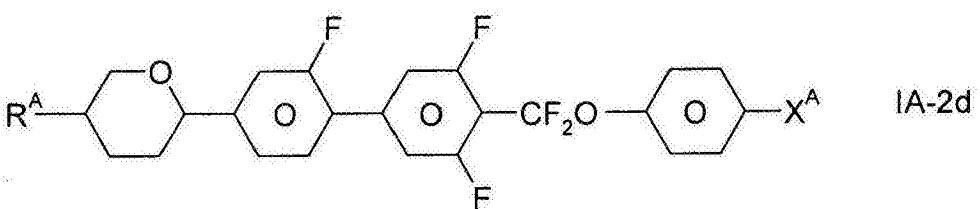
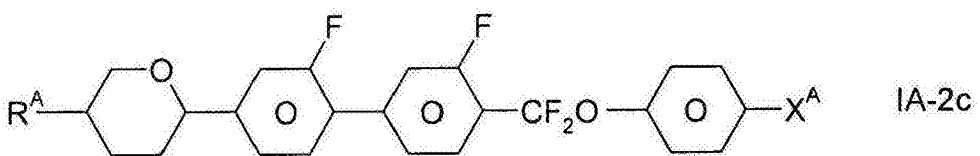
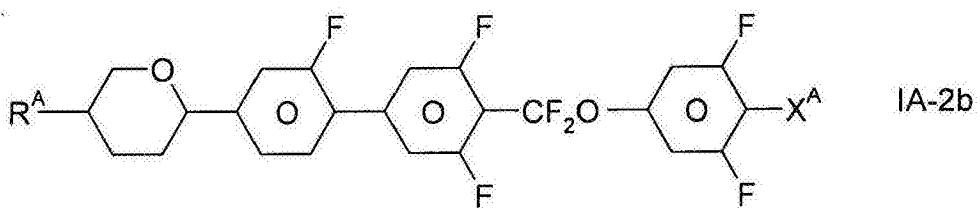
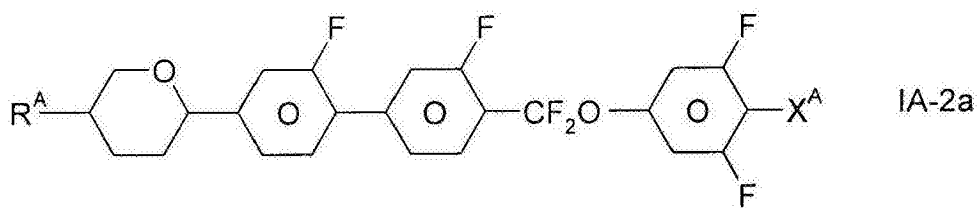
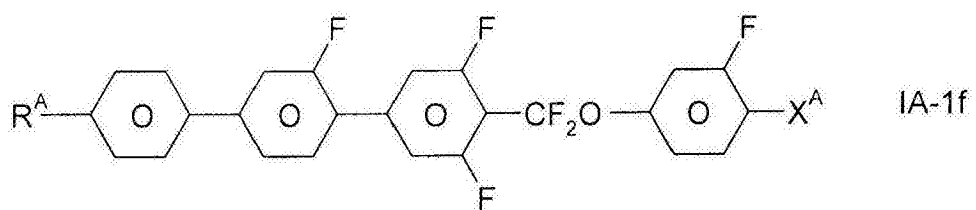
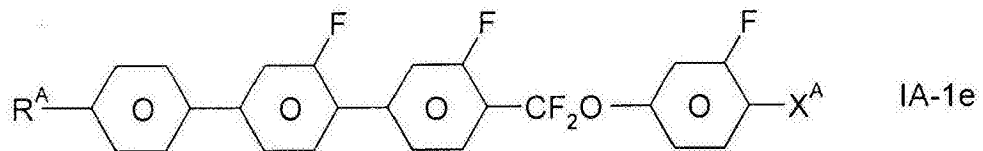
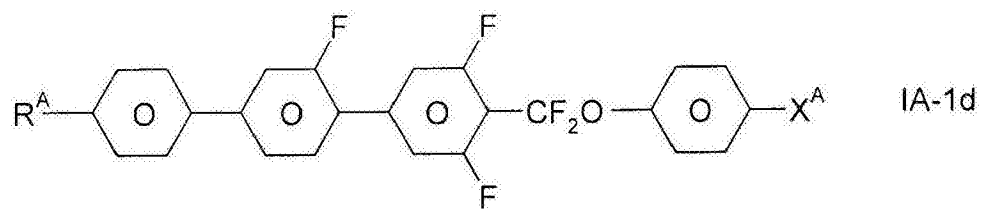
2. 根据权利要求1的液晶介质, 特征在于其包含选自式IA-1至IA-5化合物的一种或多种化合物,

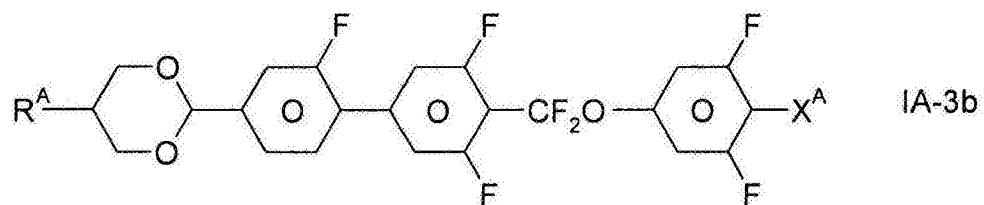
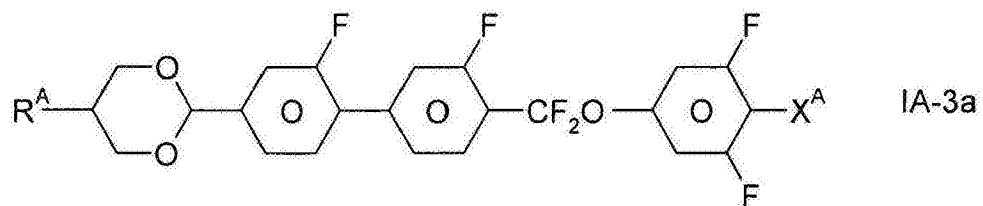
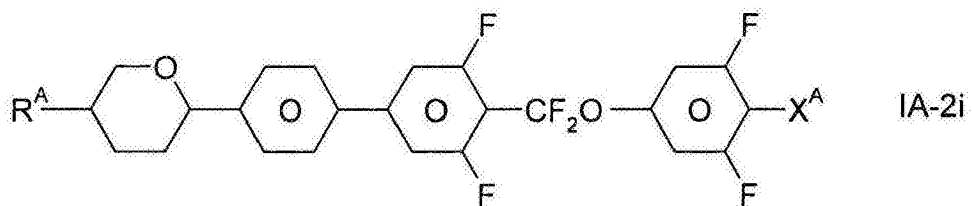
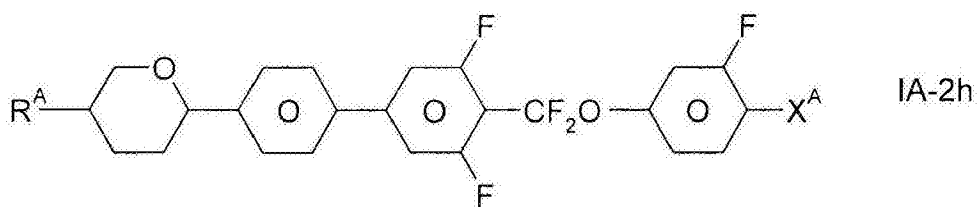
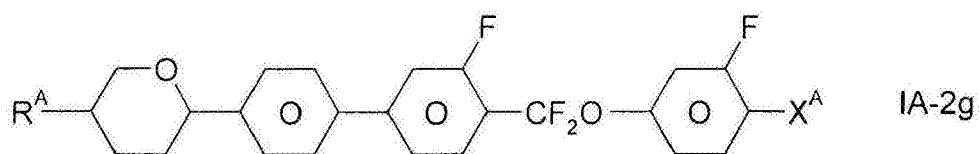
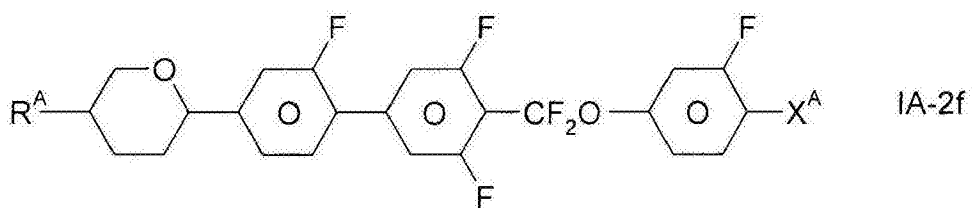
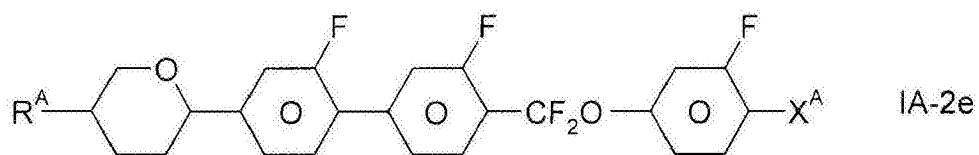


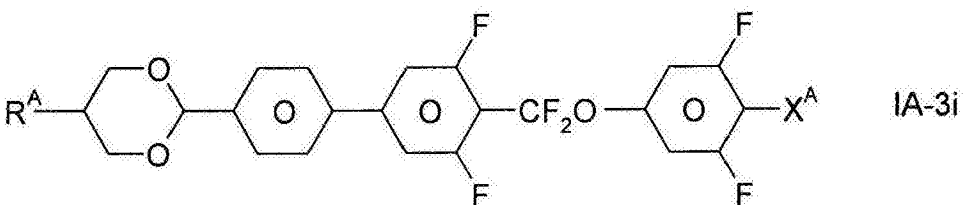
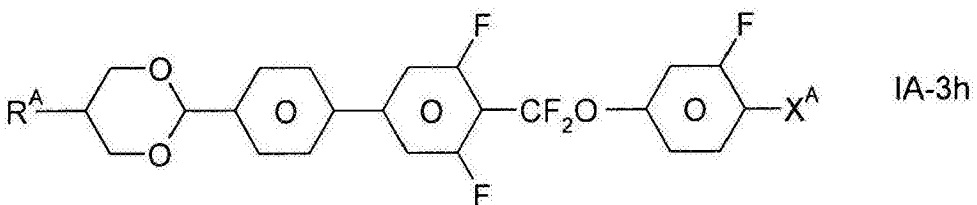
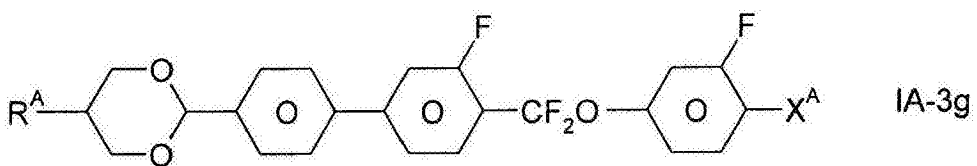
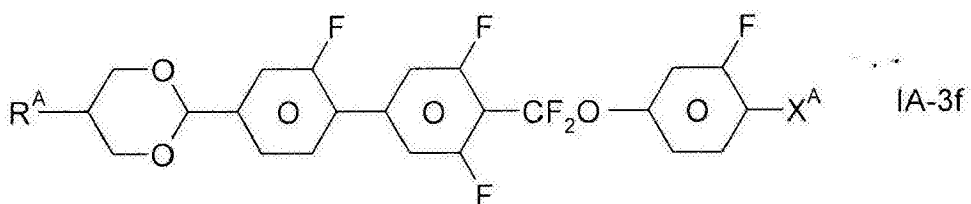
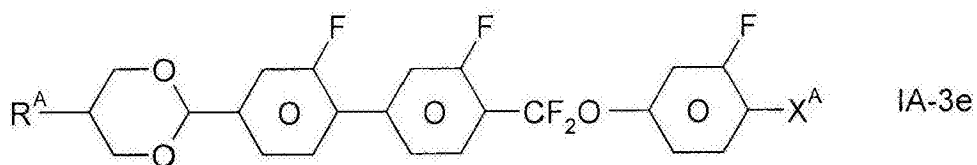
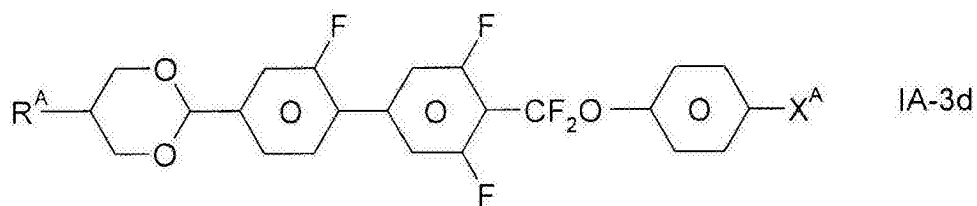
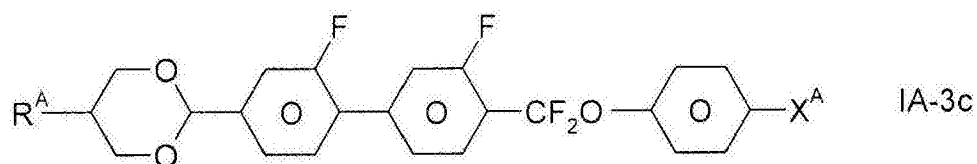
其中 R^A , X^A 和 Y^{1-6} 具有根据权利要求1的上述含义, 并且 Y^7 和 Y^8 各自独立地表示H或F。

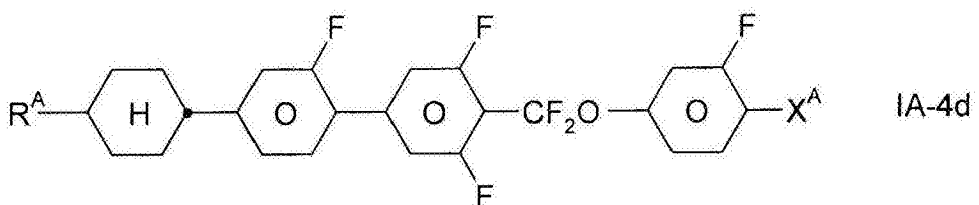
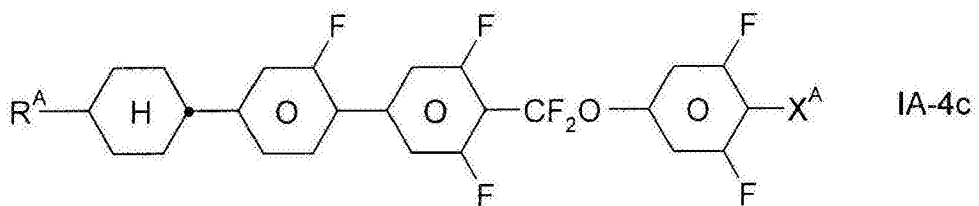
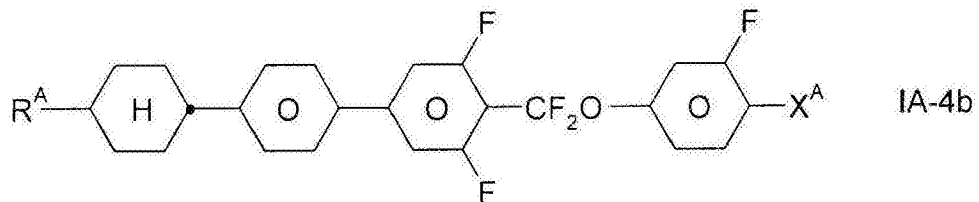
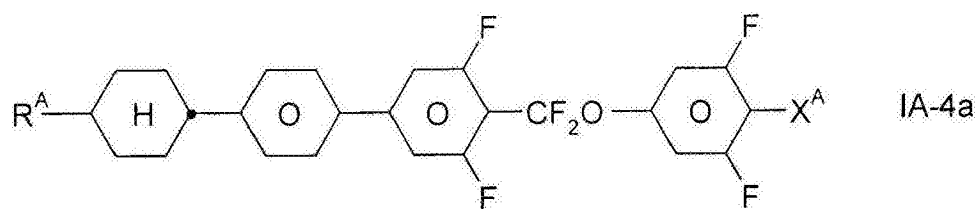
3. 根据权利要求1或2的液晶介质, 特征在于其包含选自式IA-1a至IA-4d化合物的一种或多种化合物,







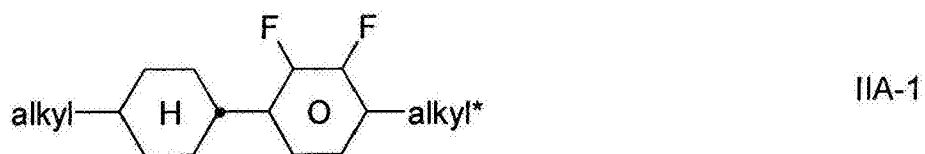


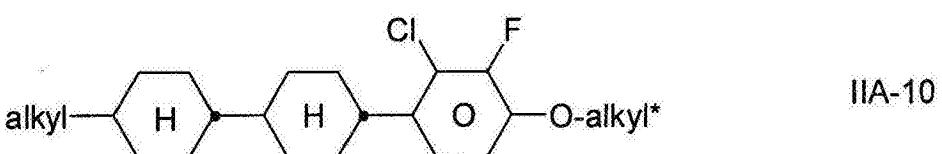
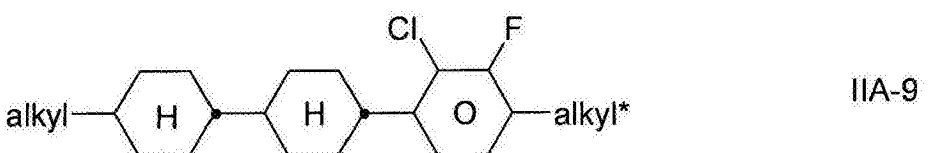
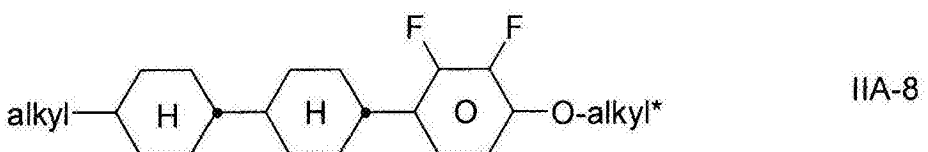
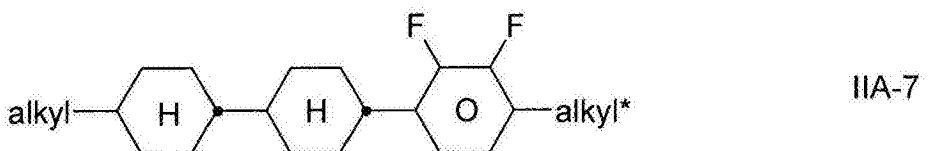
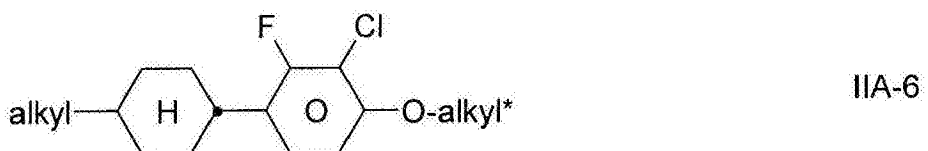
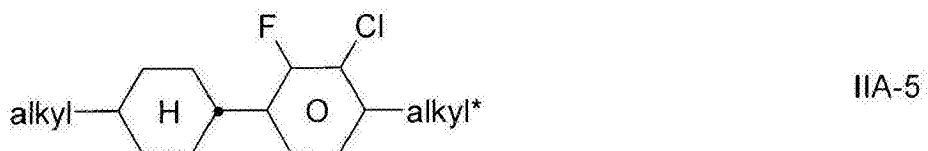
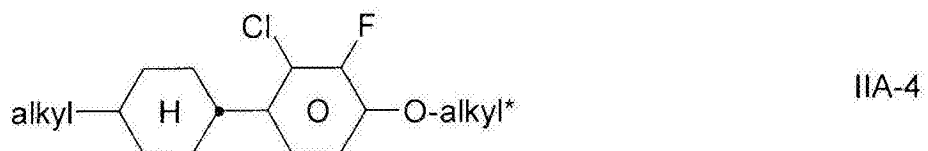
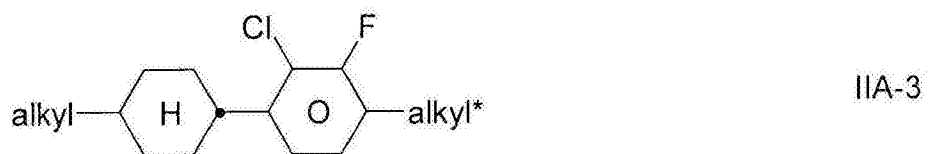
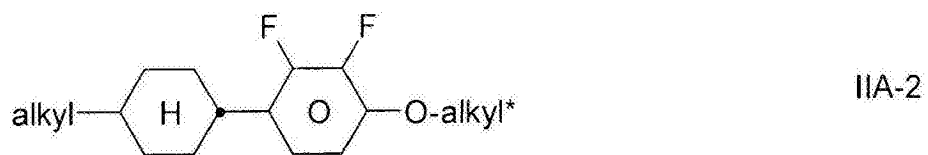


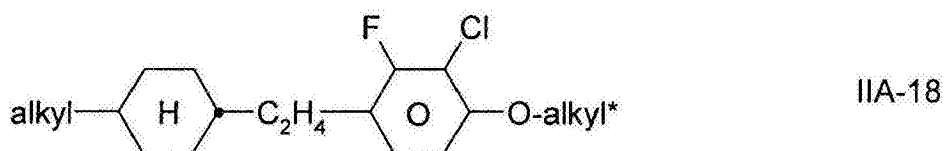
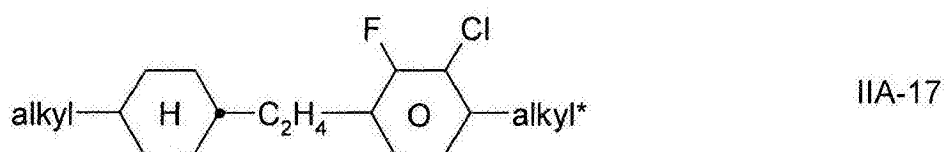
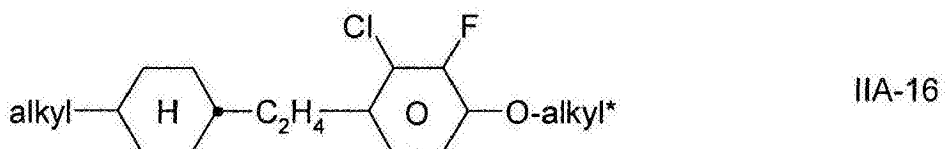
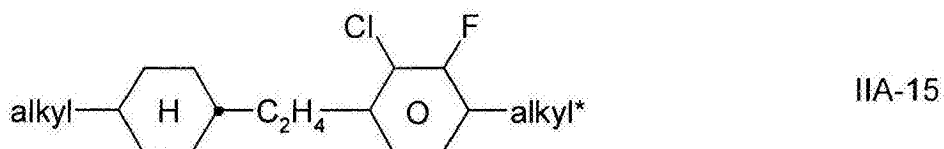
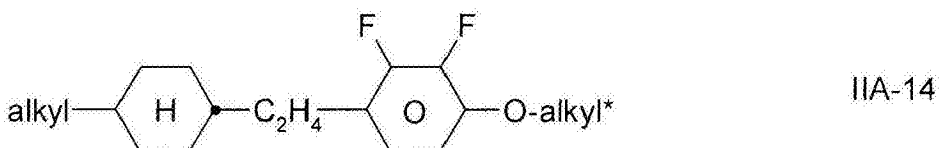
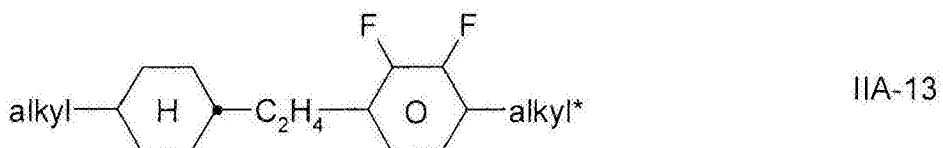
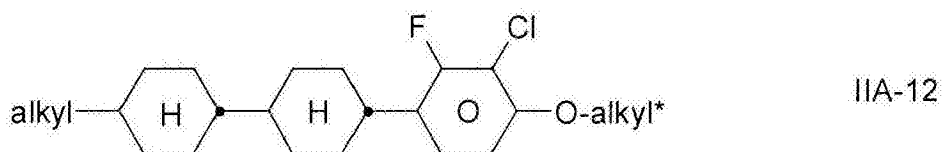
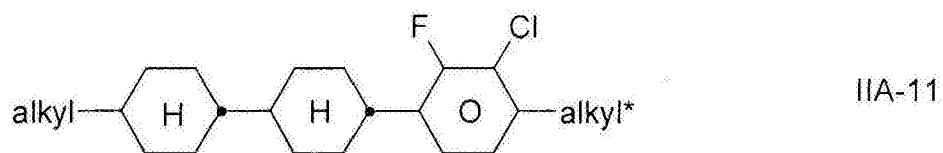
其中 R^A 和 X^A 具有权利要求1所示含义。

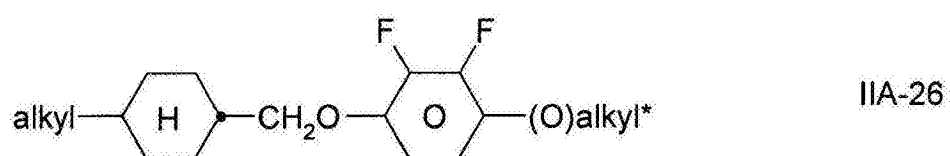
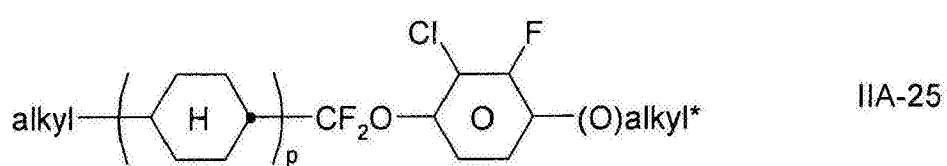
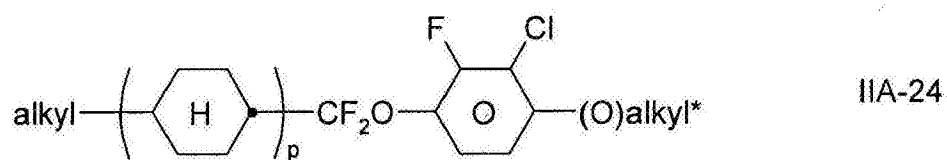
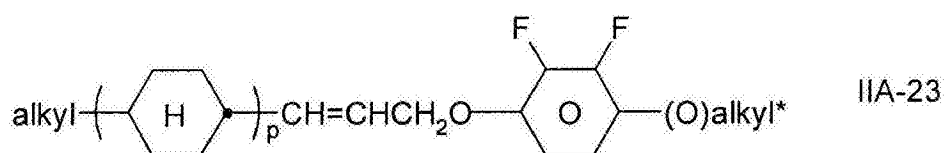
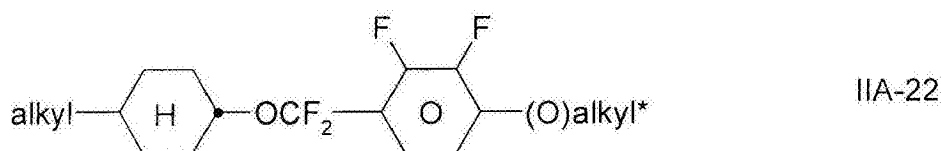
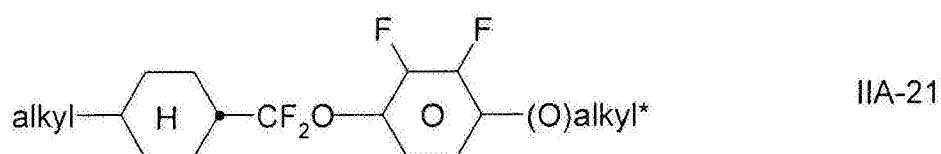
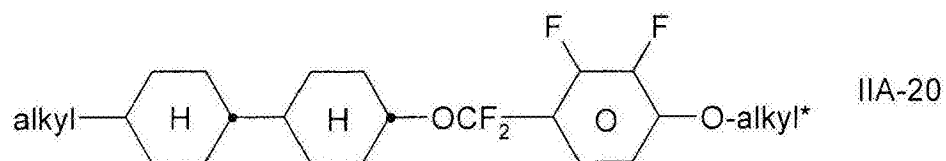
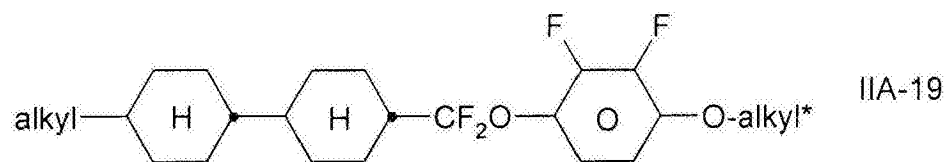
4. 根据权利要求1或2的液晶介质, 特征在于式IA中的 X^A 表示F, OCF_3 , $OCHF_2$, CF_3 , $OCHF_2$, $OCHF_2CF_3$, $OCF_2CH_2CF_3$, $CF=CF_2$, $CH=CF_2$, $OCF=CF_2$, 或 $OCH=CF_2$ 。

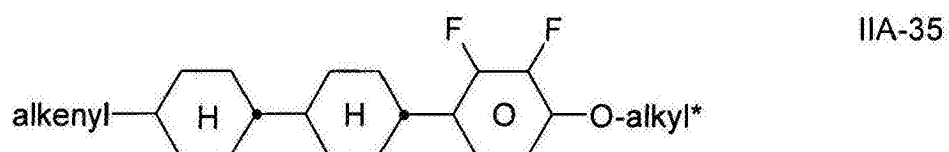
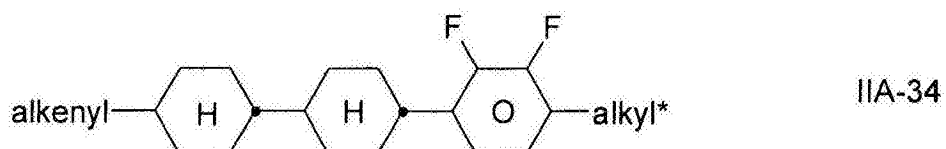
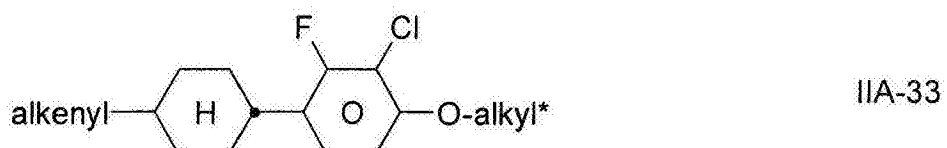
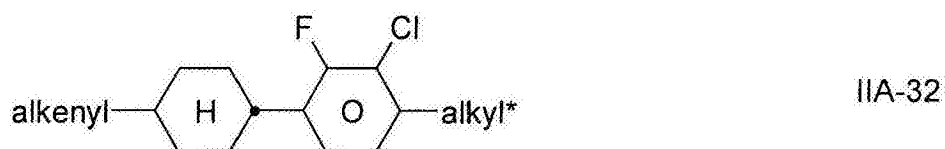
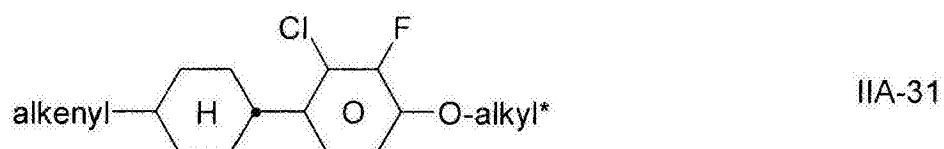
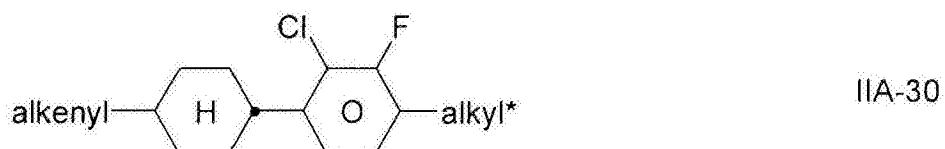
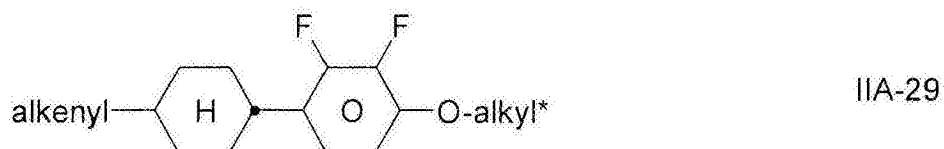
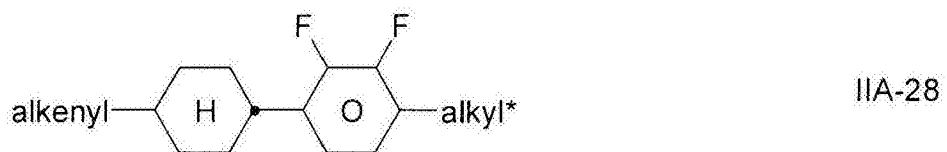
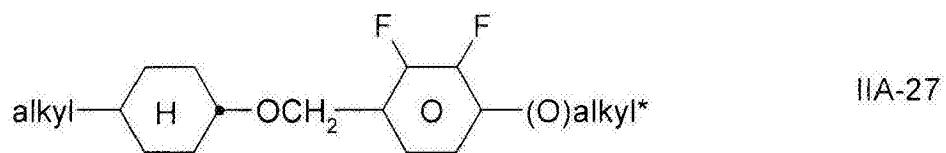
5. 根据权利要求1或2的液晶介质, 特征在于其包含式IIA-1至IIC-6的一种或多种化合物,

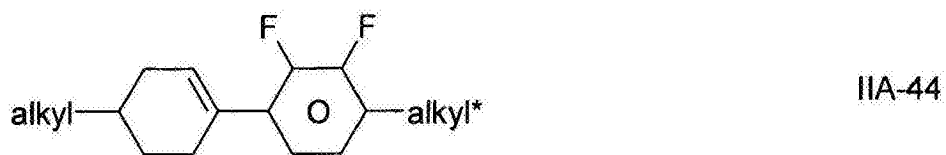
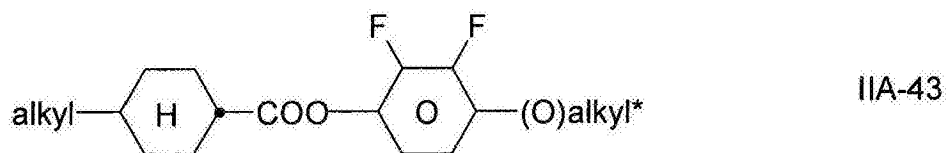
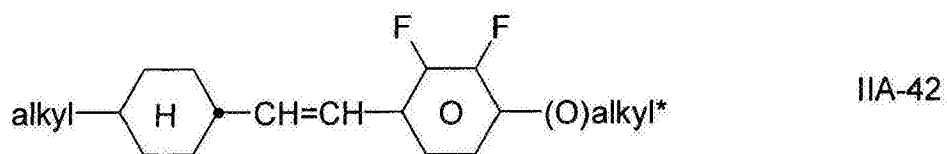
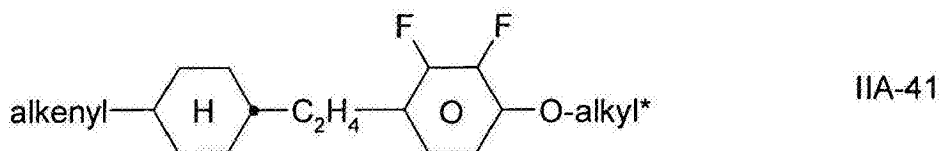
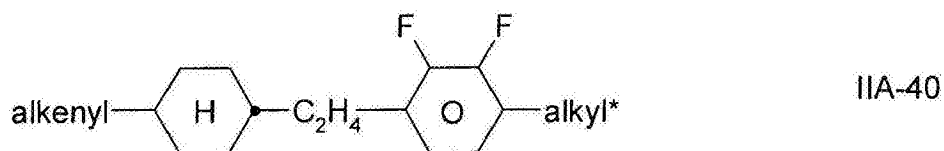
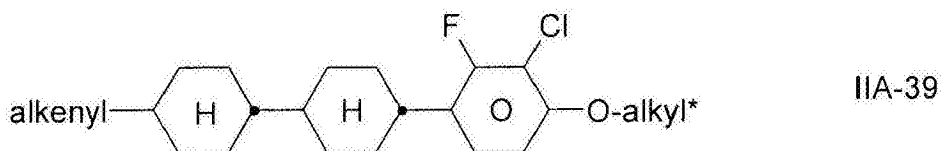
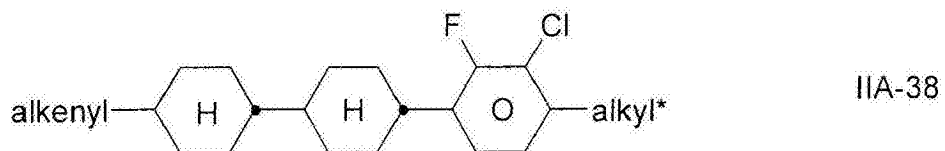
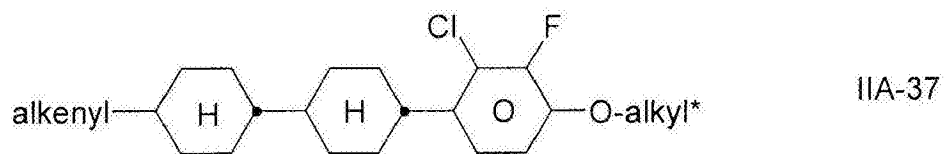
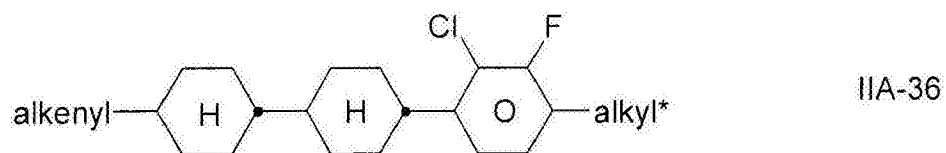


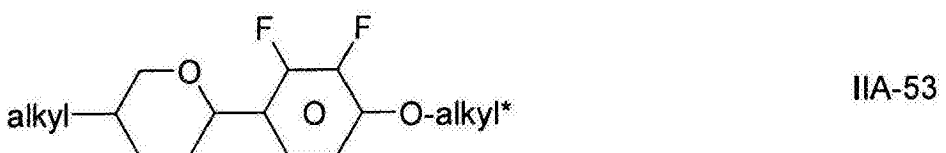
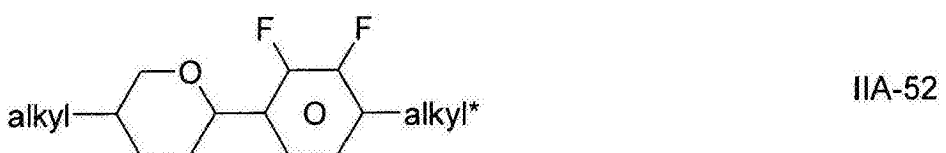
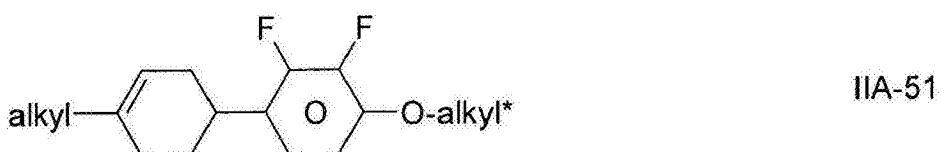
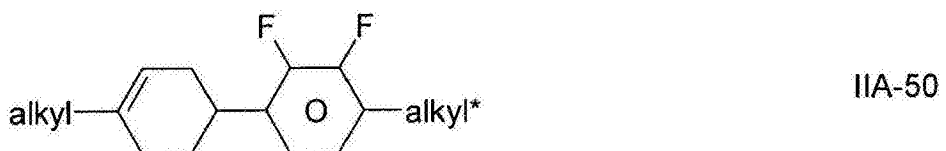
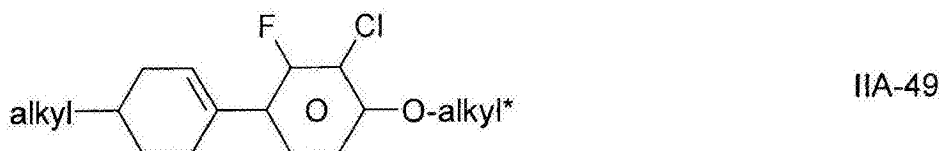
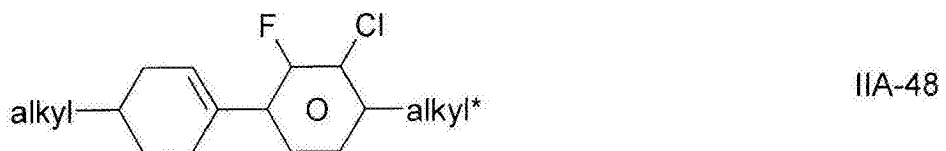
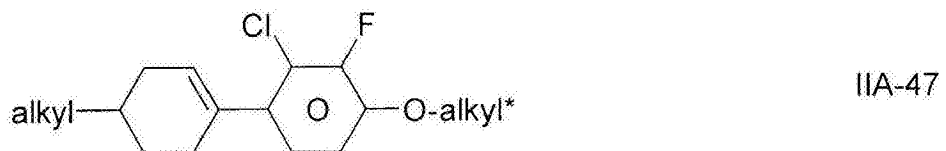
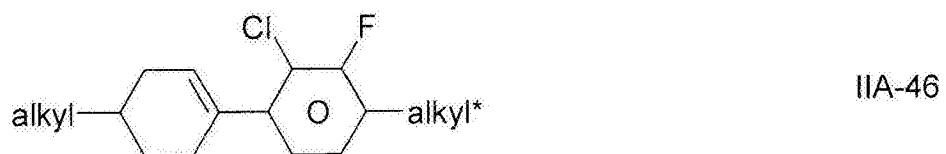
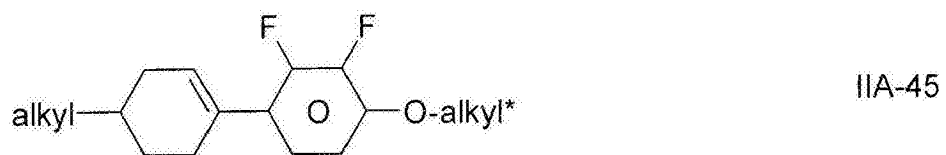


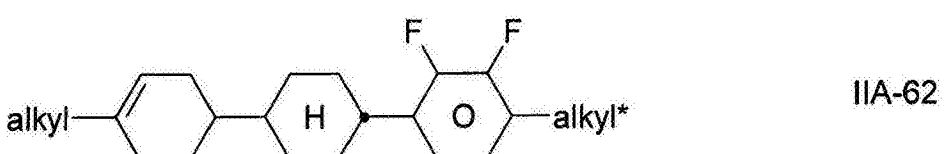
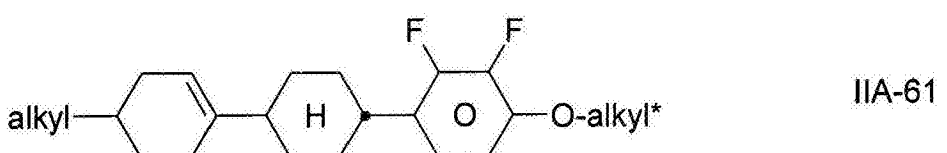
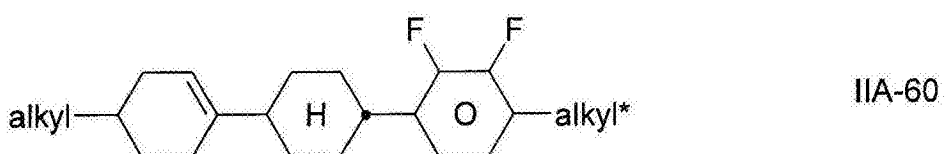
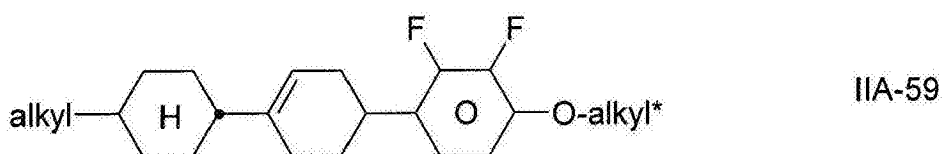
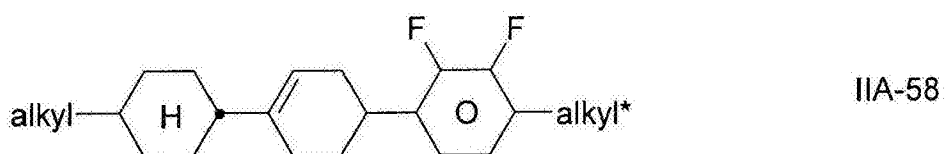
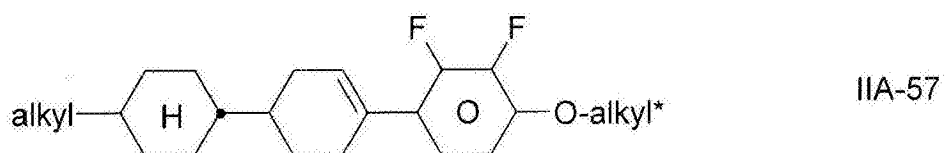
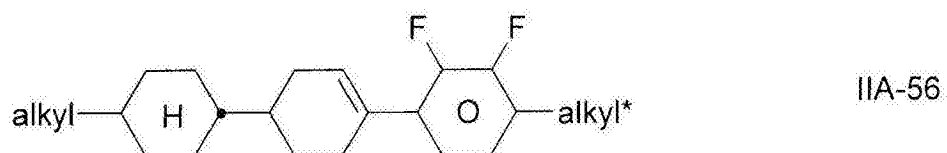
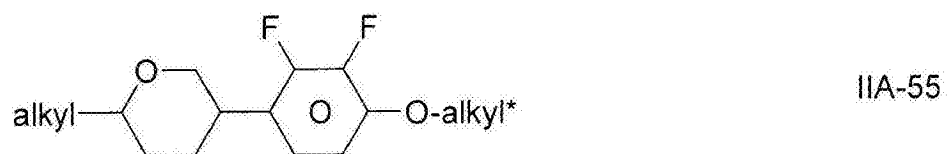


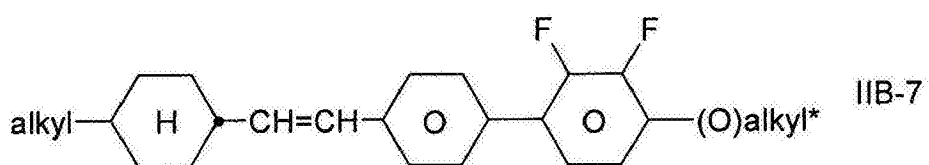
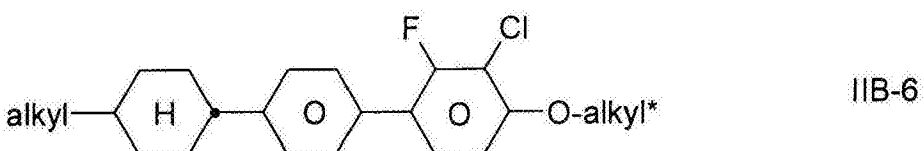
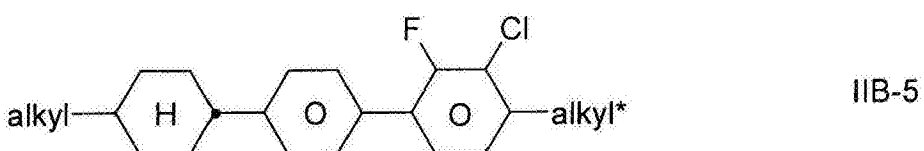
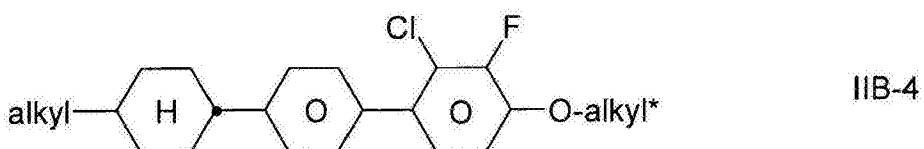
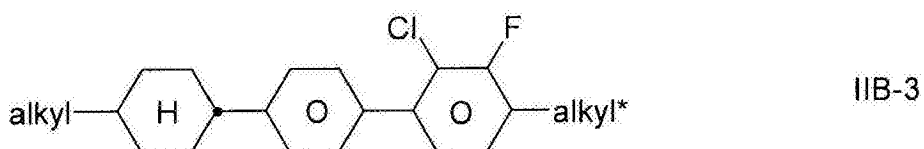
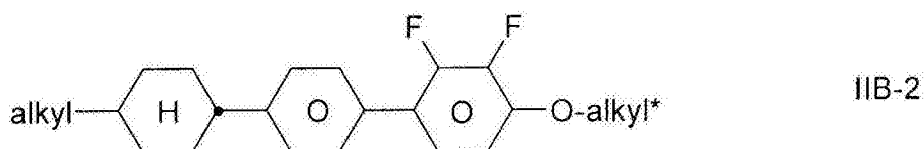
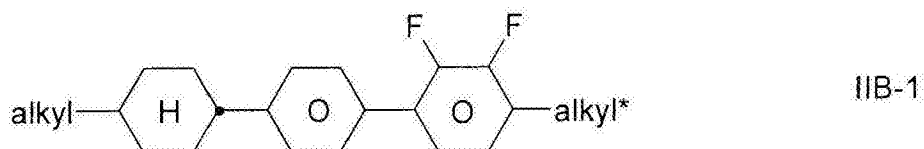
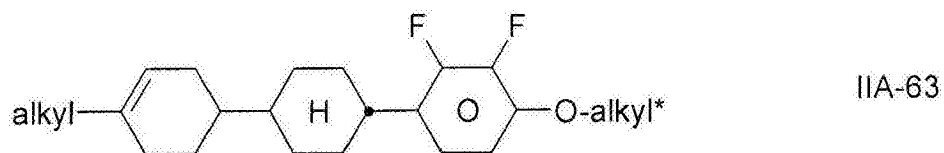


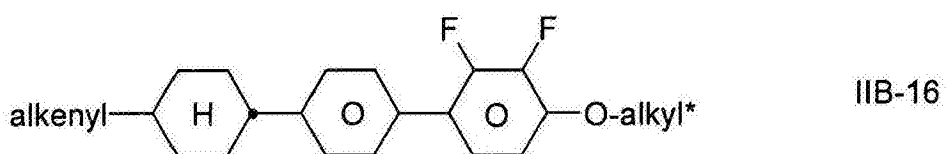
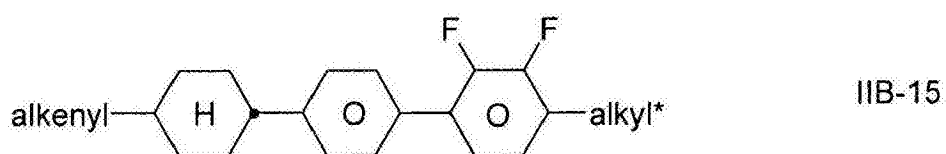
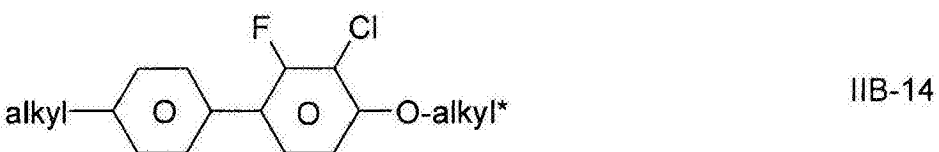
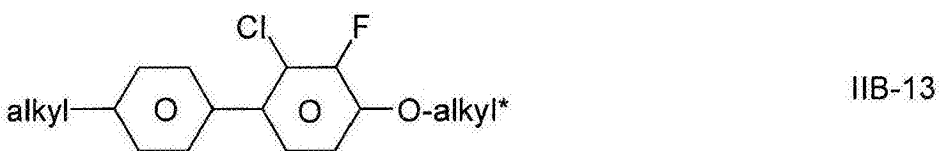
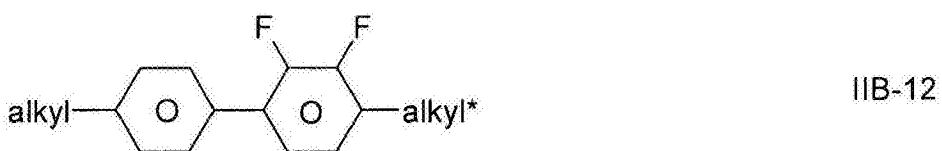
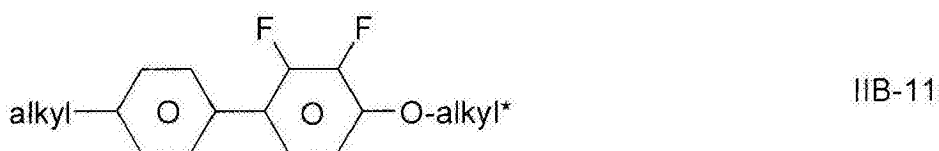
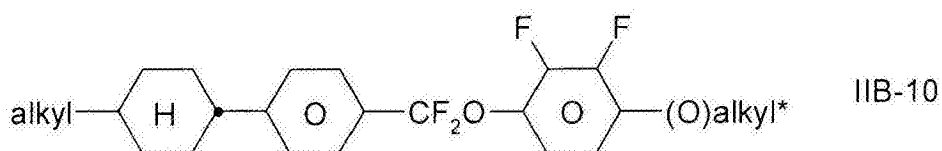
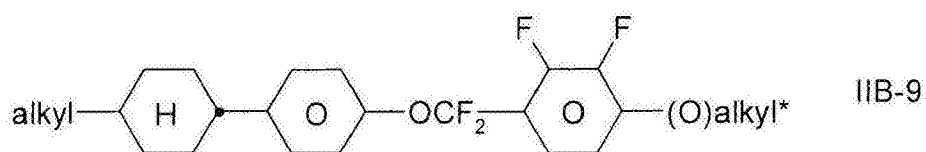
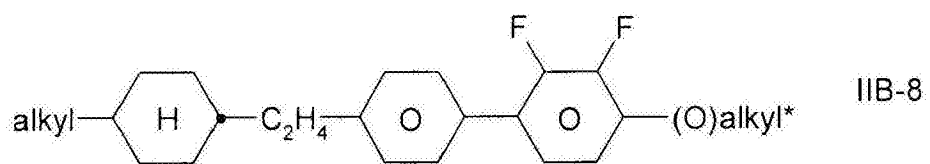


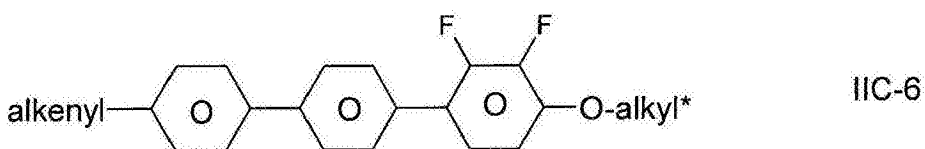
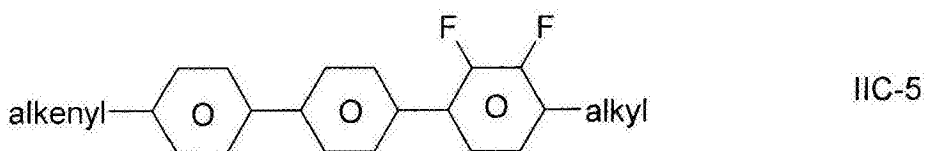
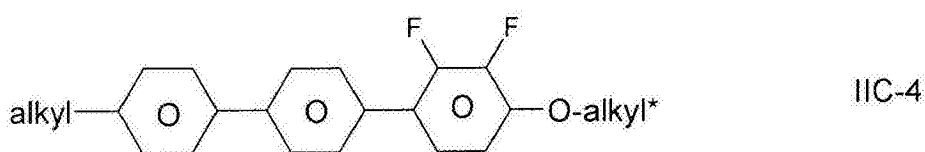
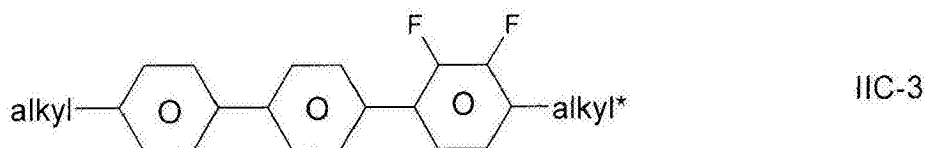
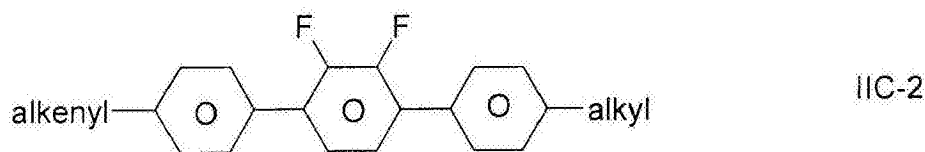
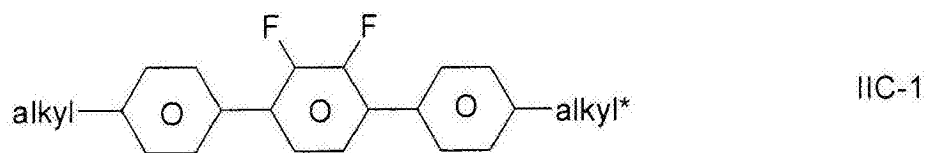






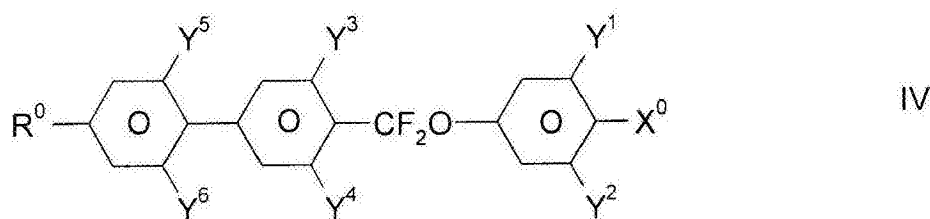
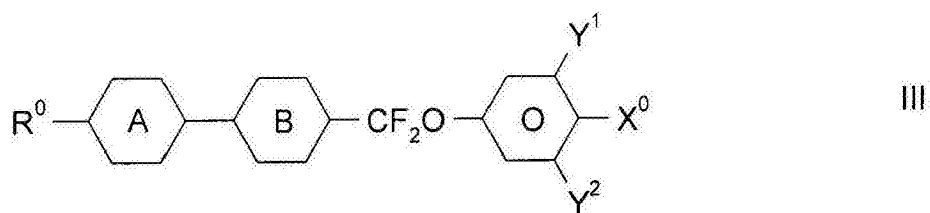






其中alkyl和alkyl*各自彼此独立地表示具有1-6个C原子的直链烷基,以及alkenyl表示具有2-6个C原子的直链烯基。

6. 根据权利要求1或2的液晶介质,特征在于其额外包含选自式III和/或IV的一种或多种化合物,

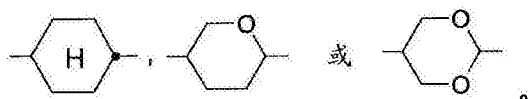


其中

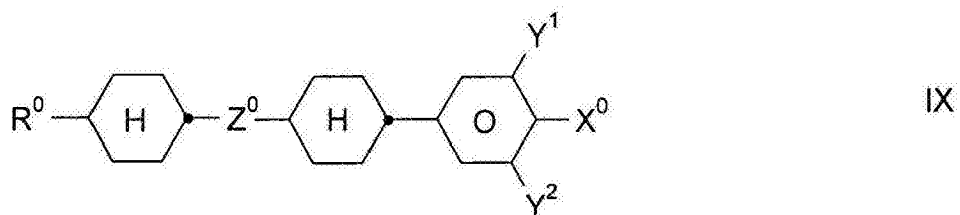
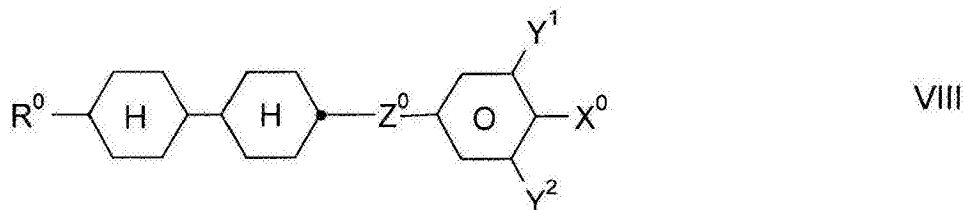
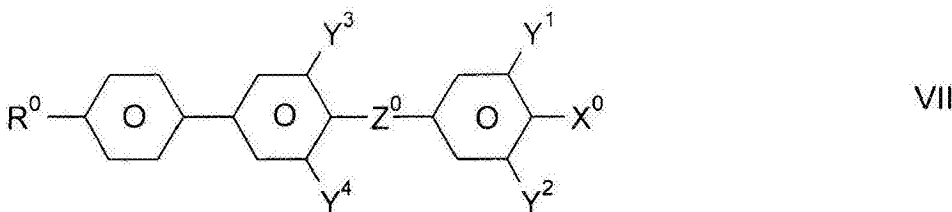
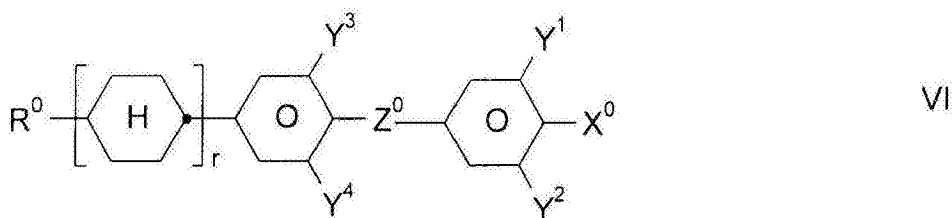
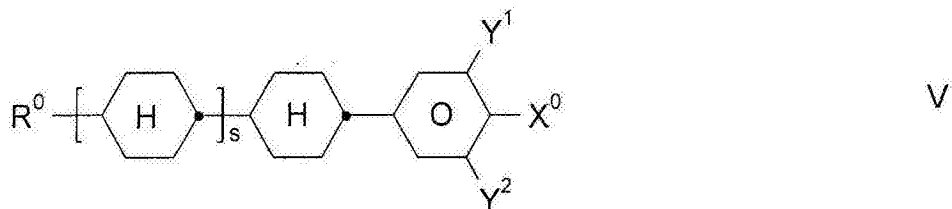
R^0 表示具有1-15个C原子的卤代或未取代的烷基或烷氧基,其中另外地这些基团中一个或多个 CH_2 基团可以各自彼此独立地被 $-C\equiv C-$, $-CF_2O-$, $-CH=CH-$, $-\diamond-$, $-\diamond\diamond-$, $-O-$, $-CO-O-$ 或 $-O-CO-$ 以O原子不彼此直接链接的方式代替,

X^0 表示F, Cl, CN, SF_5 , SCN, NCS, 各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基,

Y^{1-6} 各自彼此独立地表示H或F,



7. 根据权利要求1或2的液晶介质,特征在于其还包含一种或多种选自式V至IX的化合物,



其中

R^0 表示具有1-15个C原子的卤代或未取代的烷基或烷氧基,其中另外地这些基团中一个或多个 CH_2 基团可以各自彼此独立地被 $-C\equiv C-$ 、 $-CF_2O-$ 、 $-O-$ 、、、 $-CH=CH-$ 、 $-CO-O-$ 或 $-O-CO-$ 以O原子不彼此直接链接的方式代替,

X^0 表示F, Cl, CN, SF_5 , SCN, NCS, 各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基,

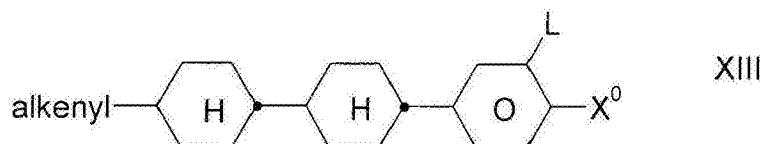
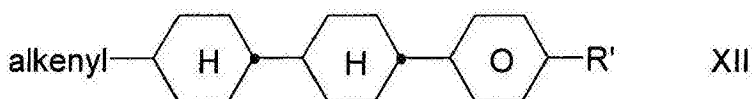
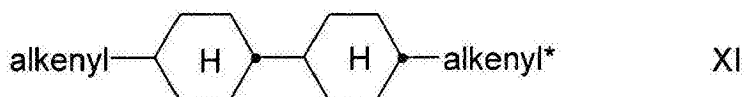
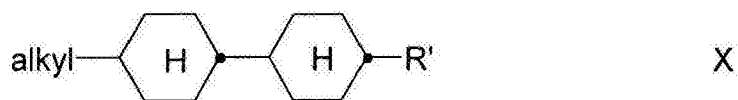
Y^{1-4} 各自彼此独立地表示H或F,

Z^0 表示 $-C_2H_4-$ 、 $-(CH_2)_4-$ 、 $-CH=CH-$ 、 $-CF=CF-$ 、 $-C_2F_4-$ 、 $-CH_2CF_2-$ 、 $-CF_2CH_2-$ 、 $-CH_2O-$ 、 $-OCH_2-$ 、 $-COO-$ 或 $-OCF_2-$,在式VI和VII中也表示单键,并且在VI和IX中也表示 $-CF_2O-$,

r表示0或1,以及

s表示0或1。

8. 根据权利要求1或2的液晶介质,特征在于其额外地包含选自式X至XIII的一种或多种化合物,



其中 X^0 具有权利要求7所示含义,以及

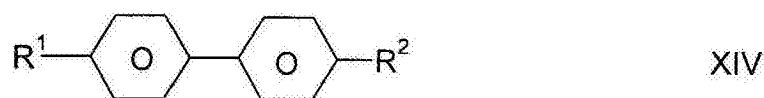
L表示H或F,

“alkyl”表示 C_{1-6} 烷基,

R' 表示 C_{1-6} 烷基、 C_{1-6} 烷氧基或 C_{2-6} 烯基,以及

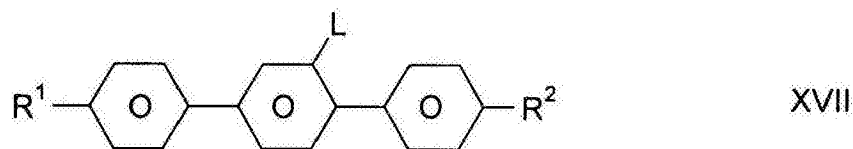
“alkenyl”和“alkenyl*”各自彼此独立地表示 C_{2-6} 烯基。

9. 根据权利要求1或2的液晶介质,特征在于其额外地包含一种或多种式XIV的化合物,



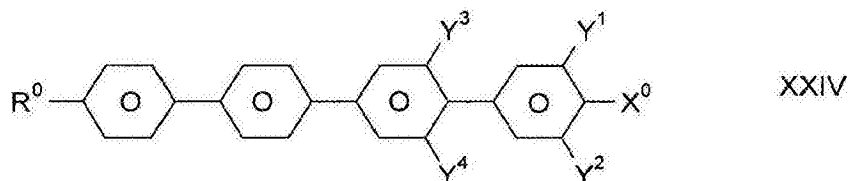
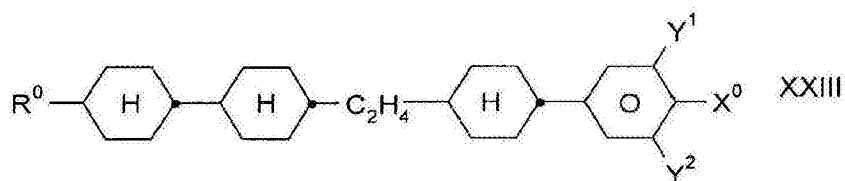
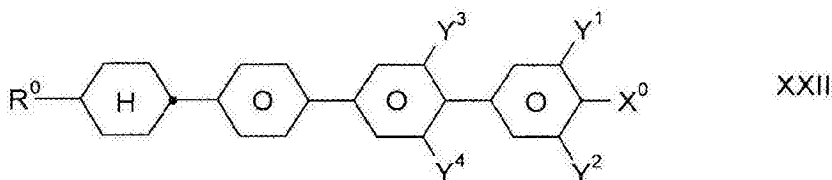
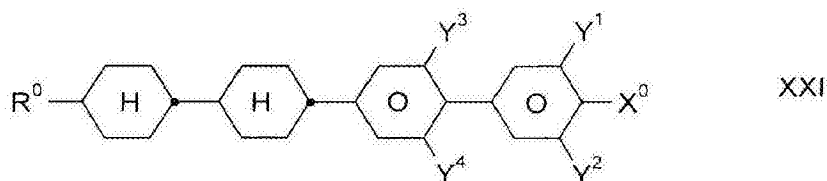
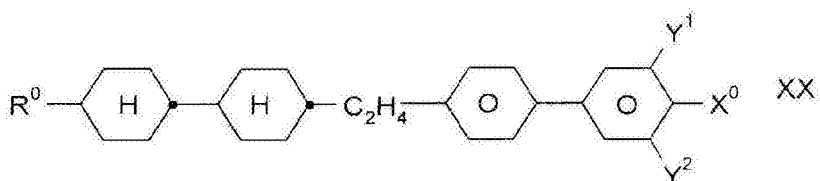
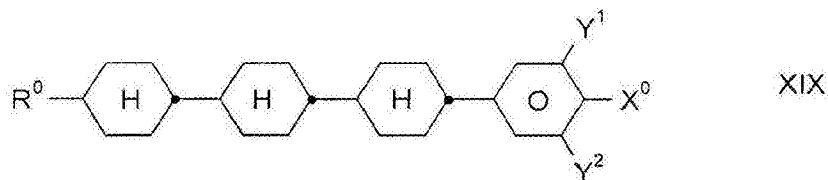
其中 R^1 和 R^2 各自彼此独立地表示各自具有至多6个C原子的正烷基,烷氧基,氧杂烷基,氟烷基或烯基。

10. 根据权利要求1或2的液晶介质,特征在于其额外地包含一种或多种式XVII的化合物,



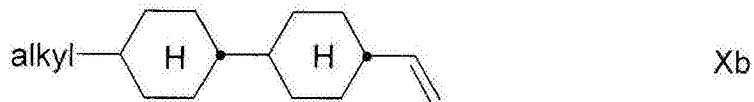
其中R¹和R²各自彼此独立地表示各自具有至多6个C原子的正烷基, 烷氧基, 氧杂烷基, 氟烷基或烯基, 以及L表示H或F。

11. 根据权利要求1或2的液晶介质, 特征在于其包含一种或多种选自式XIX, XX, XXI, XXII, XXIII和XXIV化合物的化合物,



其中R⁰和X⁰具有权利要求7中所示含义, 以及Y¹-⁴各自彼此独立地表示H或F。

12. 根据权利要求1或2的液晶介质, 特征在于其包含≥20重量%的式Xb化合物,



其中alkyl具有权利要求5中所示含义。

13. 根据权利要求1或2的液晶介质,特征在于其包含至少两种式IA化合物以及至少两种式IIA化合物。

14. 根据权利要求1或2的液晶介质,特征在于基于混合物,其包含总计 ≥ 20 重量%的式IA化合物和式IIB化合物。

15. 根据权利要求1或2的液晶介质,特征在于基于混合物,其包含总计 ≥ 20 重量%的式IA化合物和式IIC化合物。

16. 根据权利要求1或2的液晶介质,特征在于其具有在20°C和1kHz条件下 >1.5 的介电各向异性($\Delta\epsilon$)。

17. 根据权利要求1或2的液晶介质,特征在于其额外地包含一种或多种选自UV稳定剂、掺杂剂和抗氧化剂的添加剂。

18. 制备根据权利要求1-17任一项的液晶介质的方法,特征在于,将根据权利要求1定义的一种或多种式IA化合物、一种或多种选自式IIA、IIB和IIC化合物的化合物、一种或多种选自式XVIb至XVI f、XXVIII、XXIX、XXX和XXXI化合物的化合物、一种或多种选自Xa、Xb、Xc、Xd、Xe、XIa、XIb、XIIa和XIIIa、一种或多种稳定剂、和一种或多种可聚合化合物,任选地与一种或多种添加剂混合。

19. 根据权利要求1-17任一项的液晶介质用于电光目的用途。

20. 根据权利要求19的液晶介质的用途,用于快门镜中,用于3D应用,用于TN、PS-TN、STN、TN-TFT、OCB、IPS、PS-IPS、FFS、PS-FFS和PS-VA-IPS显示器中。

21. 包含根据权利要求1-17任一项的液晶介质的电光液晶显示器。

液晶介质

[0001] 本发明涉及一种液晶介质 (LC 介质), 其用于电光目的的用途, 以及包含该介质的液晶显示器。

[0002] 液晶主要在显示设备中用作电介质, 因为这类物质的光学性质能通过施加的电压而改变。基于液晶的电光学器件对本领域技术人员来说是极为熟知的且可以基于各种效应。这类器件的实例是具有动态散射的盒 (cells), DAP (排列相畸变 (deformation of aligned phases)) 盒、宾/主盒 (guest/host)、具有扭曲向列结构的 TN 盒、STN (超扭曲向列) 盒、SBE (超双折射效应) 盒和 OMI (光学模式干涉) 盒。最为常见的显示器件基于 Schadt-Helfrich 效应并且具有扭曲向列结构。

[0003] 液晶材料必须具有良好的化学和热稳定性和对电场和电磁辐射的良好稳定性。此外, 液晶材料应当具有低粘度并在盒中产生短的寻址时间、低的阈值电压和高的对比度。

[0004] 此外, 它们应当在通常的操作温度, 即高于和低于室温的最宽的可能范围内具有合适的中间相 (mesophase), 例如用于上述盒的向列型中间相或胆甾型中间相。因为通常将液晶作为多种组分的混合物使用, 因此重要的是组分彼此易于混溶。更进一步的性质如导电性、介电各向异性和光学各向异性必须根据盒类型和应用领域而满足各种要求。例如, 用于具有扭曲向列结构的盒的材料应当具有正的介电各向异性和低导电率。

[0005] 例如, 对于具有集成的非线性元件以切换独立像素的矩阵液晶显示器 (MLC 显示器), 期望具有大的正介电各向异性、宽的向列相、相对低的双折射、很高的电阻率、良好的 UV 和温度稳定性和低蒸气压的介质。

[0006] 这类矩阵液晶显示器是已知的。能用于独立地切换独立像素的非线性元件的实例是有源元件 (即晶体管)。于是使用术语“有源矩阵 (active matrix)”, 其中可区分为以下两种类型:

[0007] 1. 在作为基板的硅晶片上的 MOS (金属氧化物半导体) 或其它二极管。

[0008] 2. 在作为基板的玻璃板上的薄膜晶体管 (TFT)。

[0009] 将单晶硅作为基板材料使用限制了显示器尺寸, 因为即使是多部分显示器的模块组装件也会在接头处导致问题。

[0010] 就优选的更有前景的类型 2 的情况来说, 所用的电光效应通常是 TN 效应。区分为两种技术: 包含化合物半导体例如 CdSe 的 TFT, 或基于多晶硅或非晶硅的 TFT。对于后一种技术, 全世界范围内正在进行深入的工作。

[0011] 将 TFT 矩阵施用于显示器的一个玻璃板的内部, 而另一玻璃板在其内部带有透明反电极。与像素电极的尺寸相比, TFT 非常小且对图像几乎没有不利作用。该技术还可以推广到全色功能的 (fully colour-capable) 显示器, 其中将红、绿和蓝滤光片的镶嵌物 (mosaic) 以使得滤光片元件与每个可切换的像素相对的方式布置。

[0012] TFT 显示器通常作为在传输中具有交叉的起偏器 (polarisers) 的 TN 盒来运行且是背景照明的。

[0013] 术语“MLC 显示器”在此包括具有集成非线性元件的任何矩阵显示器, 即除了有源矩阵外, 还有具有无源 (passive) 元件的显示器, 如可变电阻或二极管 (MIM = 金属-绝缘体-

金属)。

[0014] 这类MLC显示器特别适用于TV应用(例如袖珍电视)或用于计算机应用(膝上型电脑)和汽车或飞行器构造中的高信息显示器。除了关于对比度和响应时间的角度依赖性问题之外,由于液晶混合物不够高的电阻率,MLC显示器中也还产生一些困难[TOGASHI,S.,SEKIGUCHI,K.,TANABE,H.,YAMAMOTO,E.,SORIMACHI,K.,TAJIMA,E.,WATANABE,H.,SHIMIZU,H.,Proc.Eurodisplay84,1984年9月:A210-288Matrix LCD Controlled by Double Stage Diode Rings,pp.141ff.,Paris;STROMER,M.,Proc.Eurodisplay84,1984年9月:Design of Thin Film Transistors for Matrix Addressing of Television Liquid Crystal Displays,pp.145ff.,Paris]。随着降低的电阻,MLC显示器的对比度劣化,并且可能出现残留影像消除的问题。因为由于与显示器内部表面的相互作用,液晶混合物的电阻率通常随MLC显示器的寿命下降,所以高的(初始)电阻非常重要以获得可接受的使用寿命。特别是就低电压的混合物来说,至今不可能实现很高的电阻率值。此外重要的是,电阻率显示出随温度升高和在加热后和/或UV曝露后最小可能的增加。来自现有技术的混合物的低温性能也是特别不利的。要求即使在低温下也不出现结晶和/或近晶相,以及粘度的温度依赖性要尽可能低。因此,来自现有技术的MLC显示器不满足当今的要求。

[0015] 除了使用背景照明的,即透射式和期望的话透反式(transflectively)工作的液晶显示器之外,反射式液晶显示器也是特别令人感兴趣的。这些反射式液晶显示器使用环境光用于信息显示。因此它们比具有相应尺寸和分辨率的背景照明的液晶显示器消耗明显更少的能量。因为TN效应特征在于非常良好的对比度,这类反射式显示器甚至可在明亮的环境条件中很好地识别。这已经以简单的反射式TN显示器,如用于例如手表和袖珍计算器中的那些已知。然而,该原理还可用于高质量、更高分辨率的有源矩阵寻址的显示器,例如TFT显示器。在此,如已经在一般常规的透射式TFT-TN显示器中的那样,低双折射率(Δn)的液晶的使用对于达到低光学延迟($d \cdot \Delta n$)而言是必需的。该低光学延迟产生通常可接受的对比度的低视角依赖性(参见DE30 22 818)。在反射式显示器中,低双折射率液晶的应用甚至比在透射式显示器中更重要,因为在反射式显示器中光所经过的有效层厚度为在具有相同层厚度的透射式显示器中的大约两倍大。

[0016] 为了通过快门镜获得3D效果,特别使用具有低旋转粘度和相应较高光学各向异性(Δn)的快速转换混合物。使用具有较高光学各向异性(Δn)的混合物,可以获得电光学透镜系统,借助该系统可以将显示器的二维呈现转换为三维自动立体的呈现。

[0017] 因此,继续存在着对具有非常高的电阻率同时也具有大的工作温度范围、短响应时间(甚至在低温下),和低阈值电压的MLC显示器的很大需求,这种显示器不显示出或仅仅较小程度地显示出这些缺点。

[0018] 在TN(Schadt-Helfrich)盒的情形中,期望有助于盒中的以下优势的介质:

[0019] -拓宽的向列相范围(特别是向下直到低温的)

[0020] -在极低温下切换的能力(户外应用、汽车、航空电子技术)

[0021] -提高的对紫外辐射的耐受性(更长的服务寿命)

[0022] -低阈值电压

[0023] -高透射率。

[0024] 可从现有技术中获得的介质不能在保留其它参数的同时实现这些优点。

[0025] 就超扭曲 (STN) 盒来说,期望促进更大的多路传输性 (multiplexability) 和/或更低的阈值电压和/或更宽的向列相范围 (特别是在低温下) 的介质。为此,迫切地需要进一步扩展可利用的参数范围 (清亮点、近晶-向列型转变点或熔点、粘度、介电参数、弹性参数)。

[0026] 特别是在用于TV和视频应用 (例如LCD TV、监视器、PDA、笔记本、游戏控制台) 的液晶显示器的情况下,要求响应时间显著缩短。这需要具有低旋转粘度和高介电各向异性的液晶混合物。同时液晶介质应该具有高的清亮点,优选 $\geq 70^{\circ}\text{C}$ 。

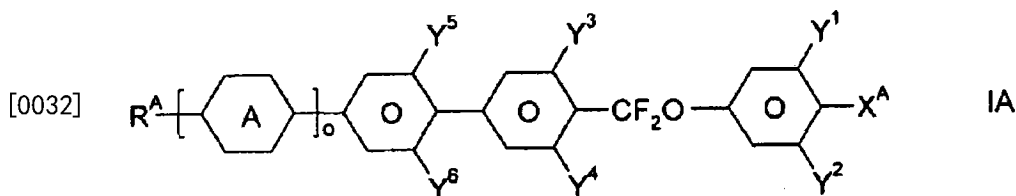
[0027] 本发明的目的是提供特别用于这种类型的MLC,FFS,IPS,TN,正VA或STN显示器的介质,其没有出现上述缺点或仅在较低程度上出现上述缺点,并优选具有快速响应时间和低旋转粘度,同时具有高清亮点,高介电各向异性,低阈值电压以及高透射率。

[0028] 目前,对于用于平板和智能手机显示器的小尺寸和中尺寸显示器来说,边缘场切换 (FFS) 模式是非常令人感兴趣的。FFS模式广泛适用于智能和中尺寸显示器的原因是宽视角,高透射率,相对于现有技术中熟知模式的低运行参数。现有技术中的液晶混合物特征在于其由具有正介电各向异性的化合物以及任选的中性化合物构成。

[0029] 目前已经发现,如果液晶介质还包含选自具有负值介电各向异性 ($-\Delta\epsilon$) 的式IIA, IIB和IIC化合物的一种或多种化合物,则具有正介电各向异性 ($+\Delta\epsilon$) 的液晶混合物可以得到改善。根据本发明的混合物具有非常高的效率,显示出非常高的透射率,低数值的旋转粘度 γ_1 ,因而适用于TN、IPS、FFS和VA模式,特别是FFS模式的各种应用。

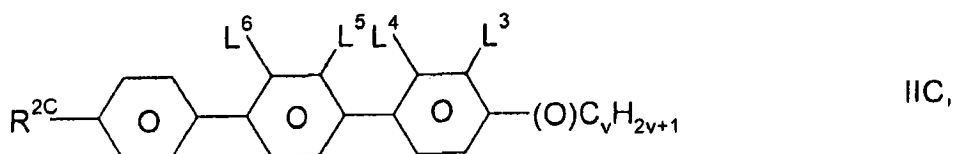
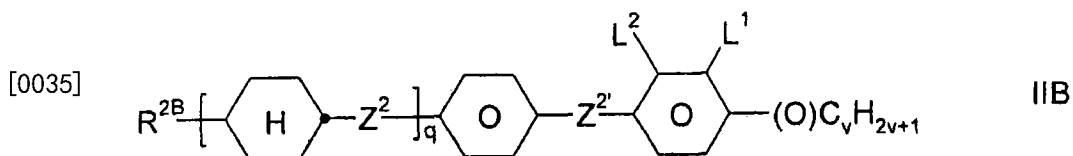
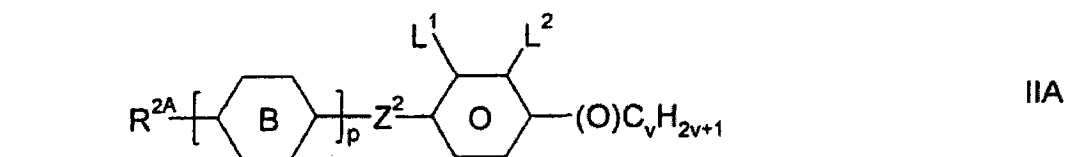
[0030] 式IA化合物与选自式IIA, IIB和IIC化合物组的至少一种化合物组合获得了具有上述期望性质的液晶混合物。

[0031] 本发明涉及具有正各向异性的液晶介质,特征在于其包含至少一种或多种式IA的化合物,



[0033] 以及

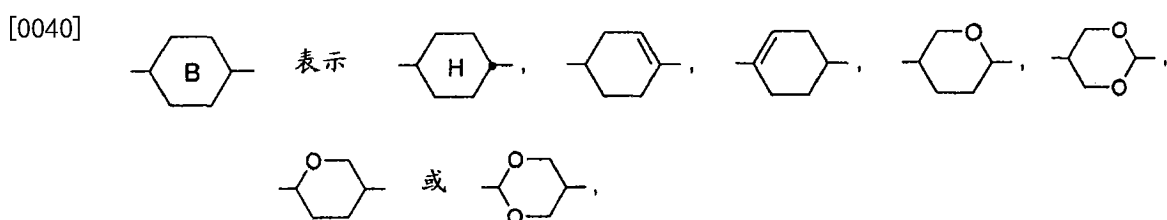
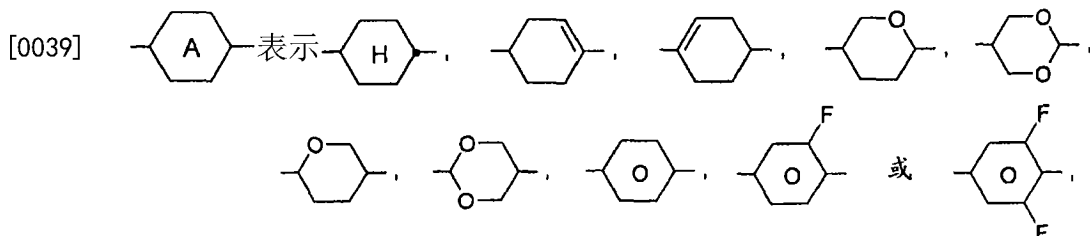
[0034] 至少一种选自式IIA, IIB和IIC的化合物组的化合物,



[0036] 其中,

[0037] R^A, R^{2A}, R^{2B} 和 R^{2C}

[0038] 各自彼此独立地表示H,具有至多15个C原子的烷基或烯基,其是未取代的、被CN或 CF_3 单取代的或至少被卤素单取代的,其中另外地这些基团中一个或多个 CH_2 基团可以被 $-O-$ 、 $-S-$ 、、 $-C\equiv C-$ 、 $-CF_2O-$ 、 $-OCF_2-$ 、 $-OC-O-$ 或 $-O-CO-$ 以O原子不彼此直接链接的方式代替,



[0041] X^A 表示F,Cl,CN, SF_5 ,SCN,NCS,各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基,

[0042] Y^{1-6} 各自彼此独立地表示H或F,

[0043] L^1 和 L^2 各自彼此独立地表示F,Cl, CF_3 , CHF_2 ,

[0044] L^{3-6} 各自彼此独立地表示H,F,Cl, CF_3 或 CHF_2 ,但 L^{3-6} 中的至少两个表示F,Cl, CF_3 , CHF_2 ,

[0045] Z^2 和 $Z^{2'}$ 各自彼此独立地表示单键, $-CH_2CH_2-$, $-CH=CH-$, $-C\equiv C-$,

[0046] $-CF_2O-$, $-OCF_2-$, $-CH_2O-$, $-OCH_2-$, $-COO-$, $-OCO-$, $-C_2F_4-$, $-CF=CF-$, $-CH=CHCH_2O-$,

[0047] p表示1或2,并且在 Z^2 =单键的情况下,p也可以表示0,

[0048] o和q各自彼此独立地表示0或1,

[0049] (O) C_vH_{2v+1} 表示 OC_vH_{2v+1} 或 C_vH_{2v+1} ,以及

[0050] v表示1-6。

[0051] 令人惊奇地,已经发现包含式IA化合物和至少一种式IIA, IIB或IIC化合物的混合物具有高介电各向异性 $\Delta\epsilon$ 并且同时具有有利的旋转粘度 γ_1 /清亮点比。因此,它们特别适用于获得具有低 γ_1 、高透射率和相对高清亮点的液晶混合物。另外,式IA、IIA、IIB和IIC化合物在液晶介质中显示出优良的溶解性。包含式IA化合物和至少一种式IIA、IIB和/或IIC化合物的根据本发明的液晶介质具有低的旋转粘度、快的响应时间、高的清亮点、非常高的正介电各向异性、相对高的双折射和宽的向列相范围和高的透射率。因此,其特别适合于移动电话、TV和视频应用,最优选用于智能手机和平板PC。

[0052] 式IA, IIA, IIB和IIC化合物具有宽范围应用。根据取代基选择不同,它们可以作为液晶介质主要组成部分的基础材料;然而,为了例如改变这种类型电介质的介电和/或光学各向异性和/或优化其透射率、阈值电压和/或其粘度,来自其它化合物类型的液晶基础材

料也可以添加到式IA和IIA、IIB和IIC的化合物中。

[0053] 在纯净状态下,式IA,IIA,IIB和IIC化合物是无色的,并且在电光应用有利的温度范围内形成液晶介晶相。它们是化学稳定、热稳定和对光稳定的。

[0054] 式IA,IIA,IIB和IIC的化合物可以通过如在文献(例如在标准著作中,例如Houben-Weyl,Methoden der organischen Chemie[有机化学方法],Georg-Thieme-Verlag,Stuttgart)中所述的本身已知的方法制备,更确切地说,在已知和适合所述反应的反应条件下制备。在此也可以使用本身已知的变化形式,对其在此不作更详细地描述。

[0055] 式IA,IIA,IIB和IIC的化合物是已知的,例如,由W02004/048501A,EP0 786 445,EP0 364 538,US5,273,680已知。

[0056] 如果上下文的式中 R^A , R^{2A} , R^{2B} 和 R^{2C} 表示烷基和/或烷氧基,则这可以是直链或支链的。其优选是直链的,具有2、3、4、5、6或7个C原子,并相应地优选表示乙基、丙基、丁基、戊基、己基、庚基、乙氧基、丙氧基、丁氧基、戊氧基、己氧基或庚氧基,以及还有甲基、辛基、壬基、癸基、十一烷基、十二烷基、十三烷基、十四烷基、十五烷基、甲氧基、辛氧基、壬氧基、癸氧基、十一烷氧基、十二烷氧基、十三烷氧基或十四烷氧基。 R^A 和 R^B 各自优选表示具有2-6个C原子的直链烷基。

[0057] 氧杂烷基优选表示直链的2-氧杂丙基(=甲氧基甲基),2-(=乙氧基甲基)或3-氧杂丁基(=2-甲氧基乙基),2-、3-或4-氧杂戊基,2-、3-、4-或5-氧杂己基,2-、3-、4-、5-或6-氧杂庚基,2-、3-、4-、5-、6-或7-氧杂辛基,2-、3-、4-、5-、6-、7-或8-氧杂壬基,2-、3-、4-、5-、6-、7-、8-或9-氧杂癸基。

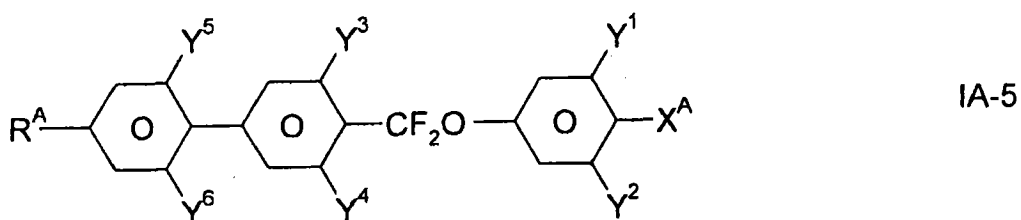
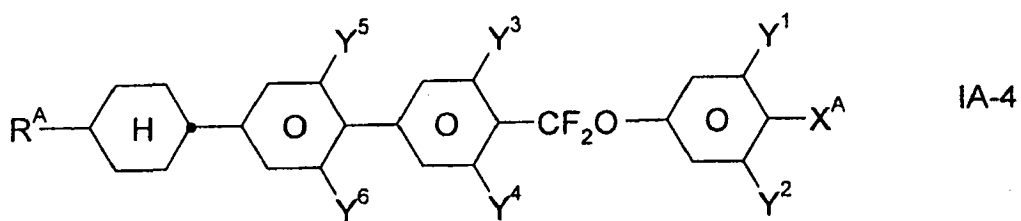
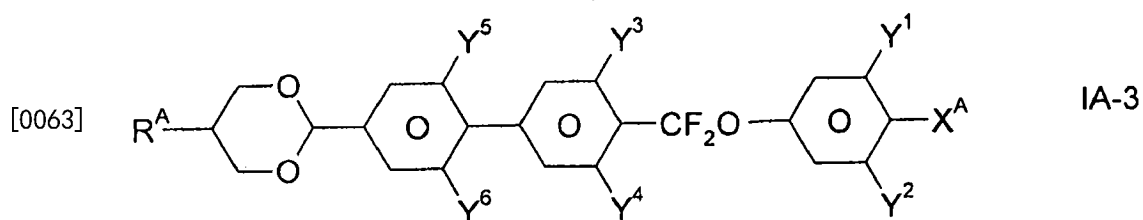
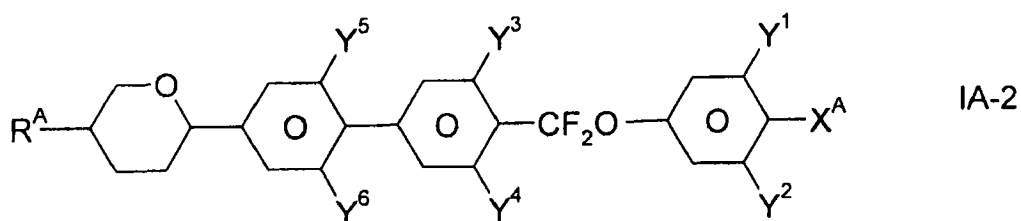
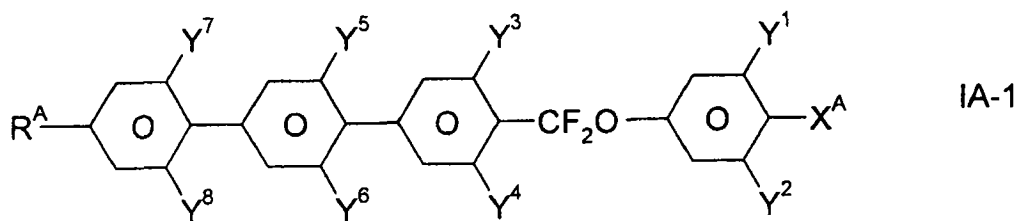
[0058] 如果 R^A , R^{2A} , R^{2B} 和 R^{2C} 表示其中一个 CH_2 基团已被 $-CH=CH-$ 替代的烷基,则这可以是直链或支链的。其优选是直链的并具有2至10个C原子。相应地,其特别表示乙烯基、丙-1-或-2-烯基、丁-1-、-2-或-3-烯基、戊-1-、-2-、-3-或-4-烯基、己-1-、-2-、-3-、-4-或-5-烯基、庚-1-、-2-、-3-、-4-、-5-或-6-烯基、辛-1-、-2-、-3-、-4-、-5-、-6-或-7-烯基、壬-1-、-2-、-3-、-4-、-5-、-6-、-7-或-8-烯基、癸-1-、-2-、-3-、-4-、-5-、-6-、-7-、-8-或-9-烯基。

[0059] 如果 R^A , R^{2A} , R^{2B} 和 R^{2C} 表示至少被卤素单取代的烷基或烯基,则该基团优选是直链的,且卤素优选为F或Cl。在多取代情况下,卤素优选为F。所得基团还包括全氟化基团。在单取代的情况下,氟或氯取代基可以在任何所需位置,但优选在 ω -位置。

[0060] 在上下文的式中, X^A 优选为F,Cl或具有1、2或3个C原子的单或多氟化烷基或烷氧基,或具有2或3个C原子的单或多氟化烯基。 X^A 特别优选为F、Cl、 CF_3 、 CHF_2 、 OCF_3 、 $OCHF_2$ 、 $OCFHCF_3$ 、 $OCFHCHF_2$ 、 $OCFHCHF_2$ 、 OCF_2CH_3 、 OCF_2CHF_2 、 OCF_2CHF_2 、 $OCF_2CF_2CHF_2$ 、 $OCF_2CF_2CHF_2$ 、 $OCFHCF_2CF_3$ 、 $OCFHCF_2CHF_2$ 、 $OCF_2CF_2CF_3$ 、 $OCF_2CF_2CClF_2$ 、 $OCClFCF_2CF_3$ 、 $OCH=CF_2$ 或 $CH=CF_2$,非常特别优选为F或 OCF_3 ,还有 CF_3 、 $OCF=CF_2$ 、 $OCHF_2$ 或 $OCH=CF_2$ 。

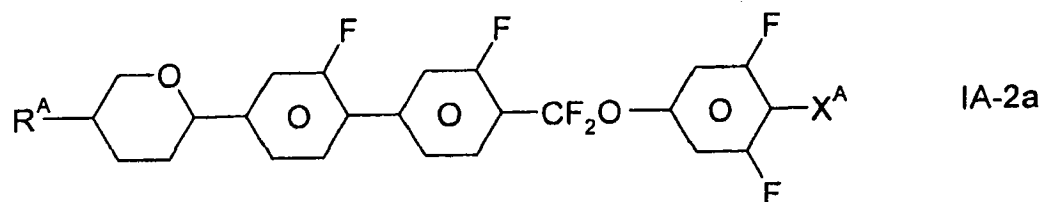
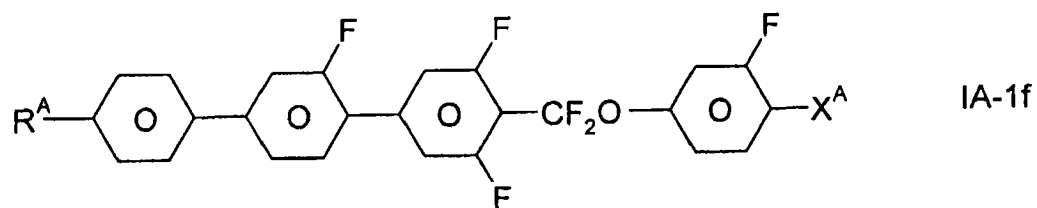
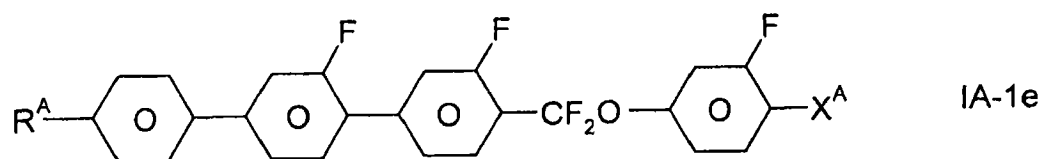
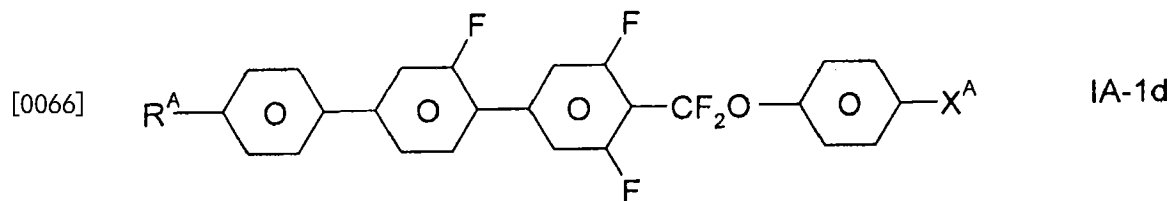
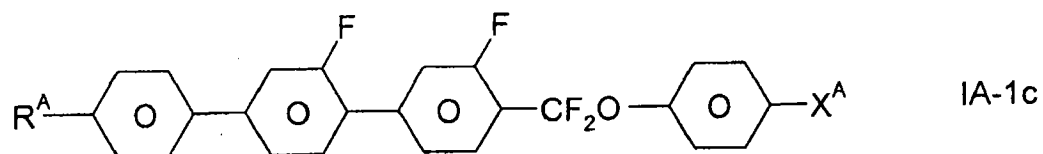
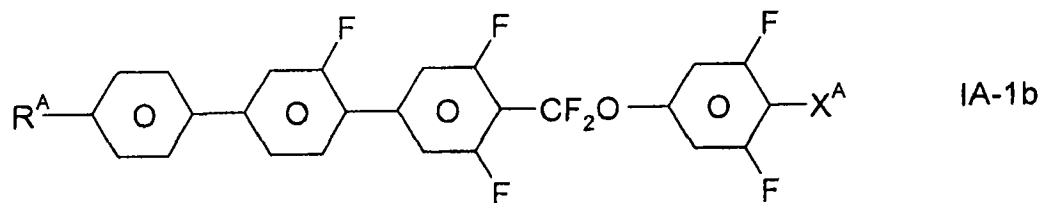
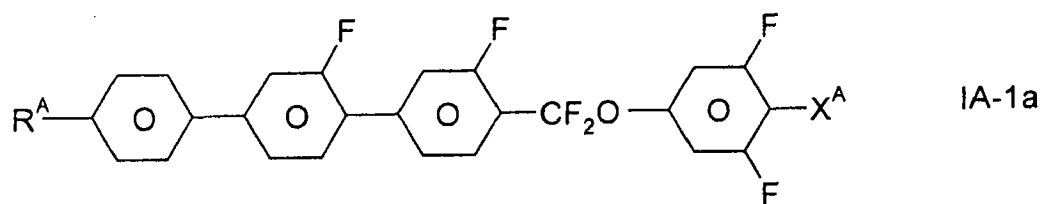
[0061] 特别优选的是其中 X^A 表示F或 OCF_3 、优选为F的式IA化合物。优选的式IA化合物为其中 Y^1 表示F的那些,其中 Y^2 表示F的那些,其中 Y^3 表示H的那些,其中 Y^4 表示H和 Y^5 表示F的那些,以及其中 Y^6 和 Y^7 各自表示H的那些。

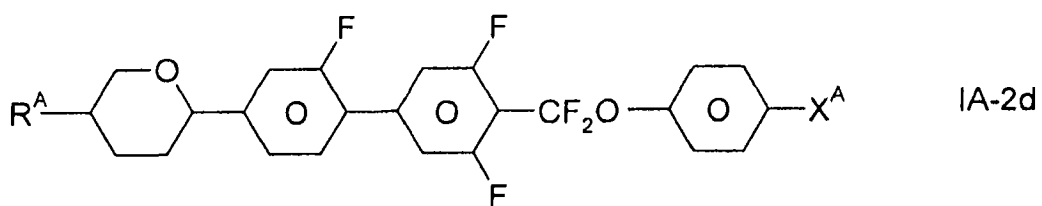
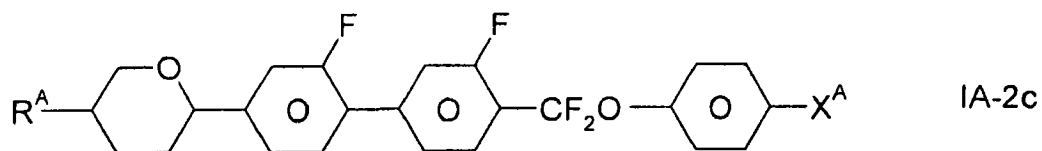
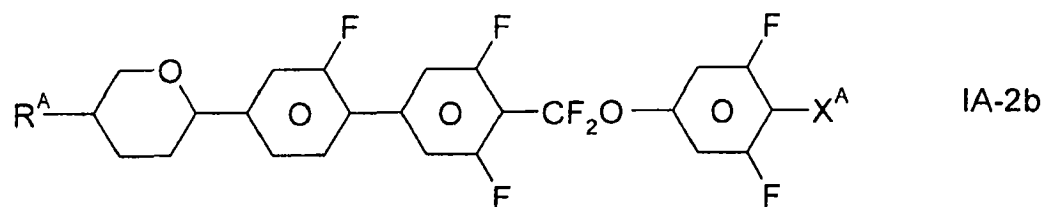
[0062] 优选的式IA化合物选自下列子式:



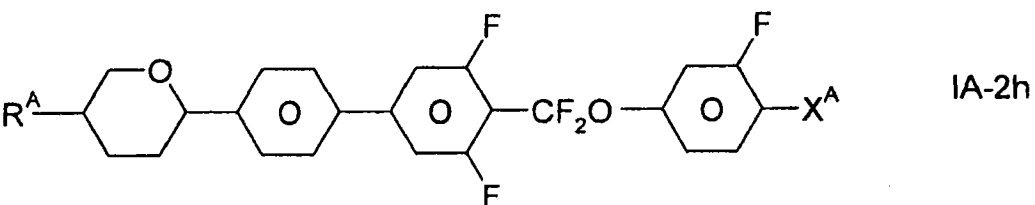
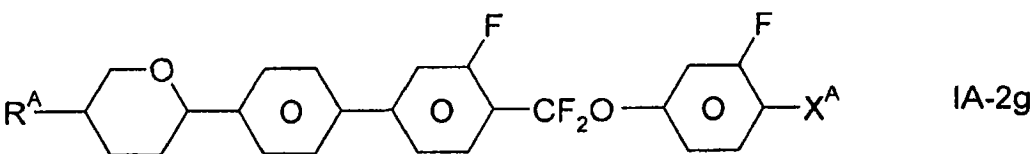
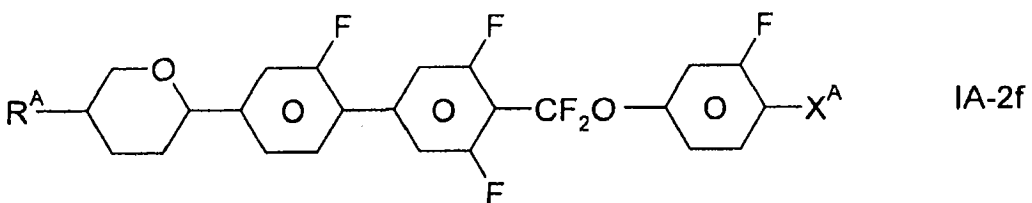
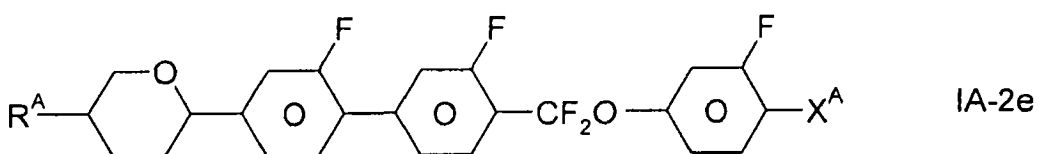
[0064] 其中 R^A , X^A 和 Y^{1-6} 具有上述含义并且 Y^7 和 Y^8 各自独立地表示H或F。

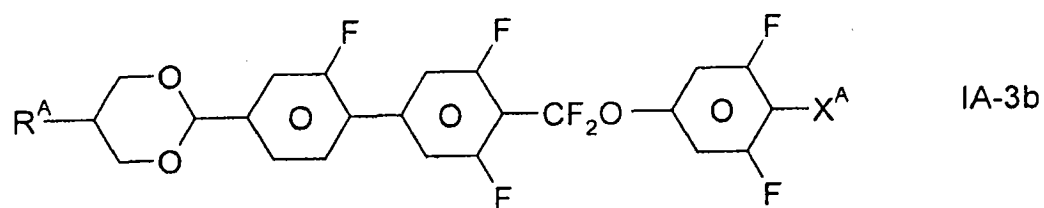
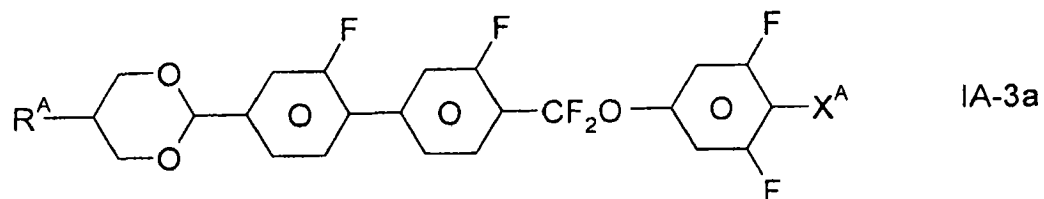
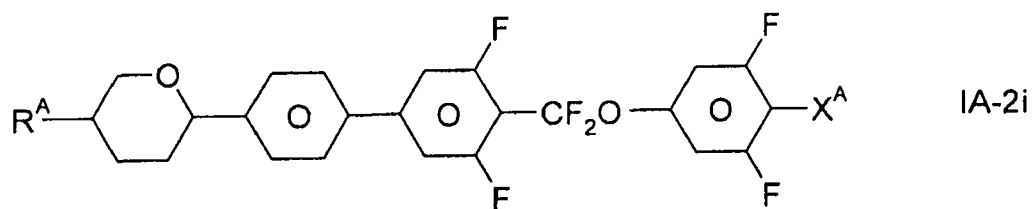
[0065] 特别优选的式IA化合物选自下列化学式：



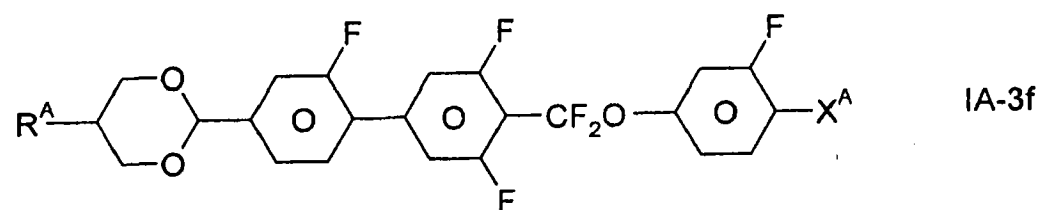
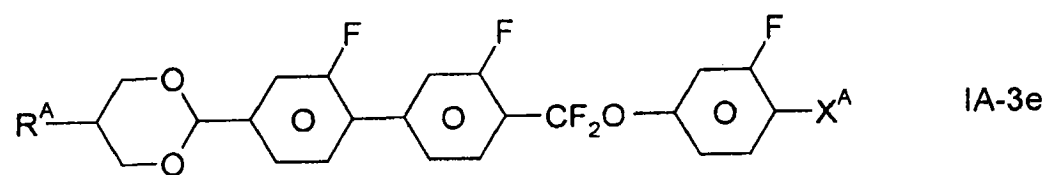
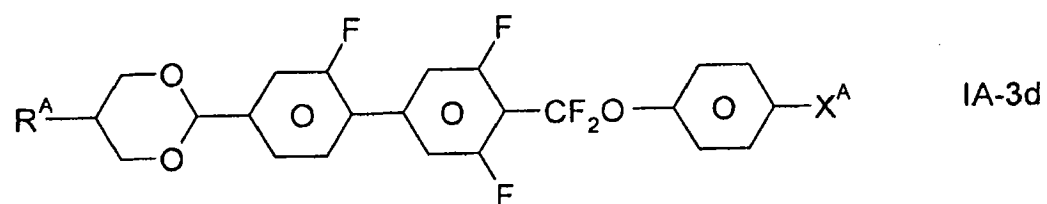
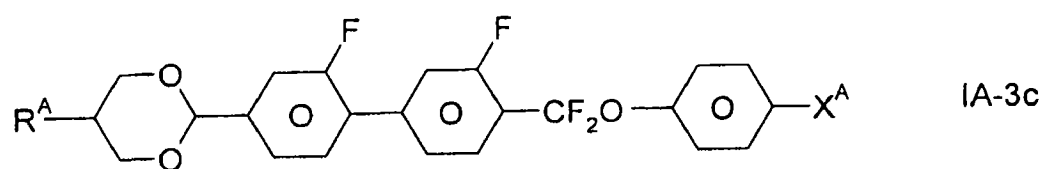


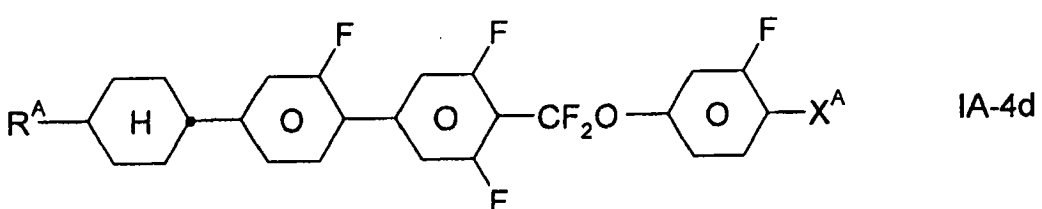
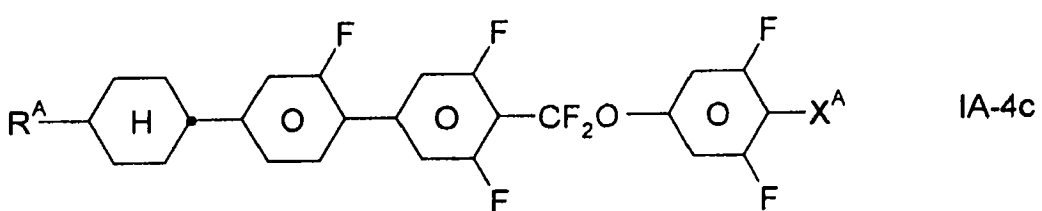
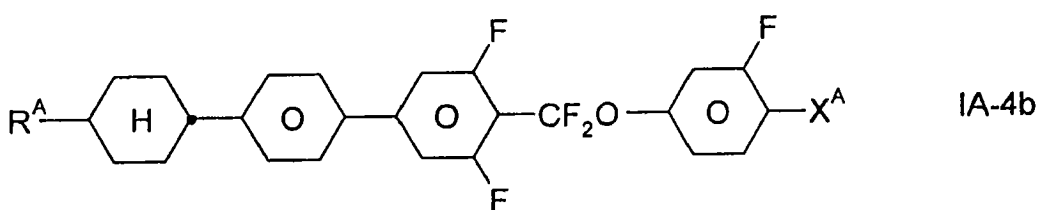
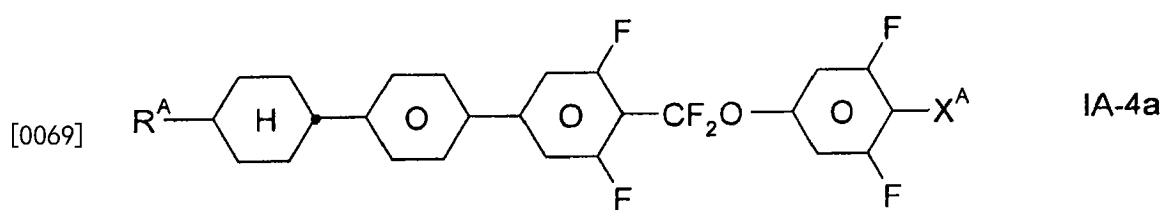
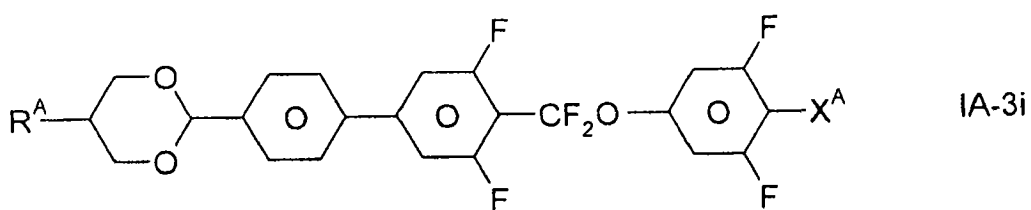
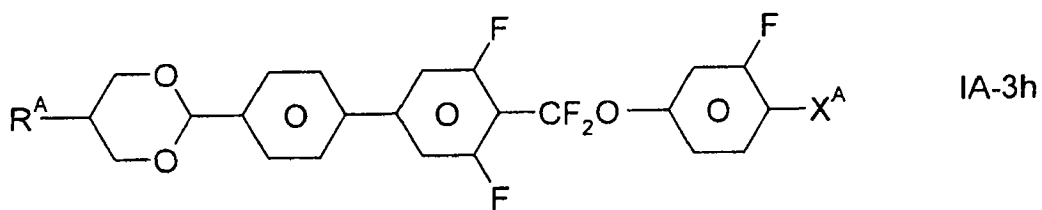
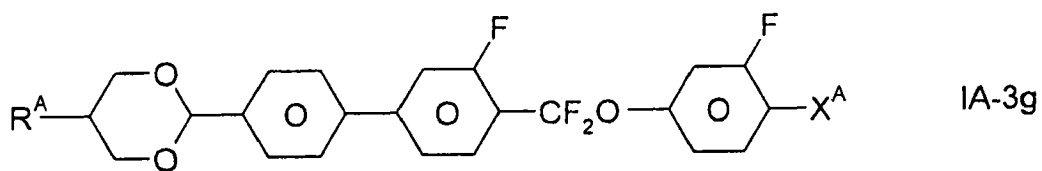
[0067]

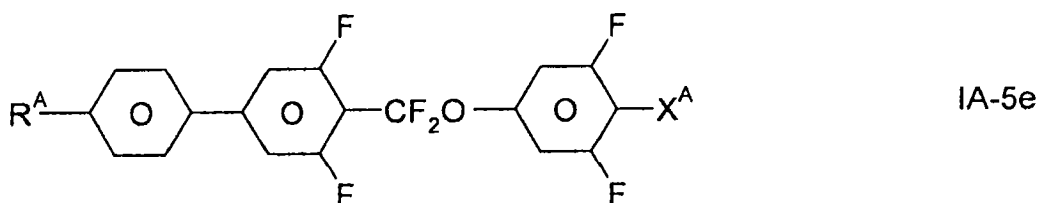
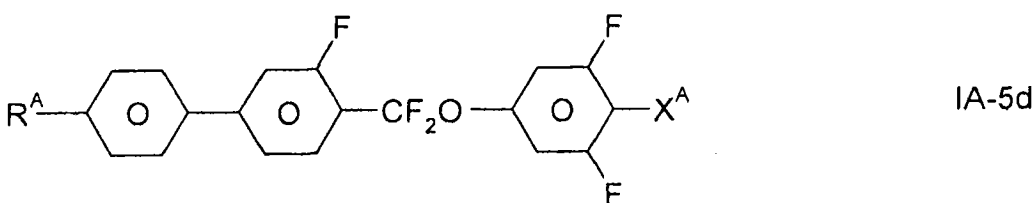
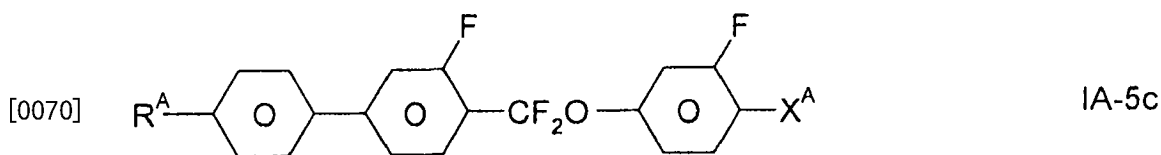
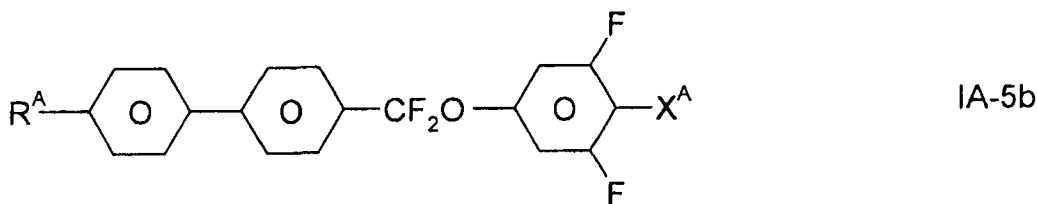
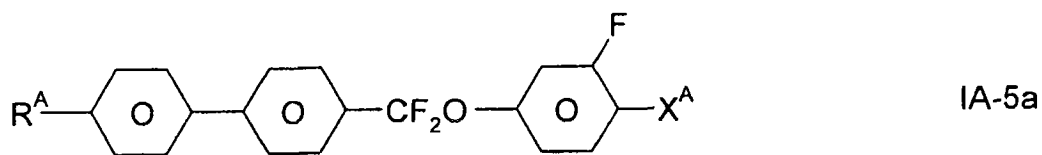




[0068]







[0071] 其中

[0072] R^A 和 X^A 具有权利要求1所示含义。 R^A 优选表示具有1-6个C原子的直链烷基,特别是乙基、丙基和戊基,还有丁基以及具有2-6个C原子的烯基。 X^A 优选表示F、 OCF_3 、 $OCHF CF_3$ 、 $OCF_2CH FCF_3$ 、 $OCH=CF_2$,最优选为F或 OCF_3 。

[0073] 非常特别优选的是子式IA-1b、IA-2i、IA-3b和IA-5e的化合物。

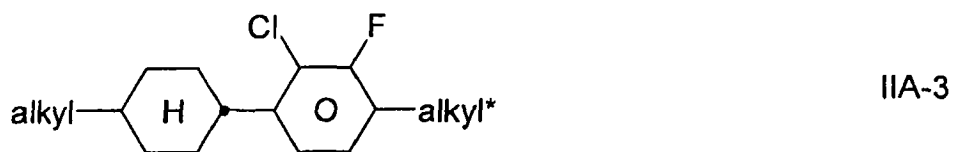
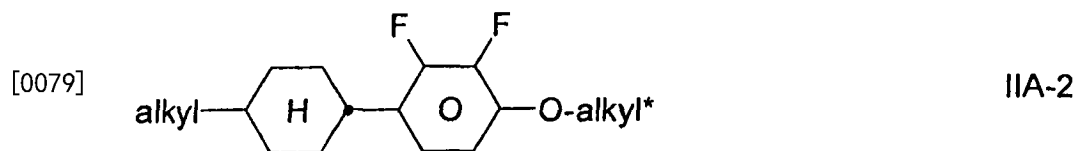
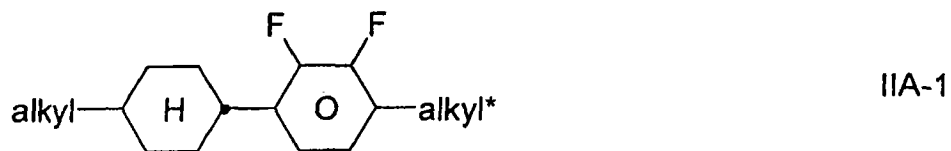
[0074] 在式IIA和IIB化合物中, Z^2 可以具有相同或不同的含义。在式IIB化合物中, Z^2 和 $Z^{2'}$ 可以具有相同或不同的含义。

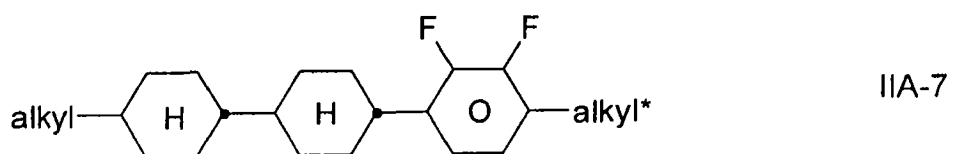
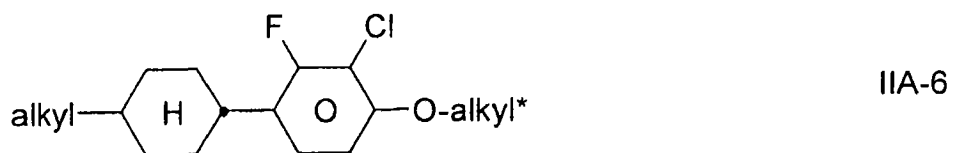
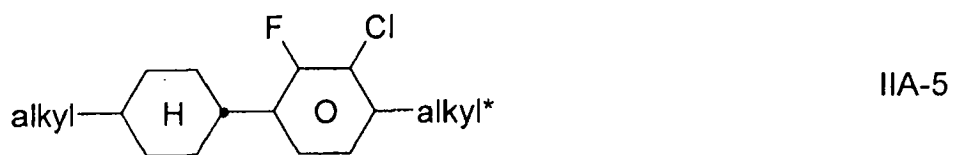
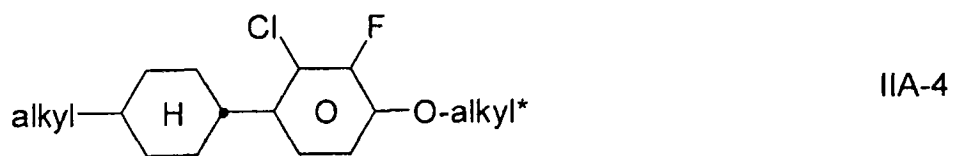
[0075] 在式IIA,IIB和IIC化合物中, R^{2A} , R^{2B} 和 R^{2C} 各自优选表示具有1-6个C原子的烷基,特别是 CH_3 , C_2H_5 , $n-C_3H_7$, $n-C_4H_9$, $n-C_5H_{11}$ 。

[0076] 在式IIA,IIB和IIC的化合物中, L^1 , L^2 , L^3 , L^4 , L^5 和 L^6 优选表示 $L^1=L^2=F$ 和 $L^5=L^6=F$ 和 $L^3=L^4=H$,还有 $L^1=F$ 和 $L^2=Cl$ 或者 $L^1=Cl$ 和 $L^2=F$, $L^3=L^4=F$ 和 $L^6=F$ 和 $L^5=H$ 。式IIA和IIB中的 Z^2 和 $Z^{2'}$ 优选各自彼此独立地表示单键,还有 $-CH_2O-$ 或 $-C_2H_4-$ 桥。

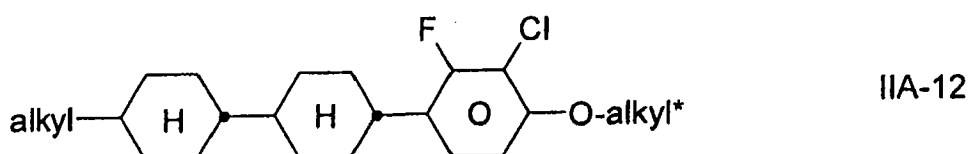
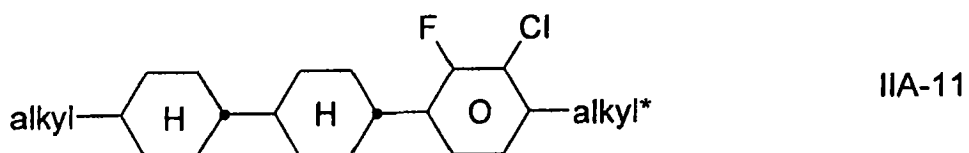
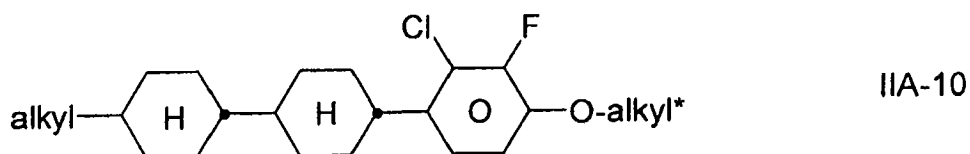
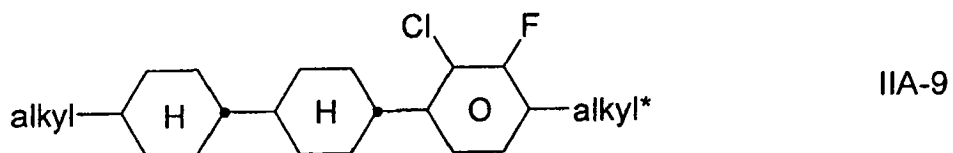
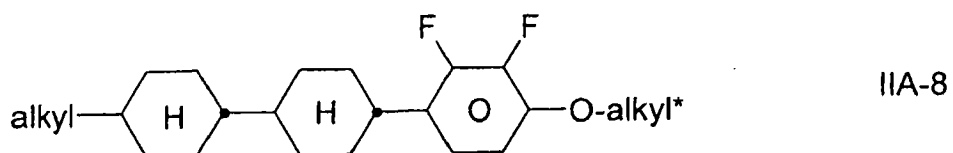
[0077] 如果在式IIB中, $Z^2=-C_2H_4-$ 、 $-CH_2O-$ 、 $-COO-$ 或 $-CH=CH-$,则 $Z^{2'}$ 优选为单键,或者,如果 $Z^{2'}=-C_2H_4-$ 、 $-CH_2O-$ 、 $-COO-$ 或 $-CH=CH-$,则 Z^2 优选为单键。在式IIA和IIB化合物中,(O) C_vH_{2v+1} 优选表示 OC_vH_{2v+1} ,还有 C_vH_{2v+1} 。在式IIC化合物中,(O) C_vH_{2v+1} 优选表示 C_vH_{2v+1} 。在式IIC化合物中, L^3 和 L^4 各自优选表示F。

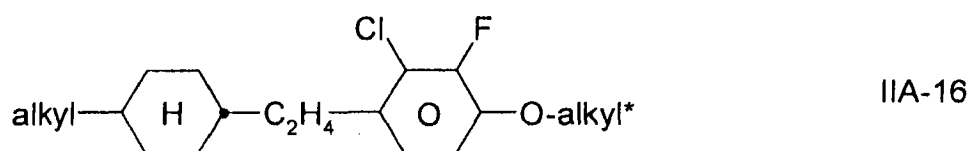
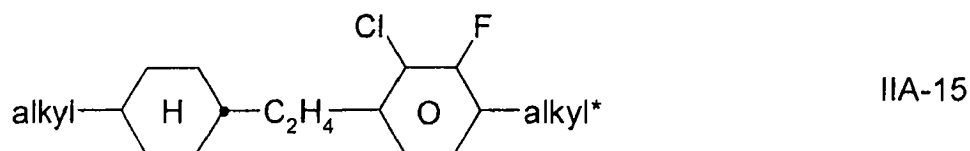
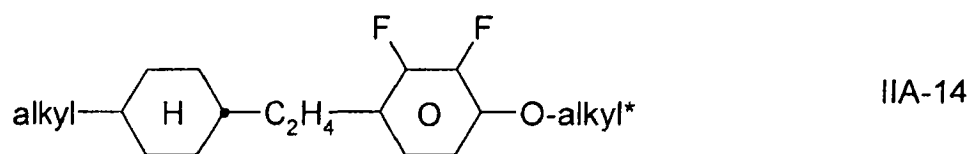
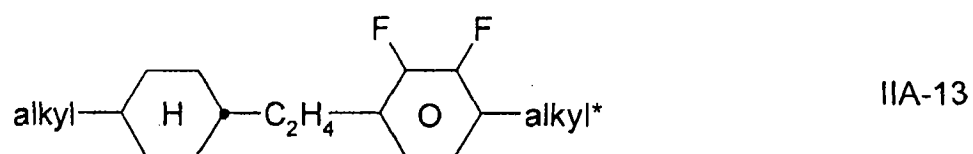
[0078] 优选的式IIA, IIB和IIC化合物如下所示:



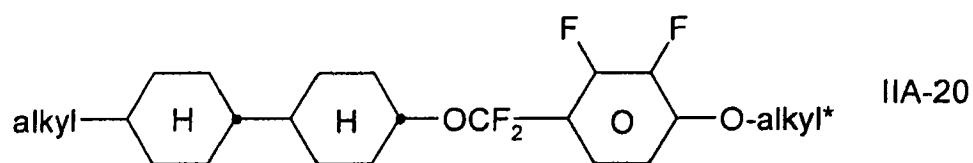
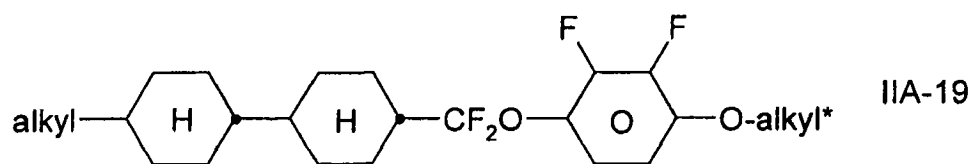
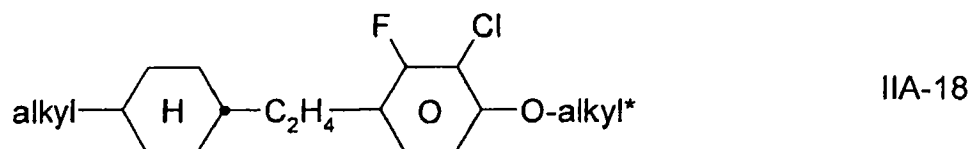
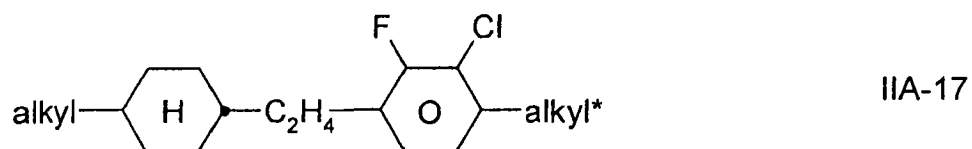


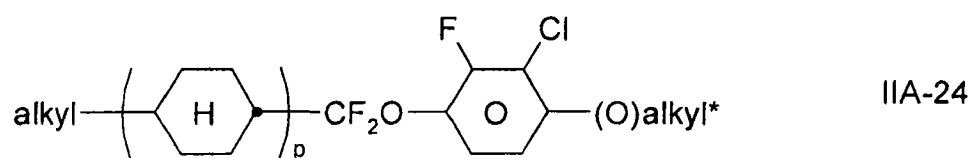
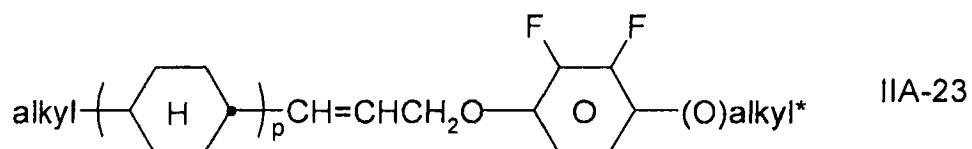
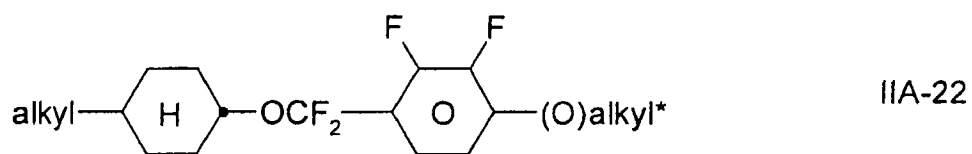
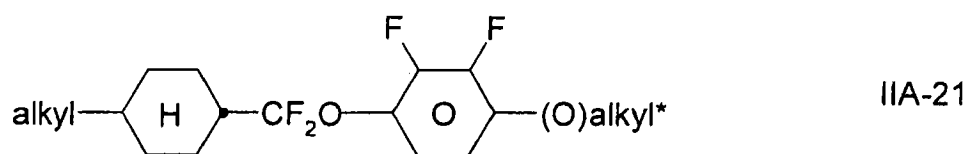
[0080]



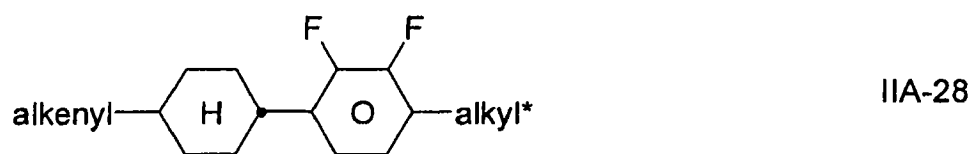
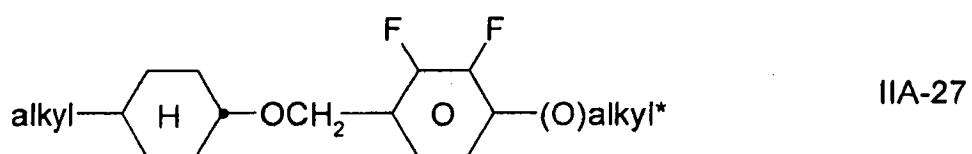
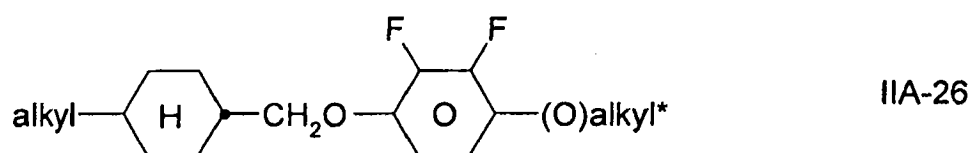
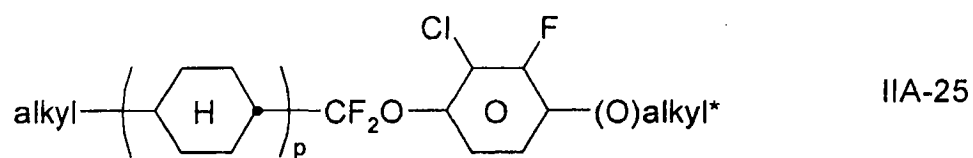


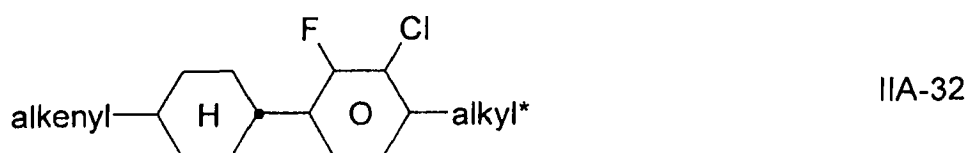
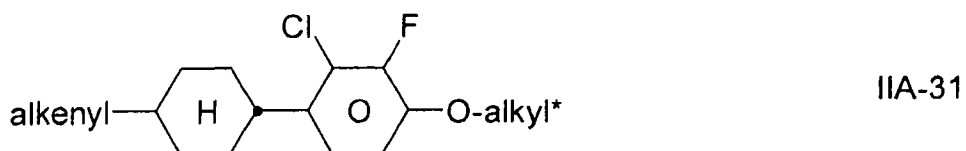
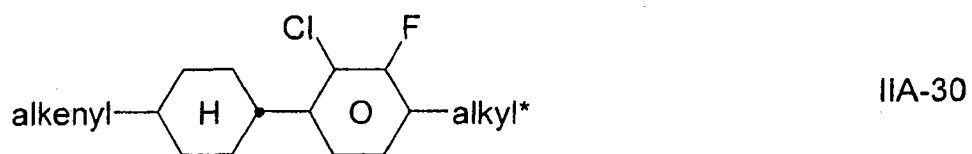
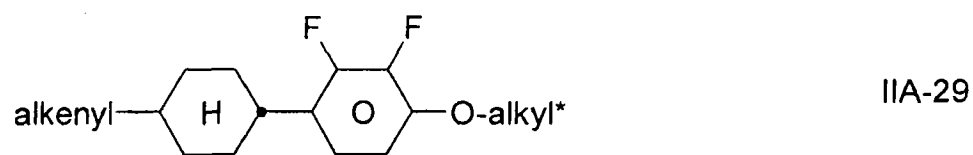
[0081]



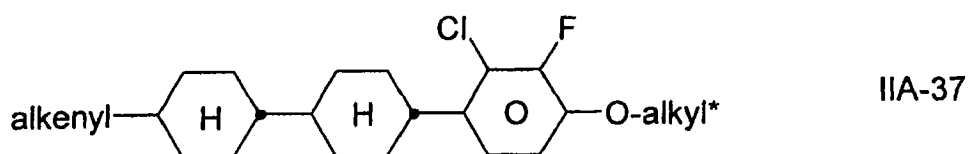
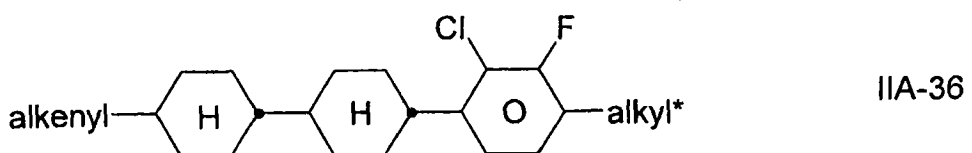
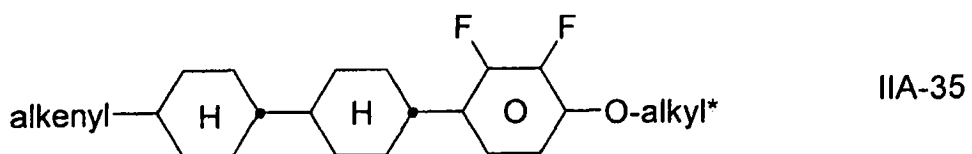
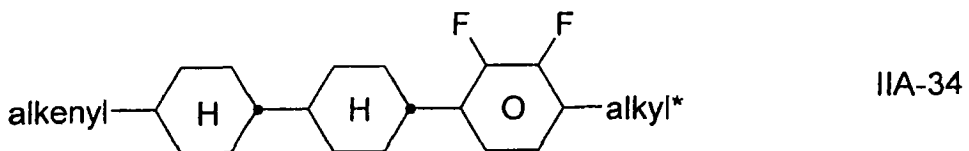
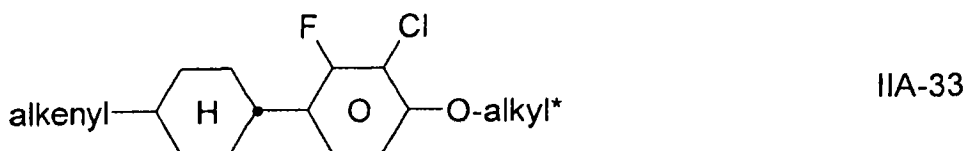


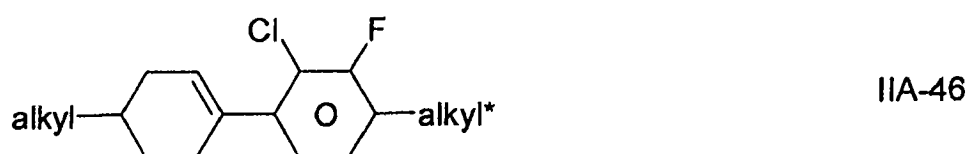
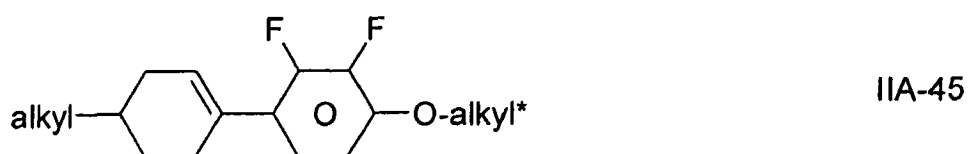
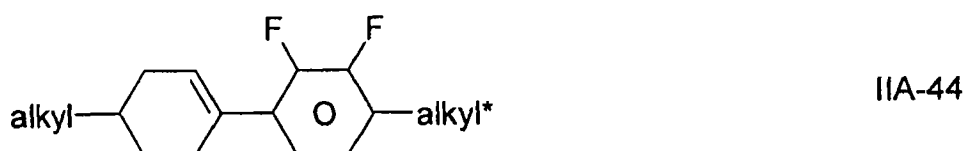
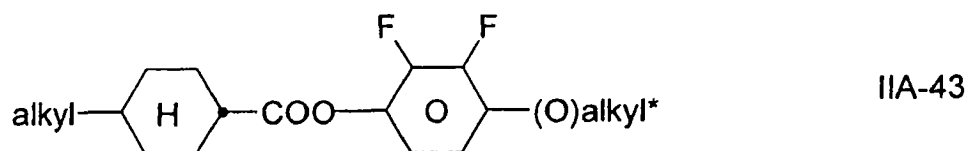
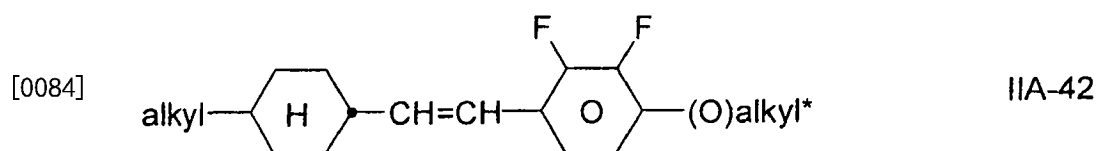
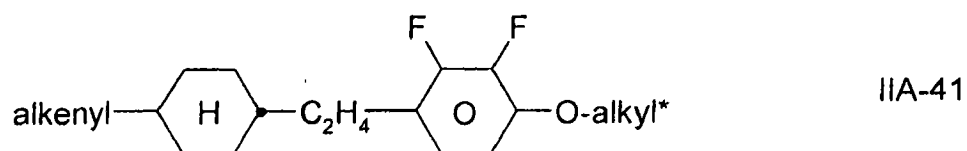
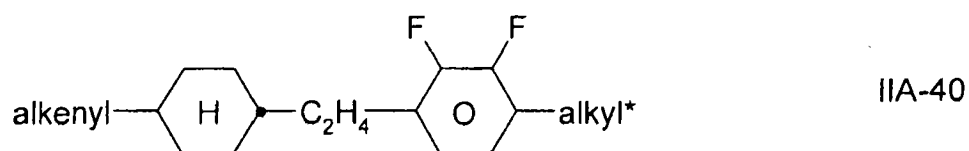
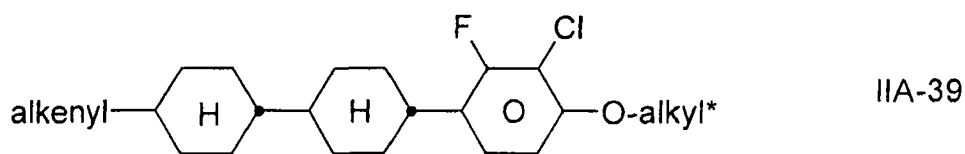
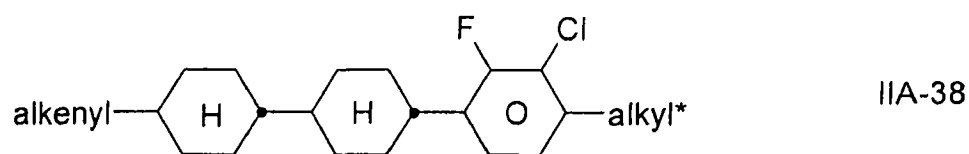
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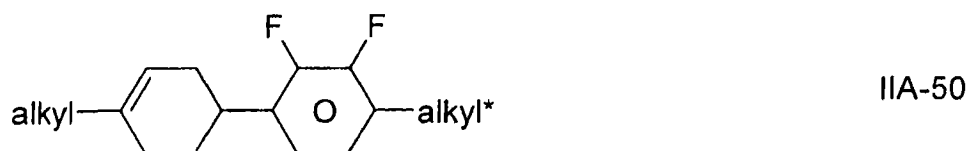
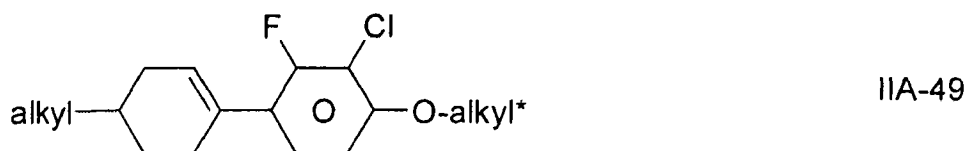
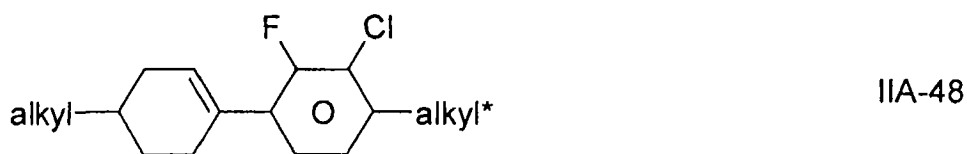
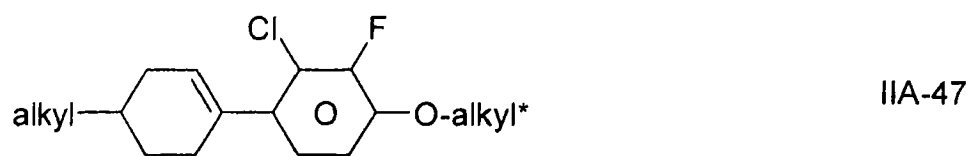




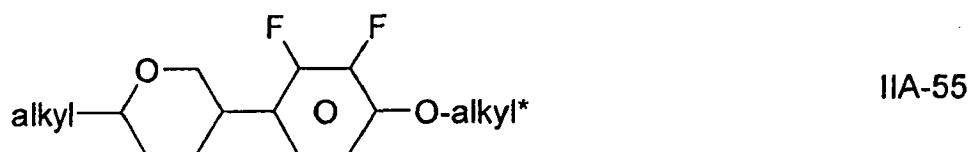
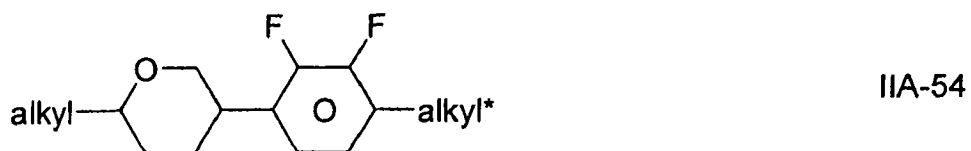
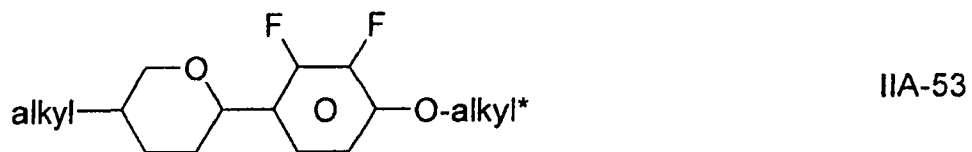
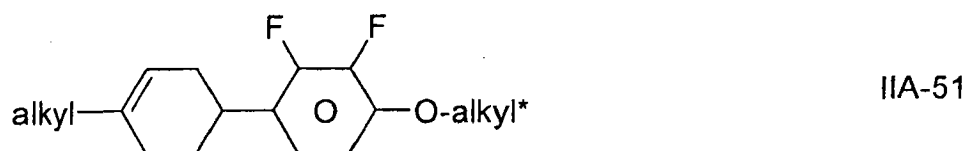
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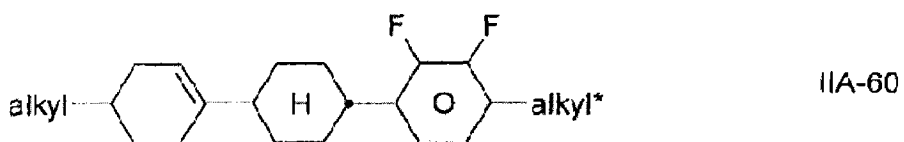
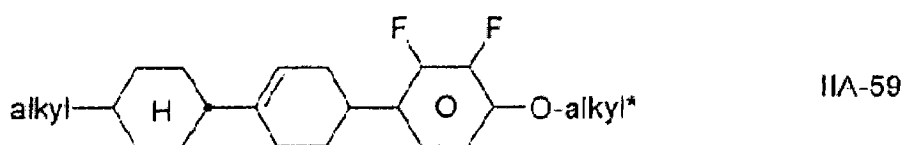
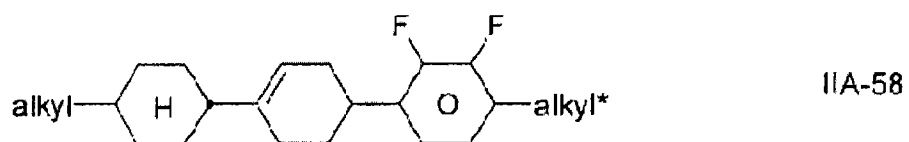
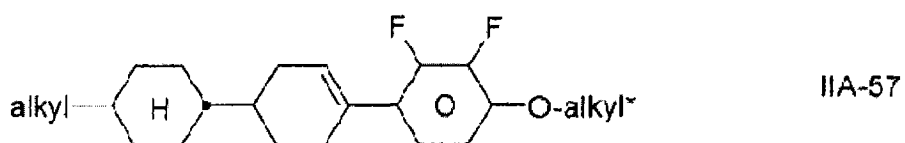
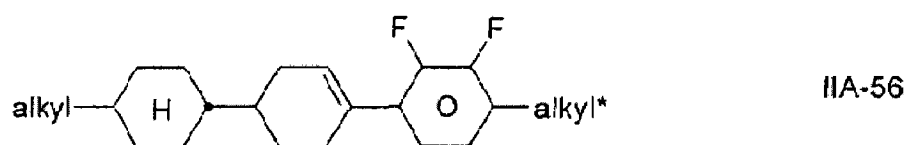




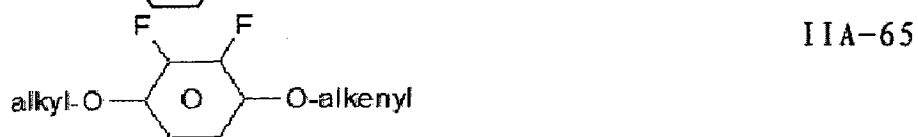
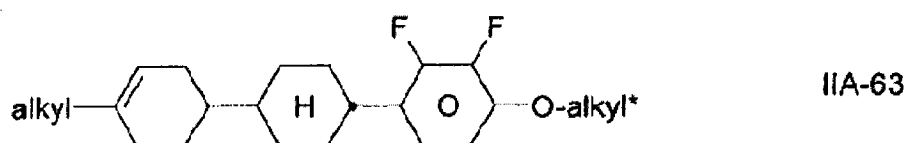
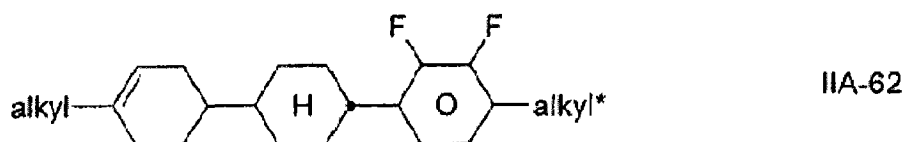
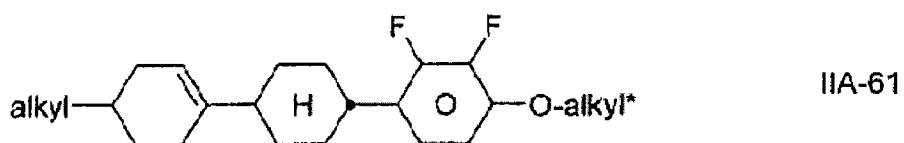


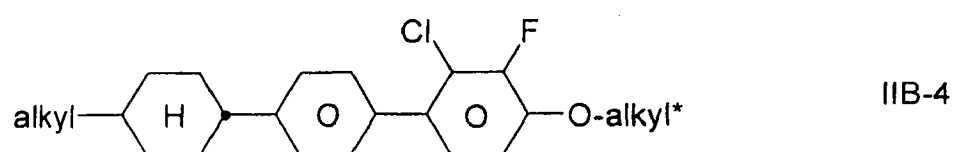
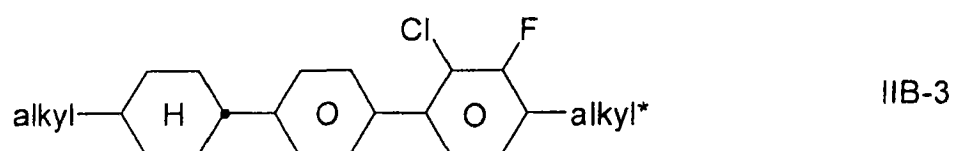
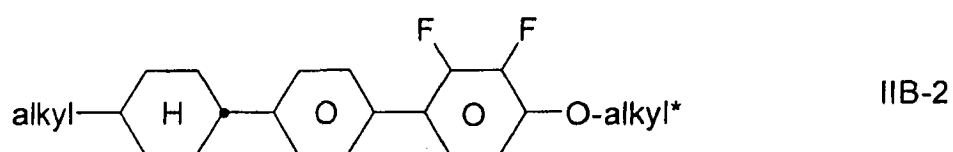
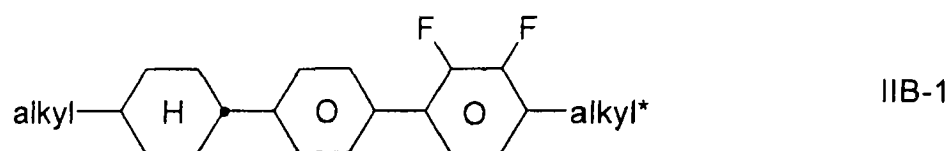
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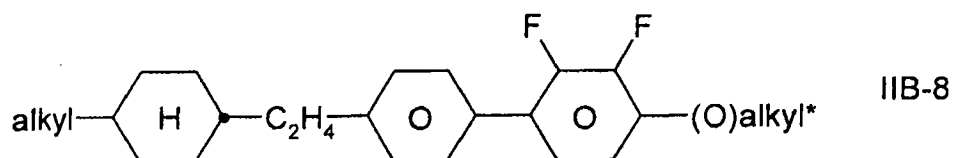
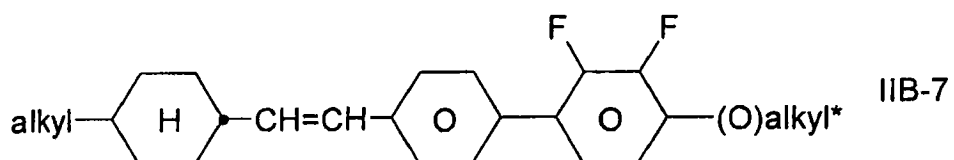
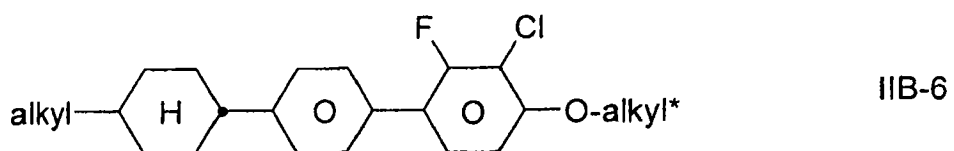
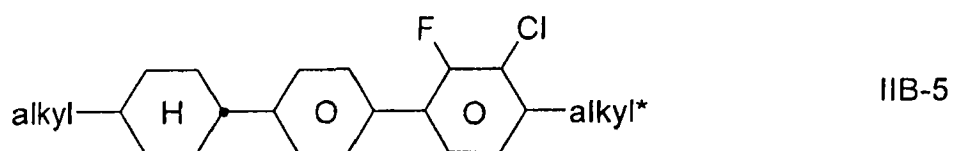


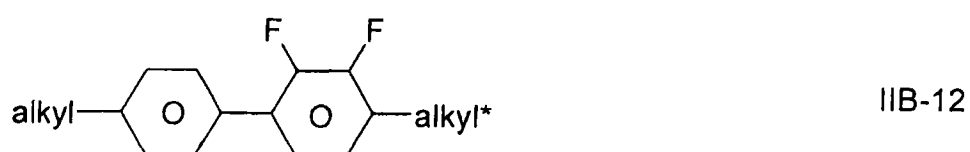
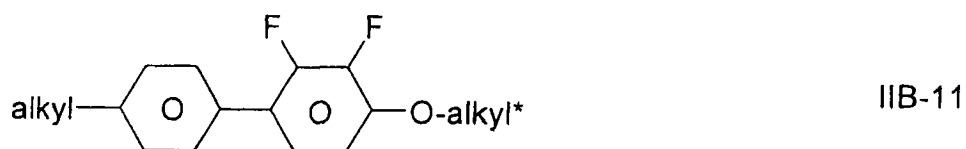
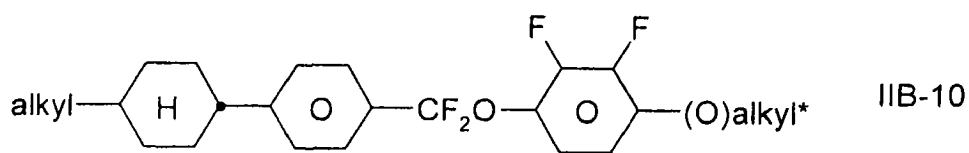
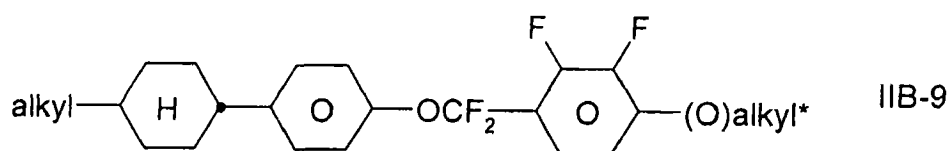
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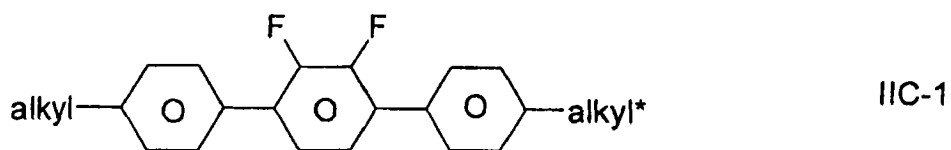
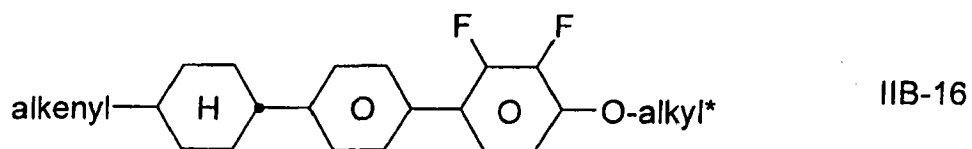
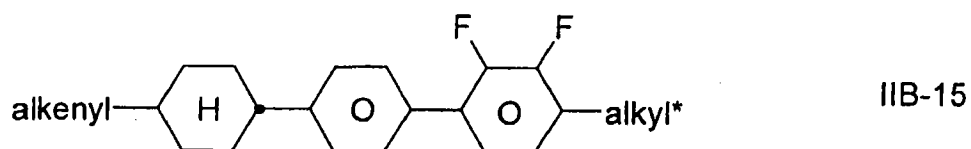
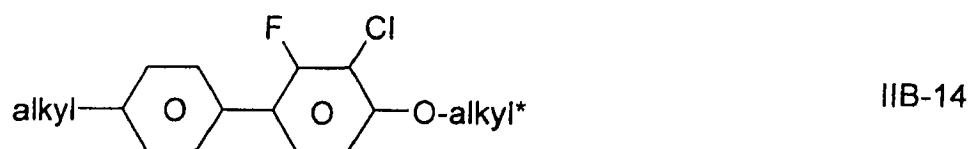
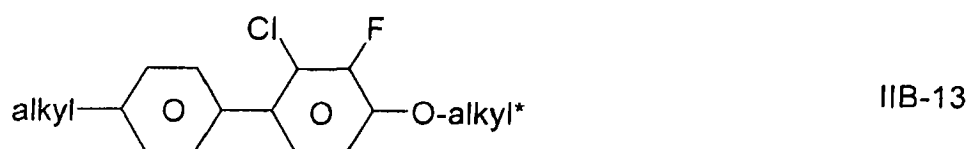


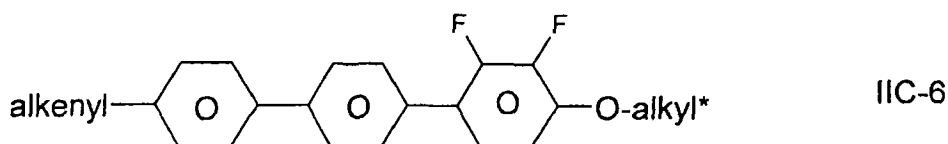
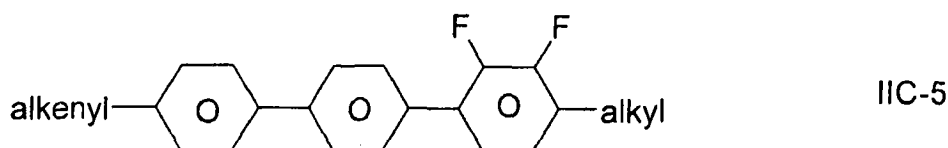
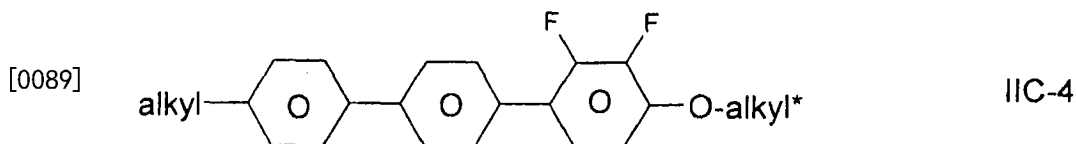
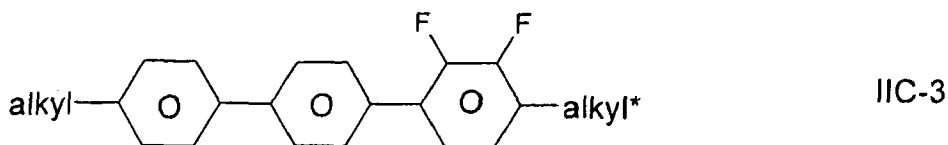
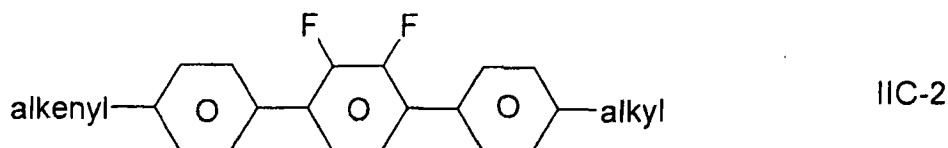
[0087]





[0088]



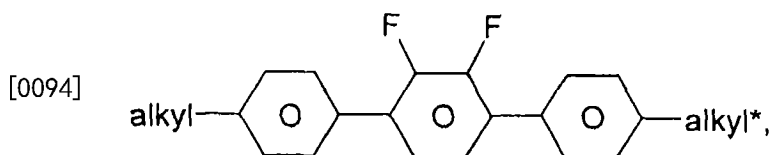


[0090] 其中alkyl和alkyl*各自彼此独立地表示具有1-6个C原子的直链烷基,alkenyl表示具有至少2-6个C原子的直链烯基,特别是 $\text{CH}_2=\text{CH}$, $\text{CH}_2=\text{CHCH}_2$, $\text{CH}_2=\text{CHC}_2\text{H}_4$, $\text{CH}_3\text{CH}=\text{CH}$, $\text{CH}_3\text{CH}=\text{CHCH}_2$ 和 $\text{CH}_3\text{CH}=\text{CHC}_2\text{H}_4$ 。

[0091] 根据本发明特别优选的混合物包含一种或多种式IIA-2, IIA-8, IIA-14, IIA-26, IIA-29, IIA-35, IIA-45, IIA-57, IIB-2, IIB-11, IIB-16和IIC-1的化合物。

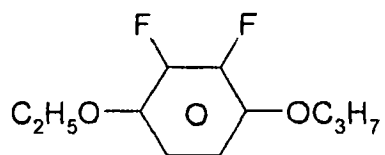
[0092] 在整个混合物中,式IIA、IIB和/或IIC化合物的比例优选为3-40重量%,优选为5-30重量%,最优选为3-20重量%。

[0093] 根据本发明特别优选的介质包含至少一种式IIC-1化合物,

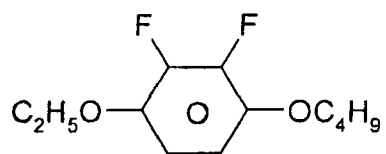


[0095] 其中alkyl和alkyl*具有上述含义,优选含量为 ≥ 3 重量%,特别是 ≥ 5 重量%,以及特别优选为5-15重量%。

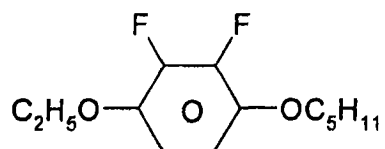
[0096] 优选的混合物包含一种或多种式IIA-64和/或IIA-65的化合物:



IIA-64a

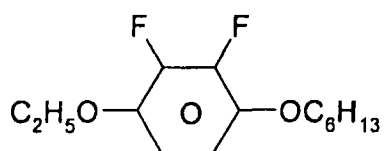


IIA-64b

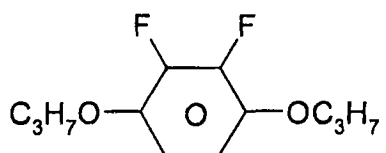


IIA-64c

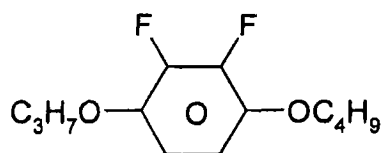
[0097]



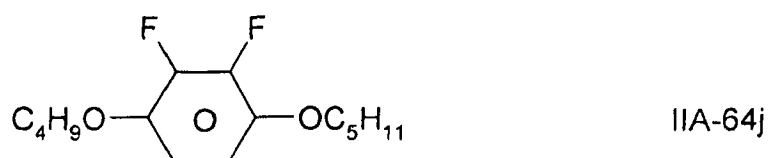
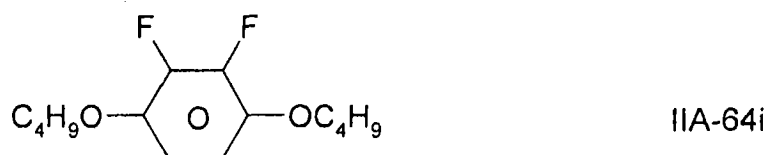
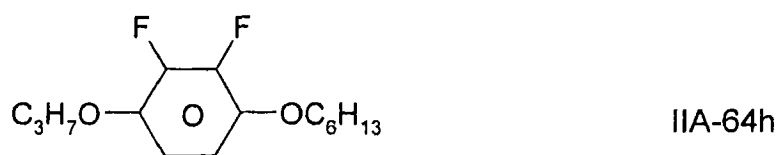
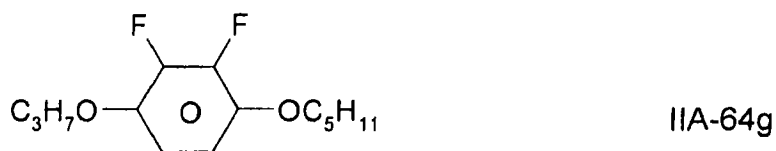
IIA-64d



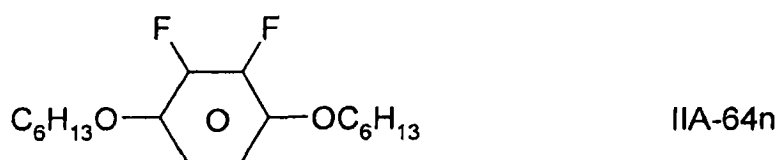
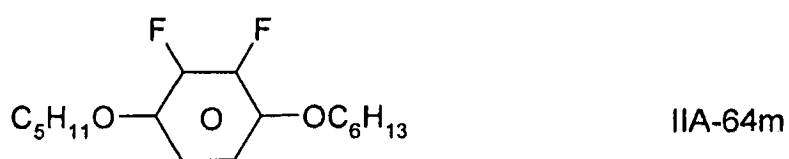
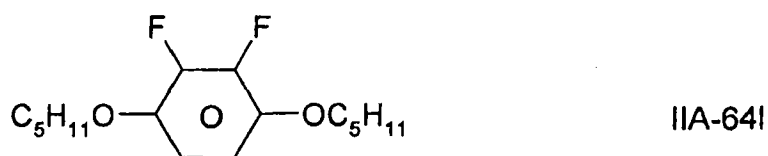
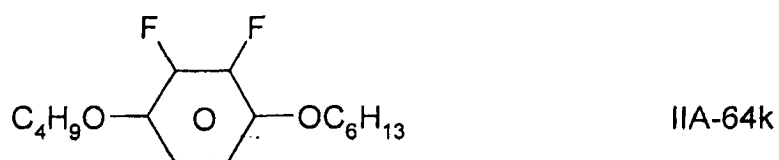
IIA-64e

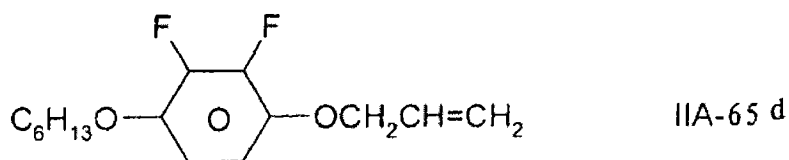
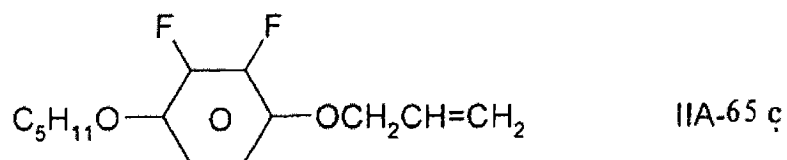
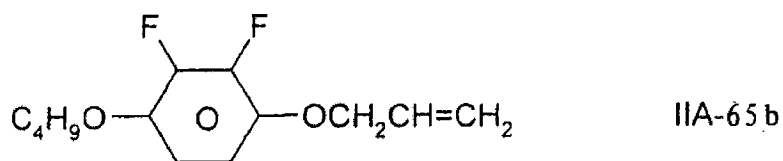
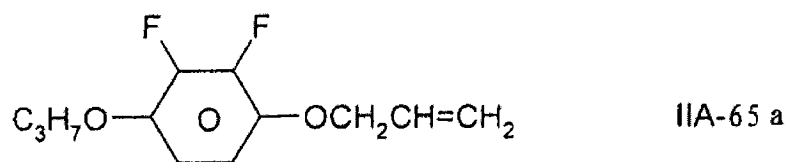


IIA-64f

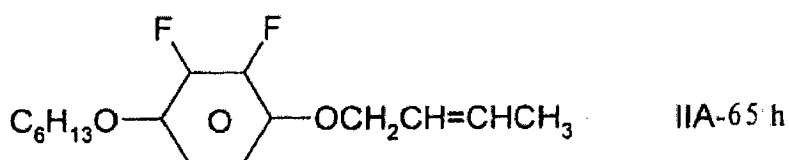
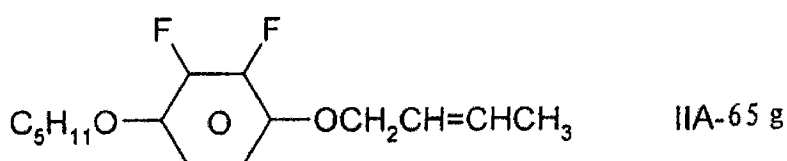
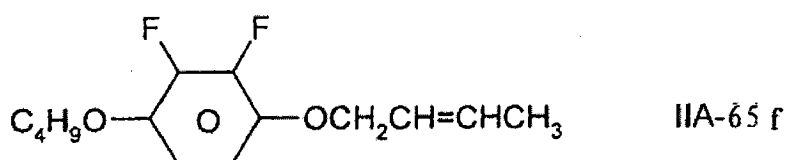
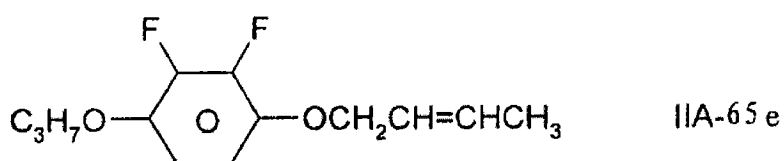


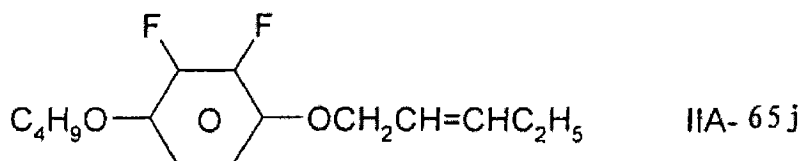
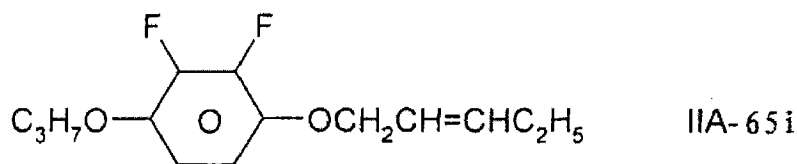
[0098]



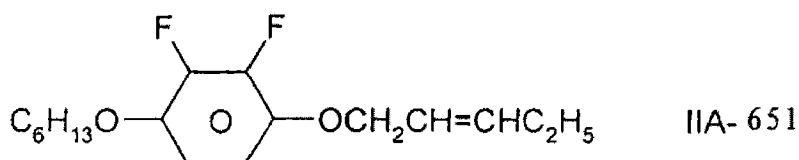
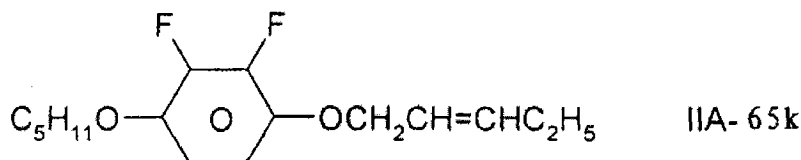


[0099]



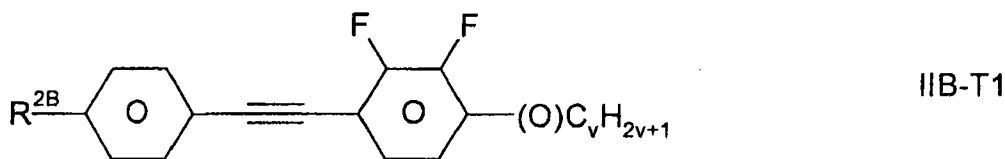


[0100]

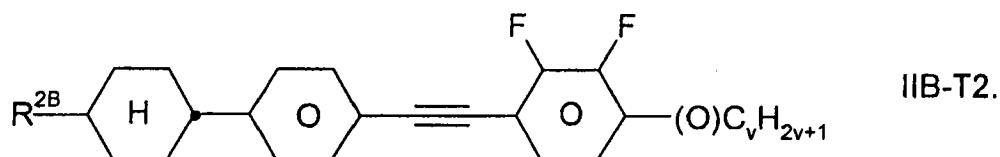


[0101] 优选的混合物包含式IIA-64a至式IIA-64n的至少一种化合物。

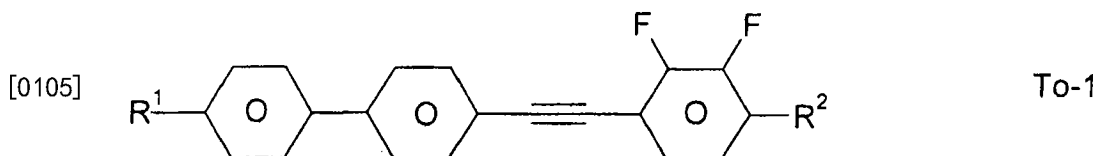
[0102] 优选的混合物包含一种或多种式IIB-T1和IIB-T2的二苯乙炔化合物。



[0103]



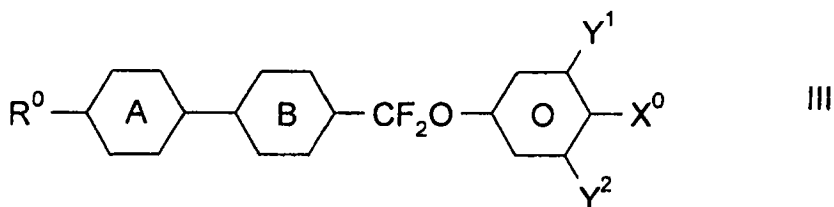
[0104] 根据本发明的混合物还可以包含至少一种式To-1的化合物

[0106] 其中R¹具有R^{2A}的含义并且R²具有(O)C_vH_{2v+1}的含义。R¹优选表示具有1-6个C原子的烷基。R²优选表示具有1-5个C原子的烷氧基,特别是OC₂H₅, OC₃H₇, OC₄H₉, OC₅H₁₁, 还有OCH₃。

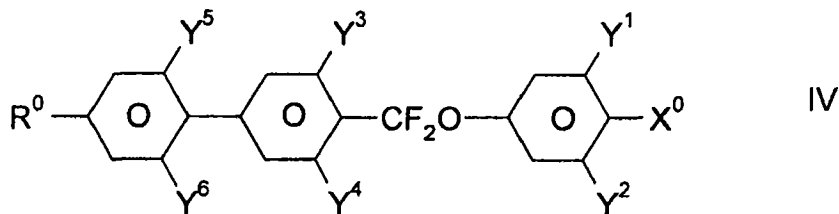
[0107] 基于整个混合物计,式IIB-T1和IIB-T2化合物优选以3-25重量%、特别是5-15重量%的浓度使用。

[0108] 根据本发明进一步优选的实施方式如下所示:

[0109] -介质还包含一种或多种式III和/或IV的化合物,



[0110]



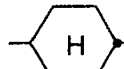
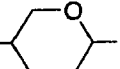
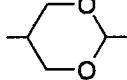
[0111] 其中

[0112] R^0 表示具有1-15个C原子的卤代或未取代的烷基或烷氧基,其中另外地这些基团中一个或多个 CH_2 基团可以各自彼此独立地被 $-C\equiv C-$, $-CF_2O-$, $-O-$, , , $-CH=CH-$, $-CO-O-$ 或 $-O-CO-$ 以O原子不彼此直接链接的方式代替,

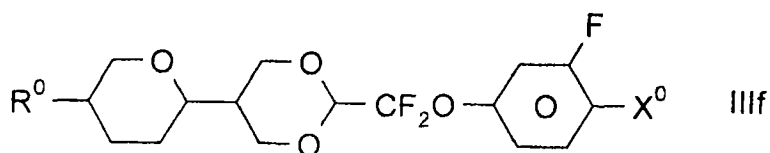
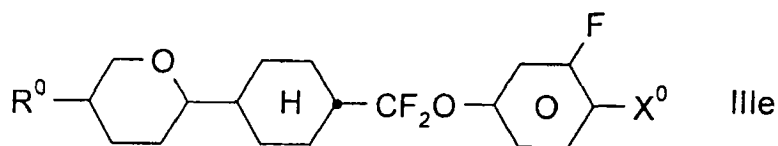
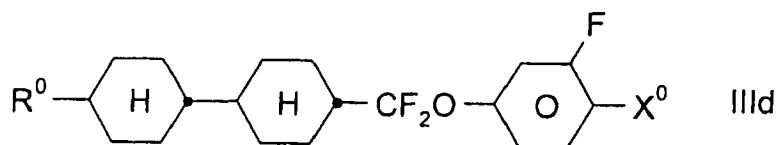
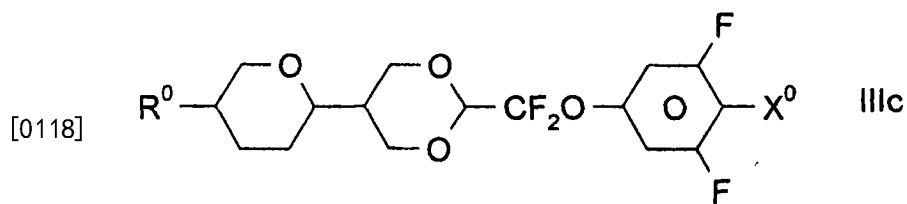
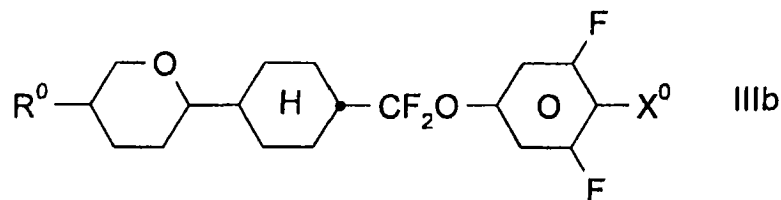
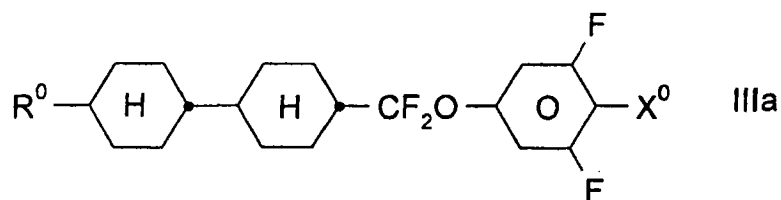
[0113] X^0 表示F, Cl, CN, SF_5 , SCN, NCS,各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基,

[0114] Y^{1-6} 各自彼此独立地表示H或F,

[0115]  和  各自彼此独立地表示

[0116] ,  或 。

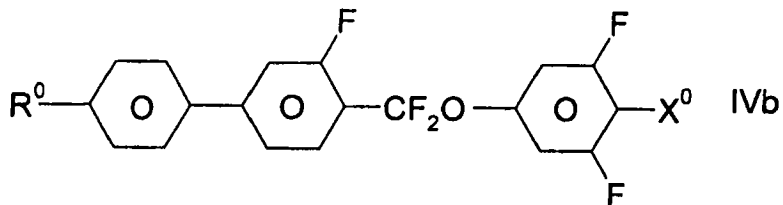
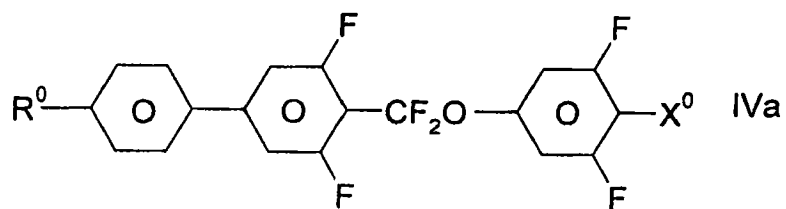
[0117] -式III化合物优选地选自下式:



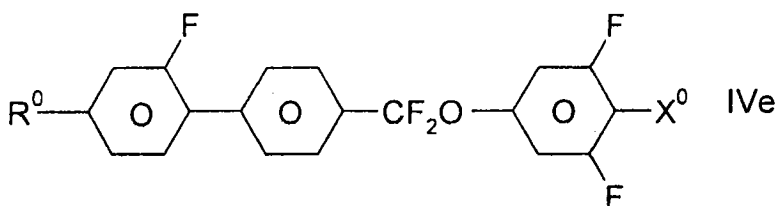
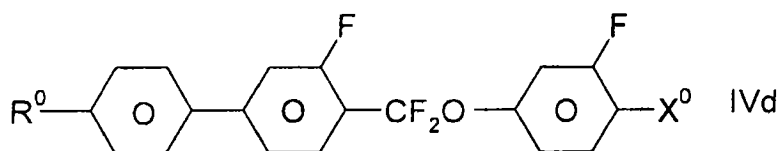
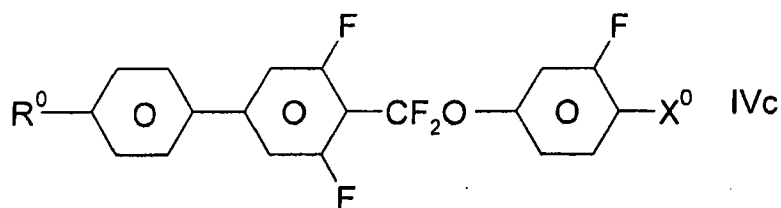
[0119] 其中R⁰和X⁰具有上述含义。

[0120] R⁰优选表示具有1-6个C原子的烷基。X⁰优选表示F。特别优选的是式IIIa和IIIb的化合物,特别是其中X表示F的式IIIa和IIIb化合物。

[0121] 一式IV化合物优选地选自下式:



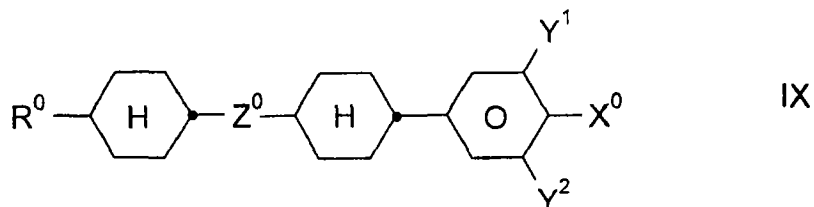
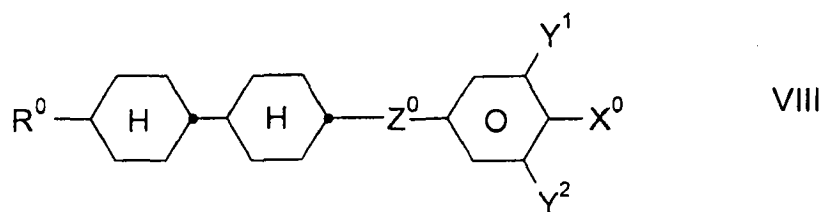
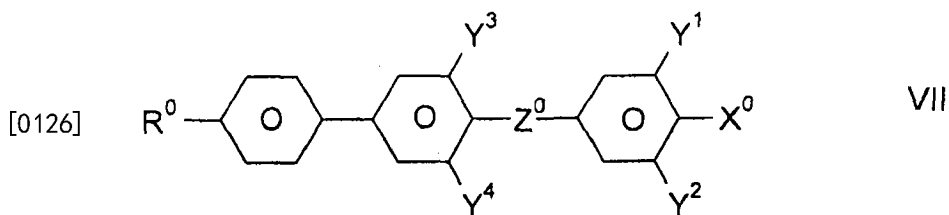
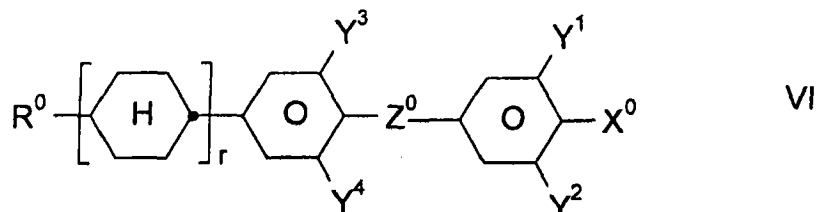
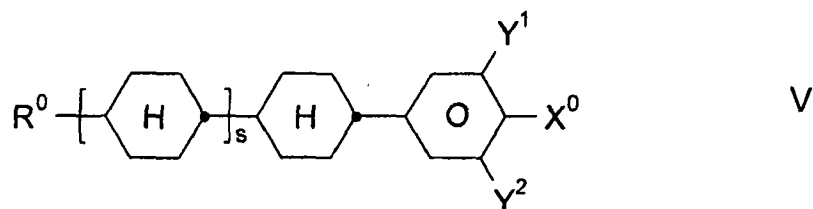
[0122]



[0123] 其中 R^0 和 X^0 具有上述含义。

[0124] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F, OCF₃或CF₃。特别优选的是式IVa和IVe的化合物,特别是式IVa的化合物;

[0125] 一介质还包含一种或多种选自下式的化合物:



[0127] 其中

[0128] R^0 表示具有1-15个C原子的卤代或未取代的烷基或烷氧基,其中另外地这些基团中一个或多个 CH_2 基团可以各自彼此独立地被 $-\text{C}\equiv\text{C}-$, $-\text{CF}_2\text{O}-$, $-\text{O}-$, $-\text{C}_6\text{H}_4-$, $-\text{C}_6\text{H}_2-$, $-\text{CH}=\text{CH}-$, $-\text{CO}-\text{O}-$ 或 $-\text{O}-\text{CO}-$ 以O原子不彼此直接键接的方式代替,

[0129] X^0 表示F, Cl, CN, SF_5 , SCN, NCS,各自具有至多6个C原子的卤代烷基、卤代烯基、卤代烷氧基或卤代烯氧基,

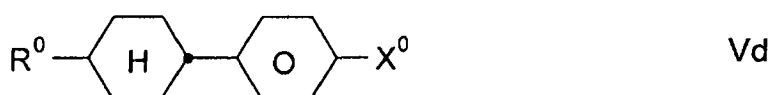
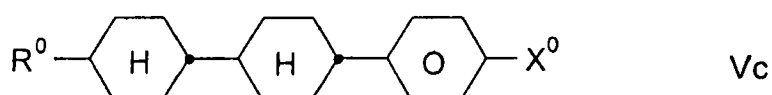
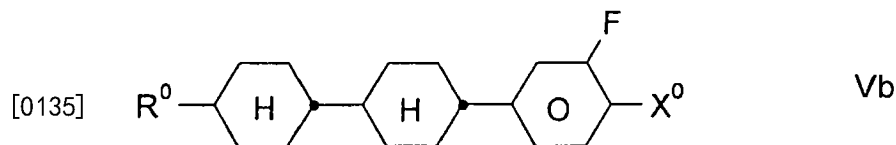
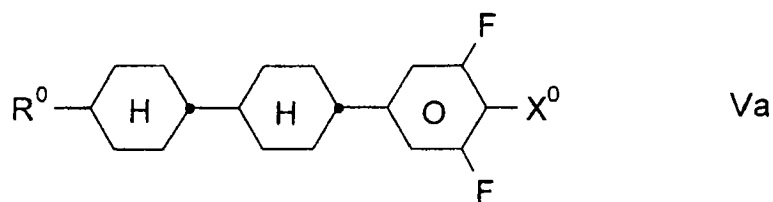
[0130] Y^{1-4} 各自彼此独立地表示H或F,

[0131] Z^0 表示 $-\text{C}_2\text{H}_4-$, $-(\text{CH}_2)_4-$, $-\text{CH}=\text{CH}-$, $-\text{CF}=\text{CF}-$, $-\text{C}_2\text{F}_4-$, $-\text{CH}_2\text{CF}_2-$, $-\text{CF}_2\text{CH}_2-$, $-\text{CH}_2\text{O}-$, $-\text{OCH}_2-$, $-\text{COO}-$ 或 $-\text{OCF}_2-$,并且在式VI和VII中也表示单键和在VI和IX中也表示 $-\text{CF}_2\text{O}-$,

[0132] r 表示0或1,以及

[0133] s 表示0或1;

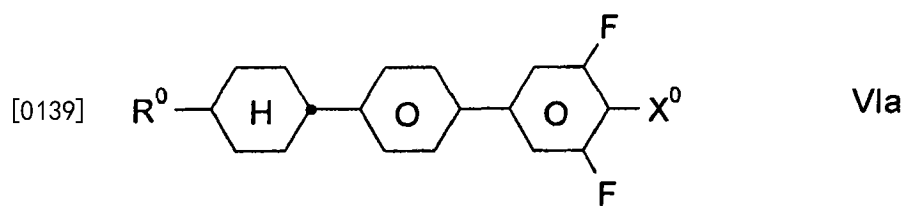
[0134] -式V化合物优选地选自下式:

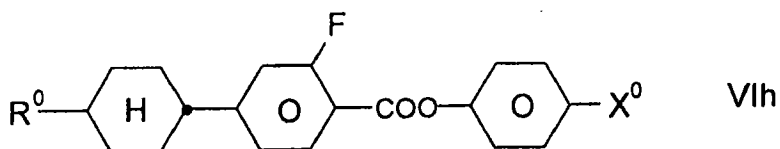
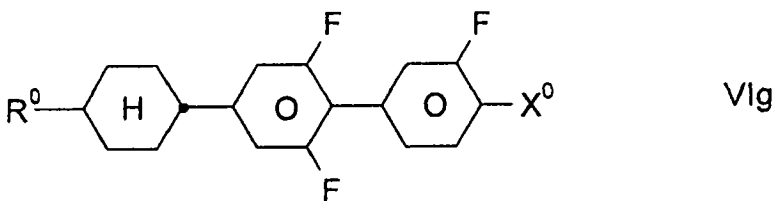
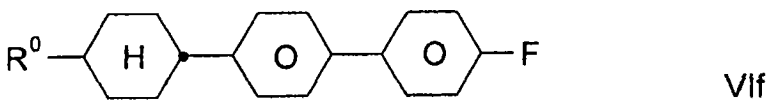
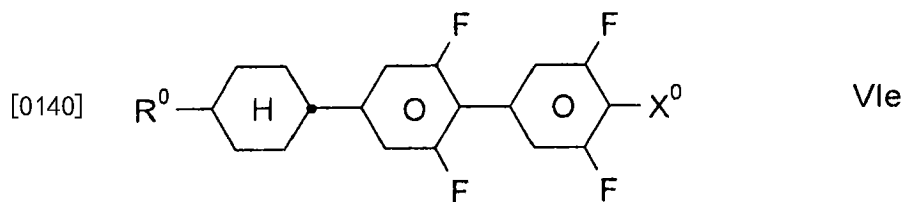
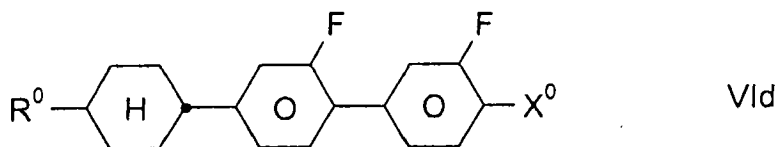
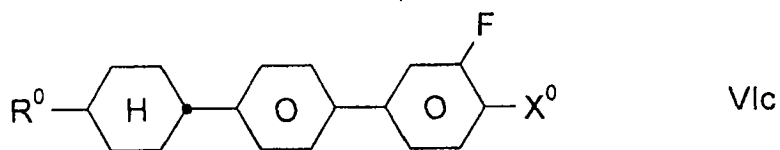
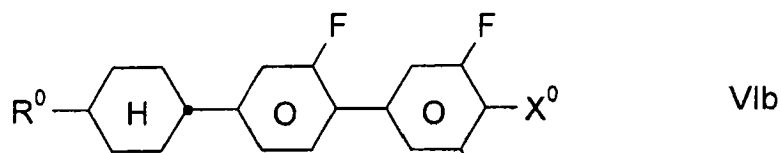


[0136] 其中 R^0 和 X^0 具有上述含义。

[0137] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F、 CF_3 或 OCF_3 ,还有 $OCF=CF_2$ 、 $OCH=CF_2$ 或Cl;

[0138] 式VI化合物优选地选自下式:

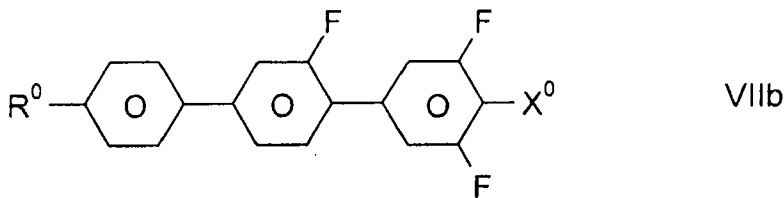
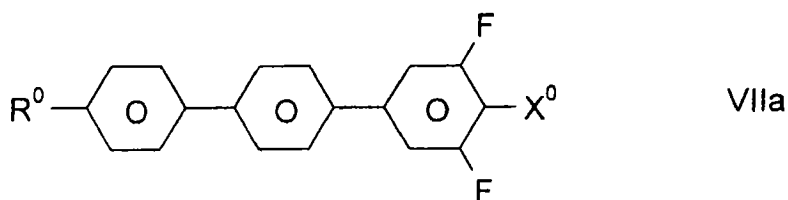




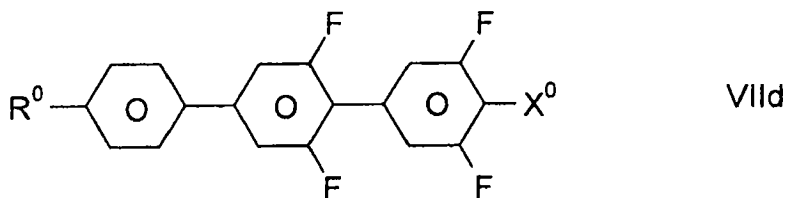
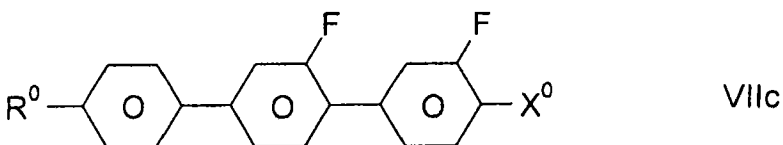
[0141] 其中 R^0 和 X^0 具有上述含义。

[0142] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F、 CF_3 或 OCF_3 ，还有 $OCHF_2$ 、 CF_3 、 $OCF=CF_2$ 或 $OCH=CF_2$ ；

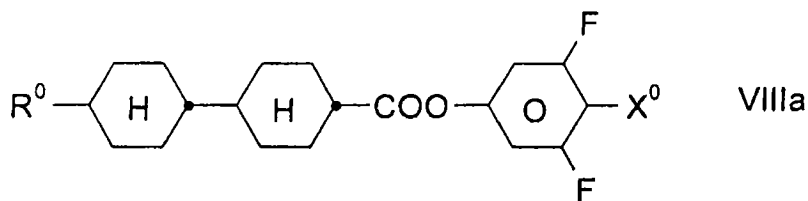
[0143] -式VII化合物优选地选自下式：



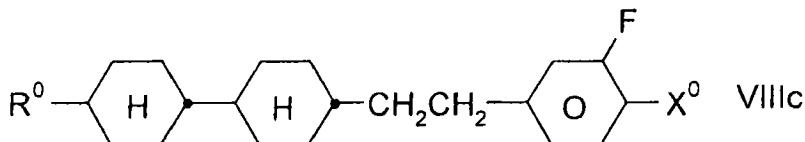
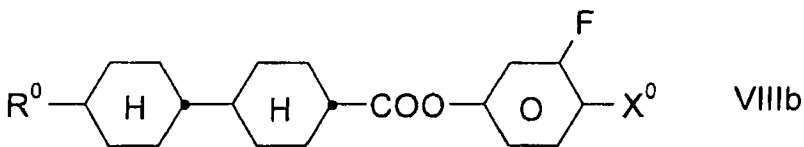
[0144]

[0145] 其中 R^0 和 X^0 具有上述含义。[0146] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F, 还有 OCF_3 , CF_3 , $CF=CF_2$, $OCF=CF_2$, $OCHF_2$ 以及 $OCH=CF_2$;

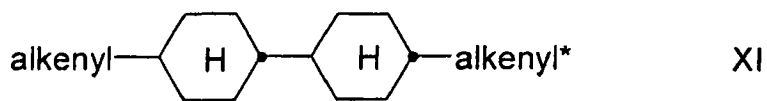
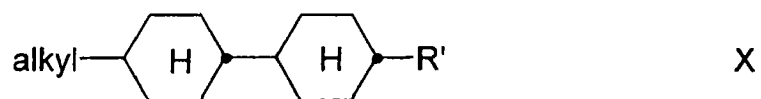
[0147] -式VIII化合物优选地选自下式:



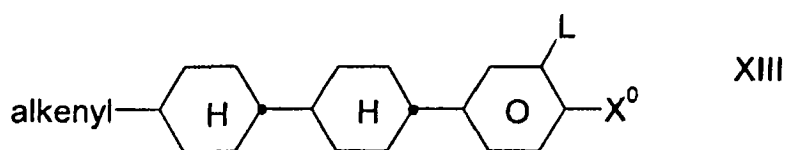
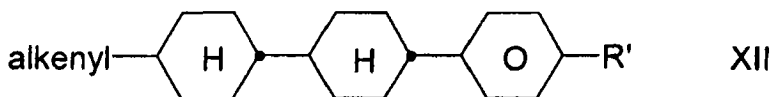
[0148]

[0149] 其中 R^0 和 X^0 具有上述含义。[0150] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F, 还有 OCF_3 , $OCHF_2$ 以及 $OCH=CF_2$;

[0151] -介质还包含一种或多种选自下式的化合物:



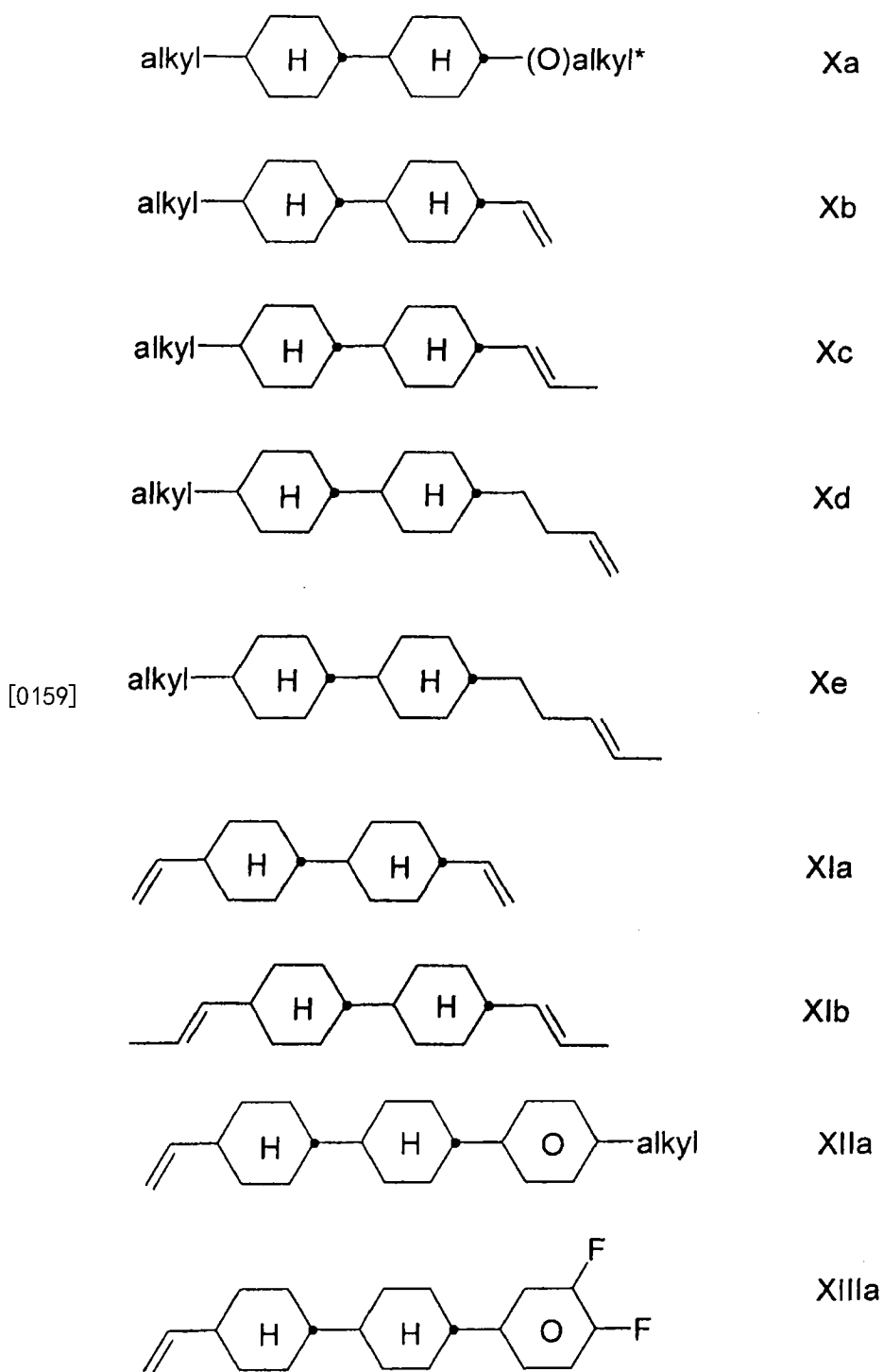
[0152]

[0153] 其中X⁰具有上述含义,以及

[0154] L表示H或F,

[0155] “alkyl”表示C₁₋₆烷基,[0156] R' 表示C₁₋₆烷基,C₁₋₆烷氧基或C₂₋₆烯基,以及[0157] “alkenyl”和“alkenyl*”各自彼此独立地表示C₂₋₆烯基。

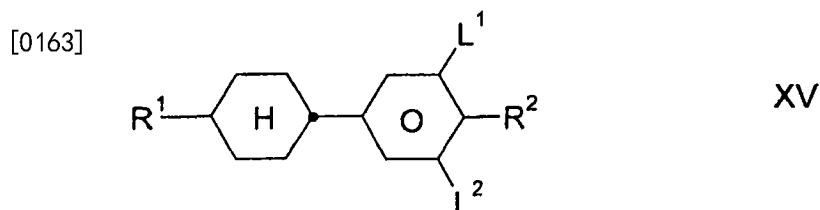
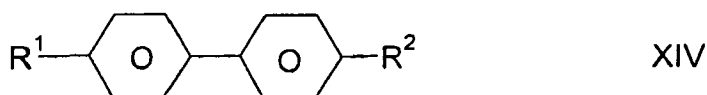
[0158] -式X-XIII化合物优选地选自下式:



[0160] 其中“alkyl”和alkyl*具有上述含义,并且(O)alkyl表示alkyl或O-alkyl(=烷氧基)。

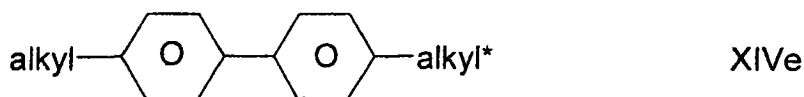
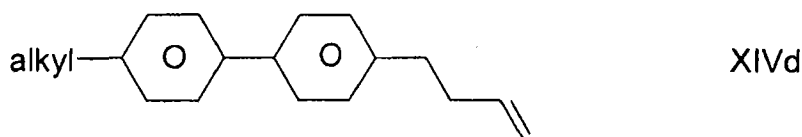
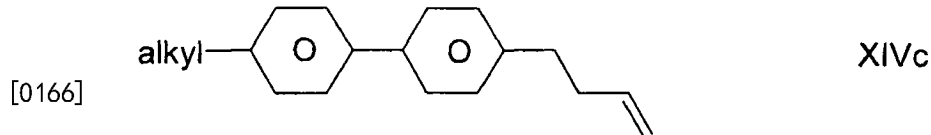
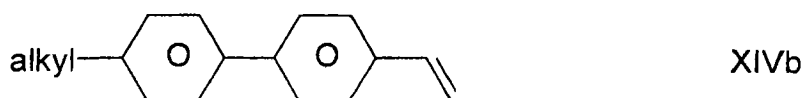
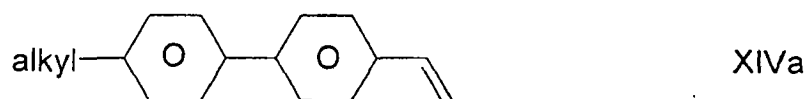
[0161] 特别优选的是式Xa,Xb,Xc,XIa,XIb,XIIa和XIIIa的化合物。在式X和XI中,“alkyl”优选各自彼此独立地表示n-C₃H₇,n-C₄H₉或n-C₅H₁₁,特别是n-C₃H₇。

[0162] 一介质还包含一种或多种选自下式的化合物:



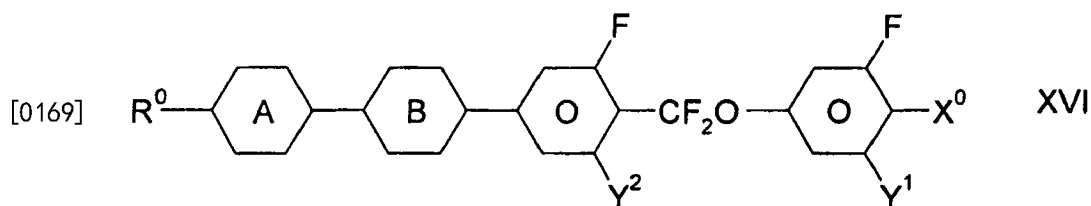
[0164] 其中 L^1 和 L^2 具有上述含义,并且 R^1 和 R^2 各自彼此独立地表示各自具有至多6个C原子的正烷基、烷氧基、氧杂烷基、氟烷基或烯基,并且优选各自彼此独立地表示具有1-6个C原子的烷基;在式XIV的化合物中,基团 R^1 和 R^2 的至少一个优选表示具有2-6个C原子的烯基或 R^1 和 R^2 各自独立地表示烷基。

[0165] -介质包含一种或多种式XIV的化合物,其中基团 R^1 和 R^2 的至少一个表示具有2-6个C原子的烯基。优选的式XIV化合物是下式化合物:

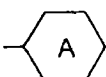


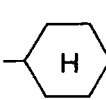
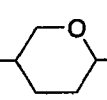
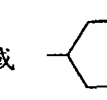
[0167] 其中“alkyl”和“alkyl*”具有上述含义;特别优选的是式XIVd和XIVE的化合物。

[0168] -介质包含一种或多种下式的化合物

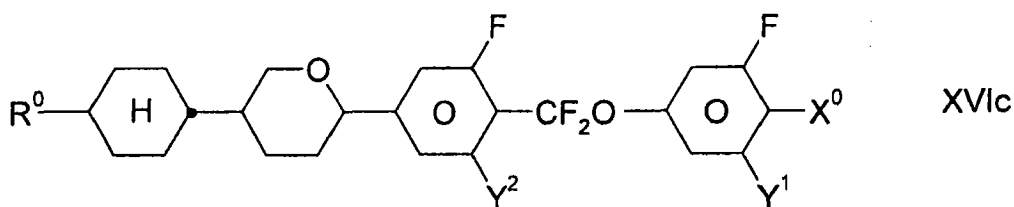
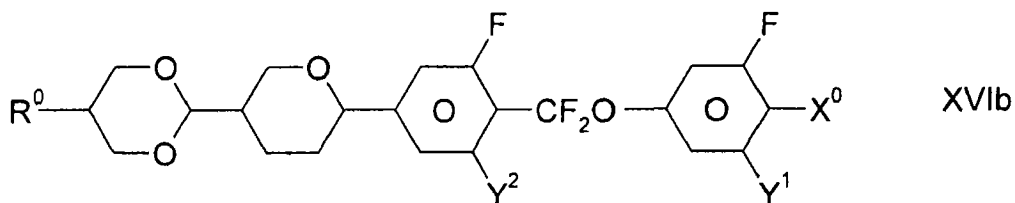
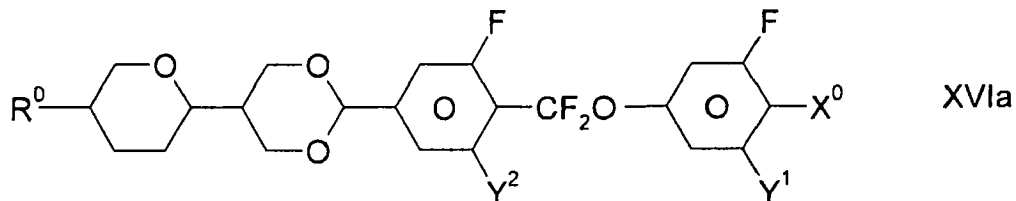


[0170] 其中 R^0 具有 R^A 的含义, X^0 具有 X^A 的含义,并且 Y^1 和 Y^2 各自独立地表示H或F,以及

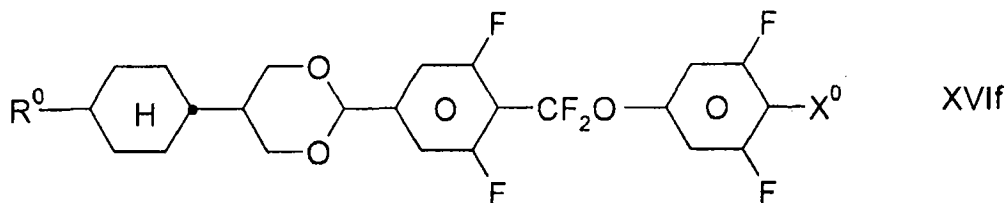
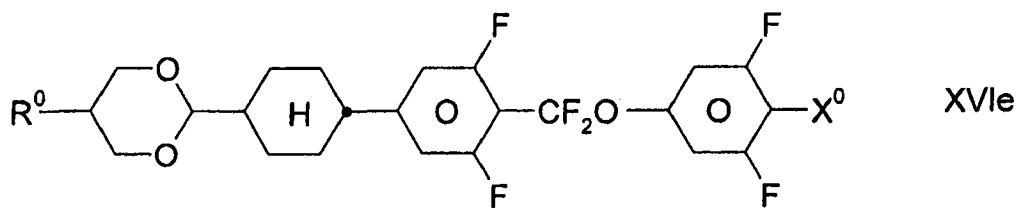
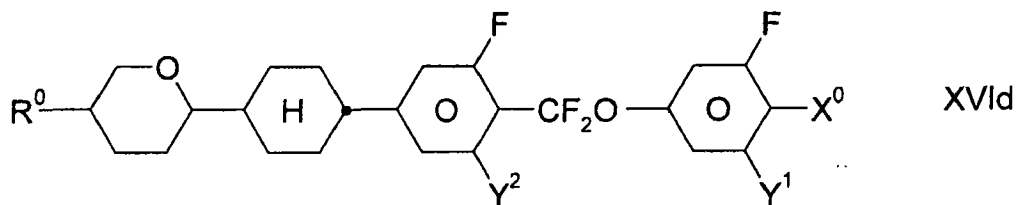
[0171]  和  各自彼此独立地表示

[0172] ,  或 。

[0173] -式XVI的化合物优选地选自下式:



[0174]

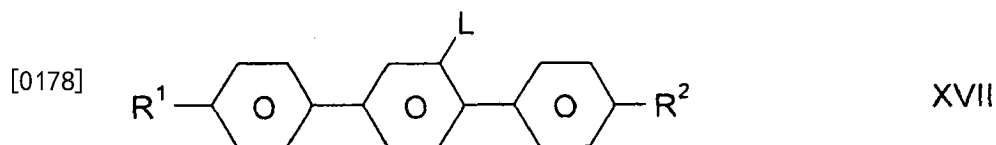


[0175] 其中 R^0 和 X^0 具有上述含义。

[0176] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F, 还有 OCF_3 。特别优选的式XVI化合物是其中 Y^1 表示F并且 Y^2 表示H或F、优选为F的那些。根据本发明的混合物特别优选包含至

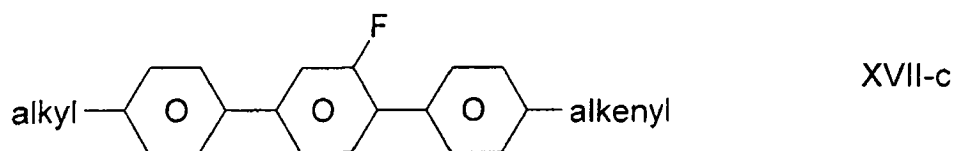
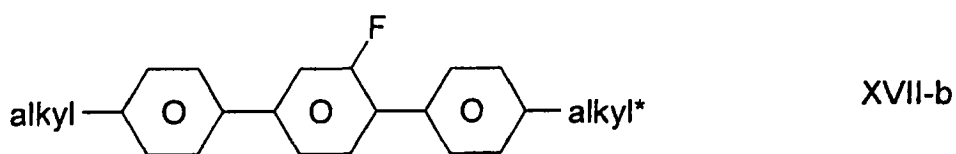
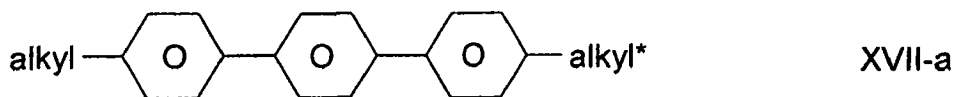
少一种式XVII-f的化合物。

[0177] -介质包含一种或多种式XVII化合物，

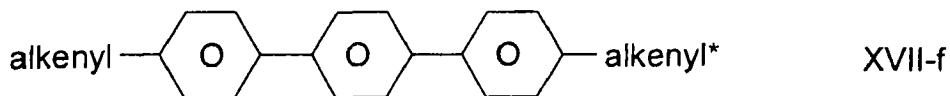
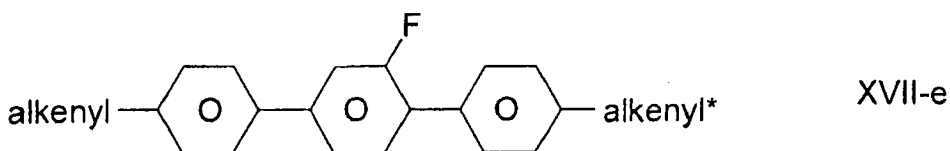
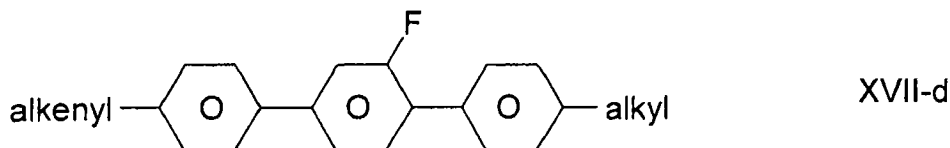


[0179] 其中R¹和R²具有上述含义。L是H或F，优选是F。优选R¹和R²各自彼此独立地表示具有1-6个C原子的烷基，或在L=F的情况下，R¹表示烷基并且R²表示烯基或者R¹表示烯基并且R²表示烷基。

[0180] 特别优选的式XVII化合物为下列子式的那些



[0181]

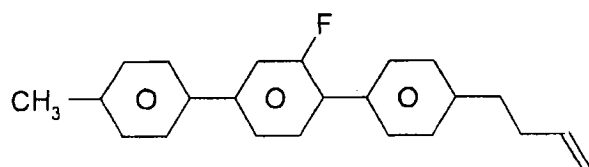
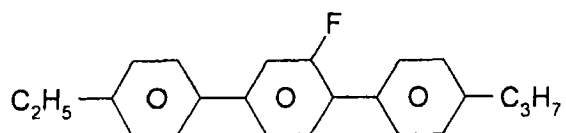
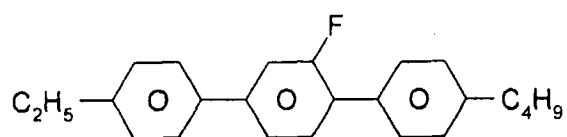
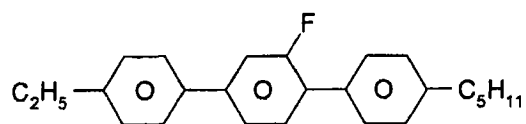


[0182] 其中

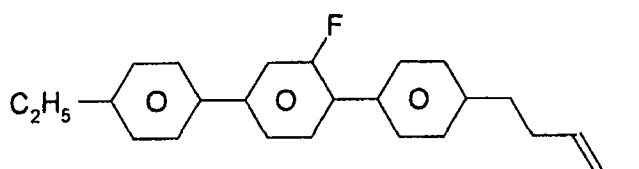
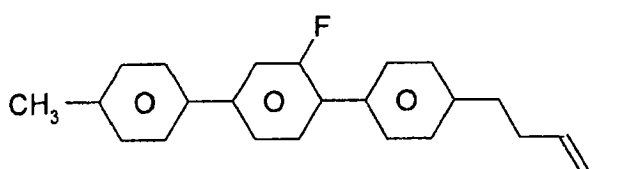
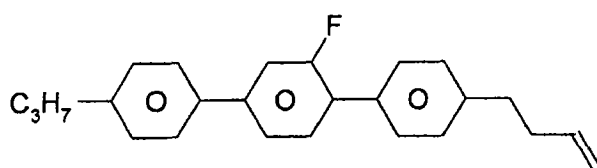
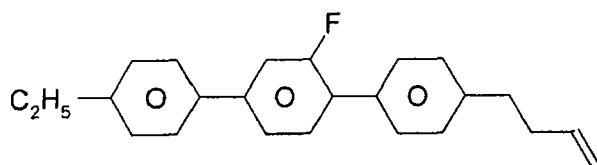
[0183] alkyl和alkyl*各自彼此独立地表示具有1-6个C原子的直链烷基，特别是乙基、丙基和戊基，

[0184] alkenyl和alkenyl*各自彼此独立地表示具有至少2-6个C原子的直链烯基，特别是CH₂=CHC₂H₄、CH₃CH=CHC₂H₄、CH₂=CH和CH₃CH=CH。

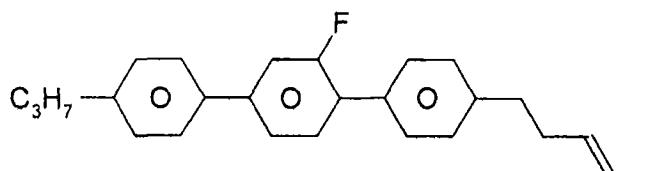
[0185] 特别优选的是式XVII-b和XVII-c化合物。非常特别优选的是下式化合物



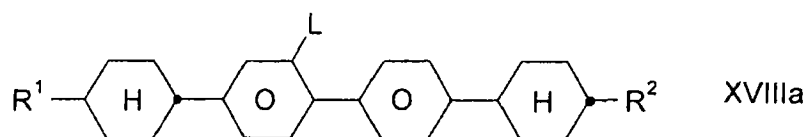
[0186]



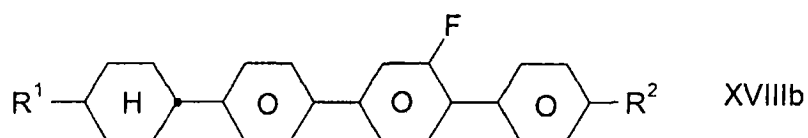
[0187]



[0188] -介质包含一种或多种下式化合物:

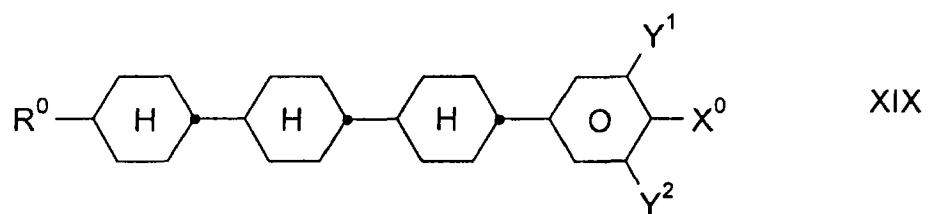


[0189]

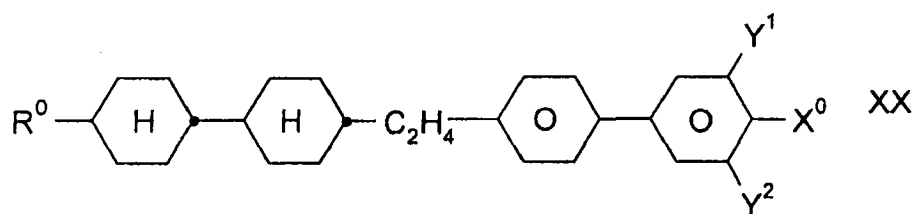


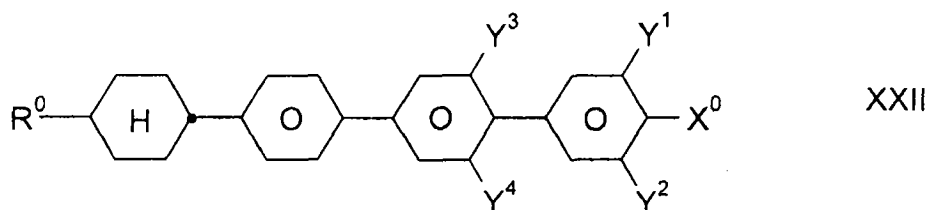
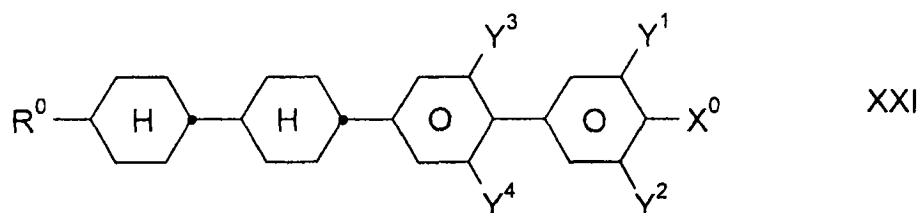
[0190] 其中 R^1 和 R^2 具有上述含义并且优选各自彼此独立地表示具有1-6个C原子的烷基。L表示H或F。

[0191] -介质还包含一种或多种选自下式的化合物：

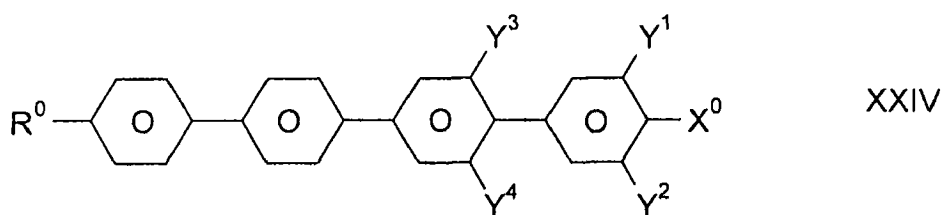
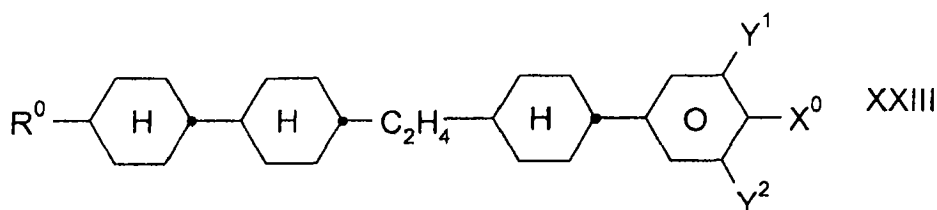


[0192]



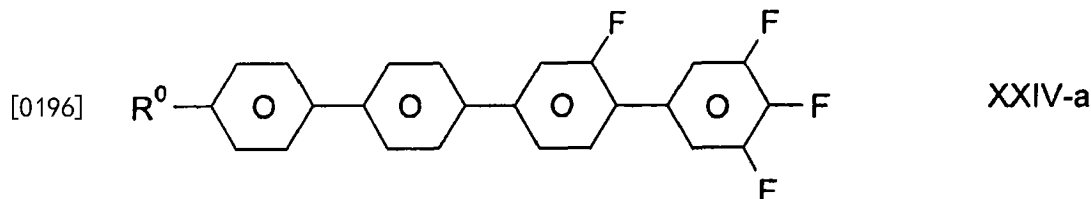


[0193]



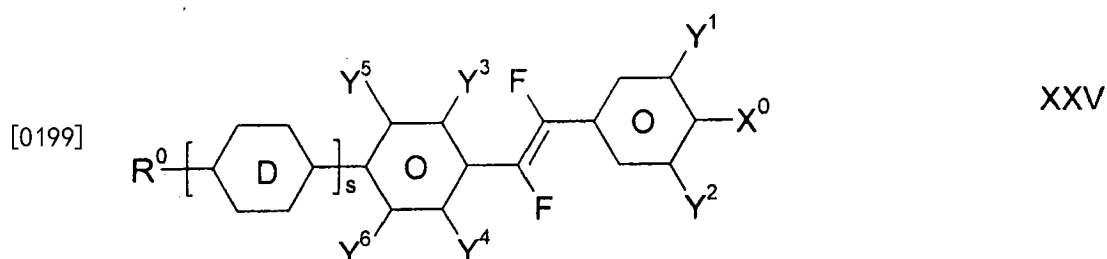
[0194] 其中 R^0 和 X^0 各自彼此独立地具有上述含义之一,并且 Y^{1-4} 各自彼此独立地表示H或F。 X^0 优选为F,Cl, CF_3 , OCF_3 或 $OCHF_2$ 。 R^0 优选表示各自具有至多6个C原子的烷基、烷氧基、氧杂烷基、氟烷基或烯基。

[0195] 根据本发明的混合物特别优选包含一种或多种式XXIV-a的化合物,



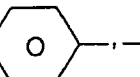
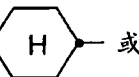
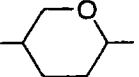
[0197] 其中 R^0 具有上述含义。 R^0 优选表示直链烷基,特别是乙基、正丙基、正丁基和正戊基以及非常特别优选正丙基。式XXIV、特别是式XXIV-a的化合物优选在根据本发明的混合物中以0.5-20重量%、特别优选1-15重量%的用量使用。

[0198] 所述介质另外包含一种或多种式XXV化合物,



[0199]

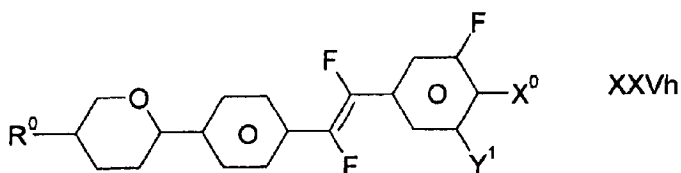
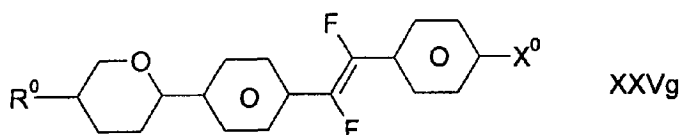
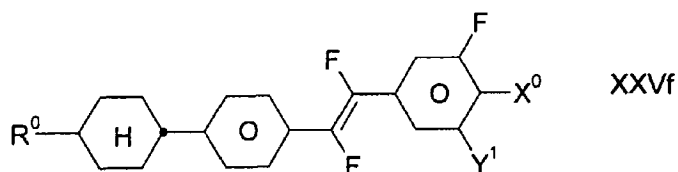
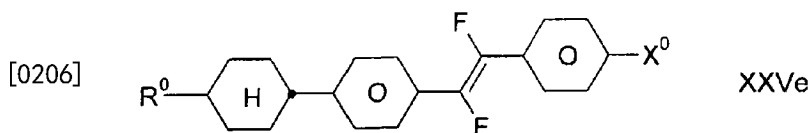
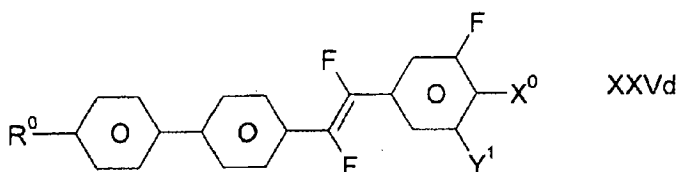
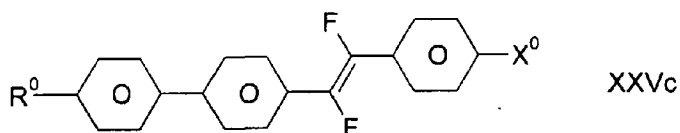
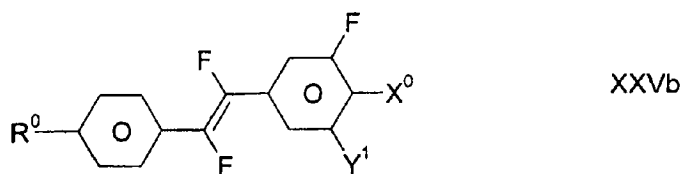
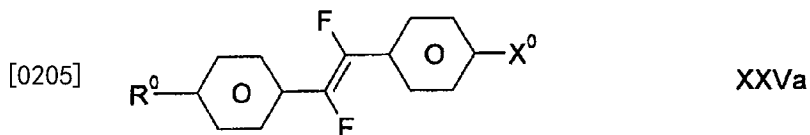
[0200] 其中 R^0 , X^0 和 Y^{1-6} 具有上述含义, s表示0或1, 并且

[0201]  表示 ,  或 

[0202] 在式XXV中, X^0 也可以表示具有1-6个C原子的烷基或具有1-6个C原子的烷氧基。烷基或烷氧基优选是直链的;

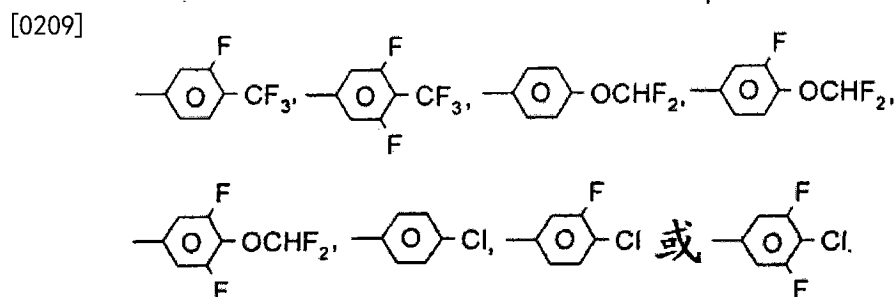
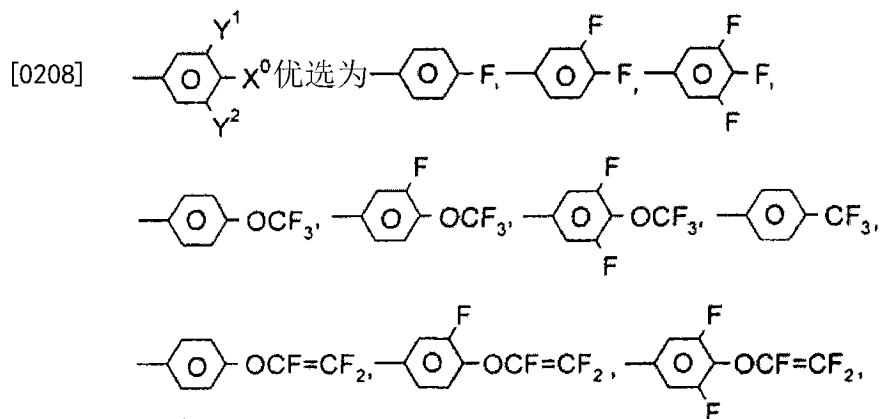
[0203] R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F;

[0204] 一式XXV化合物优选地选自下式:



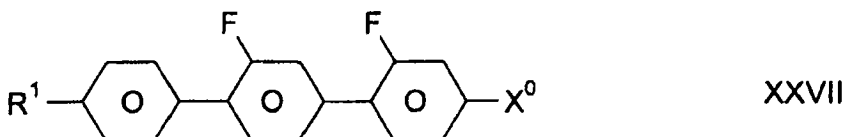
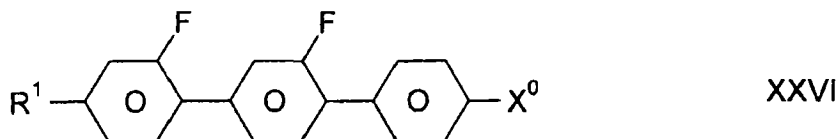
[0207] 其中 R^0 , X^0 和 Y^1 具有上述含义。 R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F, 以

及Y¹优选表示F;



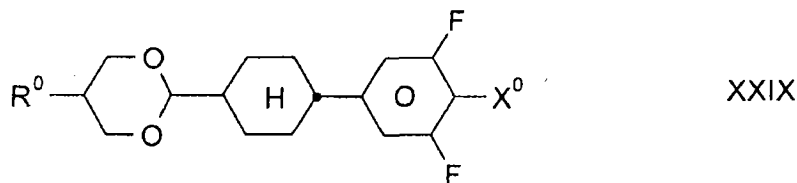
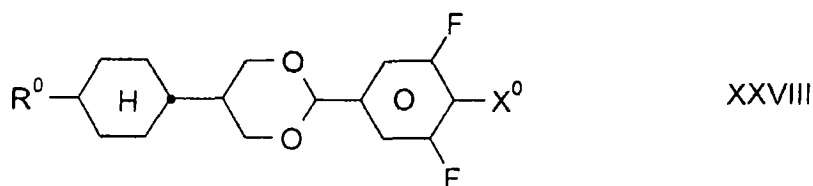
[0210] -R⁰是具有2-6个C原子的直链烷基或烯基;

[0211] -所述介质包含一种或多种下式的化合物:

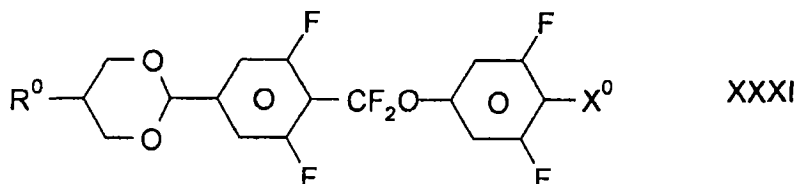
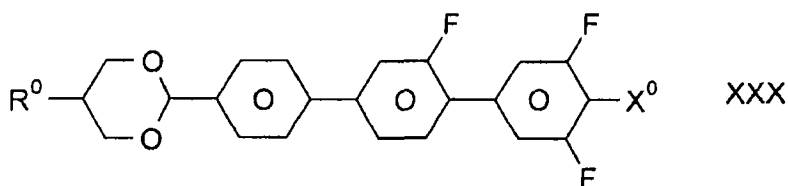


[0213] 其中R¹和X⁰具有上述含义。R¹优选表示具有1-6个C原子的烷基。X⁰优选表示F或Cl。在式XXVI中,X⁰非常特别优选表示Cl。

[0214] -介质包含一种或多种下式的化合物:

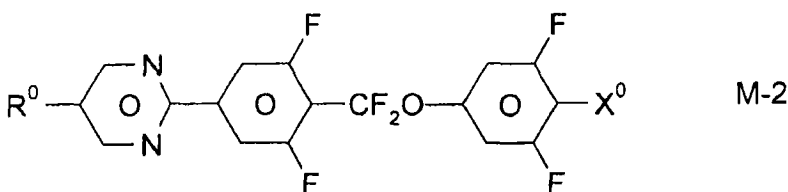
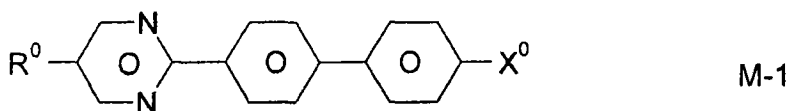


[0215]

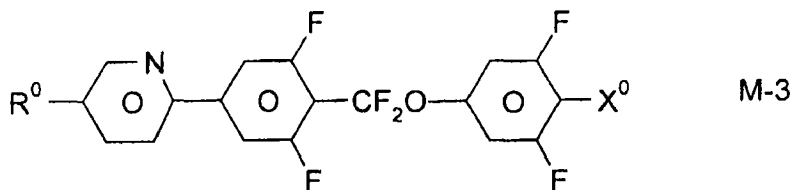


[0216] 其中 R^0 和 X^0 具有上述含义。 R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F。根据本发明的介质特别优选包含一种或多种式XXX的化合物,其中 X^0 优选表示F。式XXVIII至XXX的化合物优选在根据本发明的混合物中以1-20重量%,特别优选1-15重量%的用量使用。特别优选的混合物包含至少一种式XXX化合物。

[0217] 所述介质包含一种或多种下式的嘧啶或吡啶化合物:



[0218]



[0219] 其中 R^0 和 X^0 具有上述含义。 R^0 优选表示具有1-6个C原子的烷基。 X^0 优选表示F。根据本发明的介质特别优选包含一种或多种式M-1的化合物,其中 X^0 优选表示F。式M-1至M-3的

化合物优选在根据本发明的混合物中以1-20重量%、特别优选1-15重量%的用量使用。

[0220] 进一步特别优选的实施方式如下所示：

[0221] -所述介质包含两种或更多种式IA、特别是式IA-1b的化合物；

[0222] -所述介质包含2-50重量%、优选3-40重量%、特别优选5-15重量%的式IA化合物；

[0223] -所述介质包含3-40重量%、特别优选5-15重量%的至少一种式IV化合物；

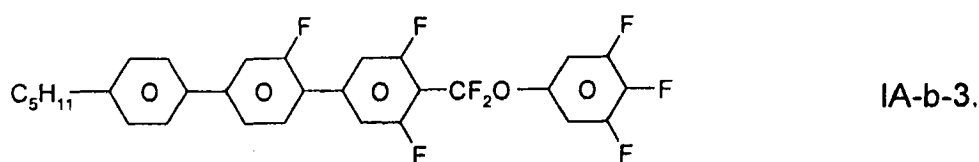
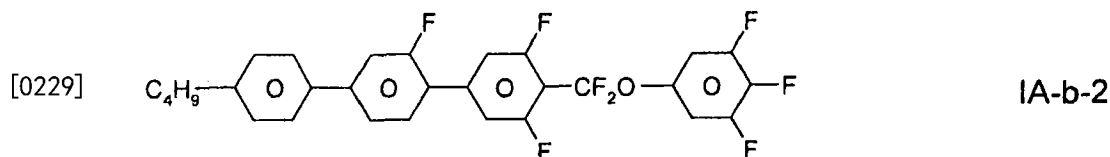
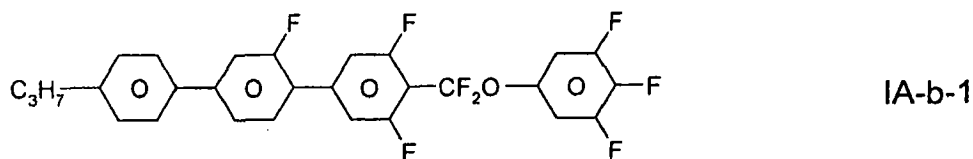
[0224] -所述介质包含5-30重量%、特别优选5-25重量%的式VII化合物；

[0225] -所述介质包含20-70重量%、特别优选25-65重量%的式X-XIV化合物；

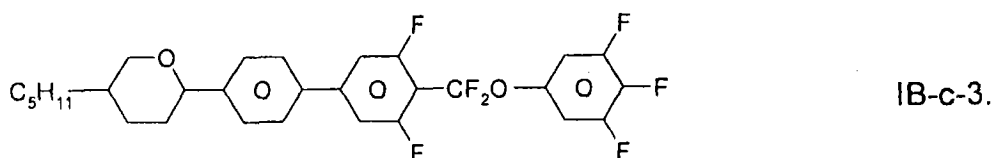
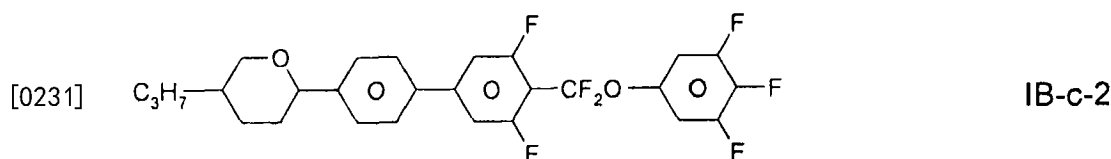
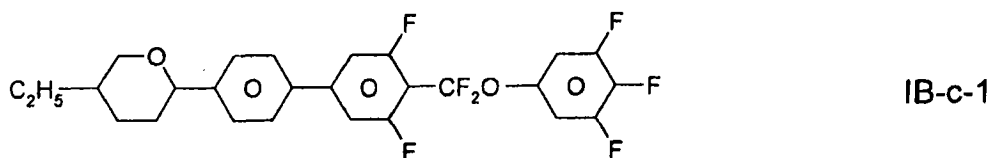
[0226] -所述介质包含3-40重量%、特别优选5-30重量%的式XVII化合物；

[0227] -所述介质包含1-20重量%、特别优选2-15重量%的式XVIII化合物；

[0228] -所述介质包含至少两种下式的化合物



[0230] -所述介质包含至少两种下式化合物



[0232] -所述介质包含至少两种式IA化合物和至少两种式IIB化合物；

[0233] -所述介质包含至少一种式IA化合物和至少一种式IIB化合物和至少一种式IIC化合物；

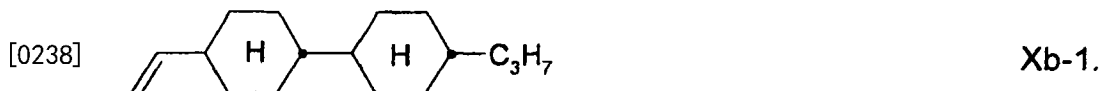
[0234] -所述介质包含至少两种式IA化合物和至少两种式IIB化合物和至少一种式IVa化

合物；

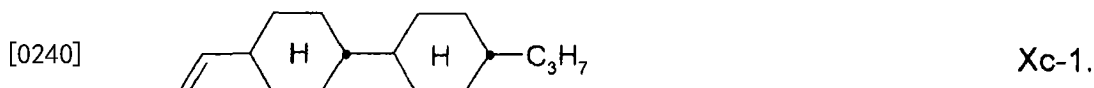
[0235] -所述介质包含 ≥ 20 重量%、优选 ≥ 25 重量%、特别优选 ≥ 30 重量%的一种或多种式IA化合物和一种或多种式IIB化合物；

[0236] -所述介质包含 ≥ 20 重量%、优选 ≥ 25 重量%、特别优选 ≥ 30 重量%的一种或多种式IA化合物和一种或多种式IIB化合物；

[0237] -所述介质包含 ≥ 20 重量%、优选 ≥ 24 重量%、更优选25-60重量%的式Xb化合物，特别是式Xb-1化合物，



[0239] -所述介质包含至少一种式XIb-1化合物和至少一种式Xc-1化合物；



[0241] -所述介质包含至少一种式DPGU-n-F化合物；

[0242] -所述介质包含至少一种式CDUQU-n-F化合物；

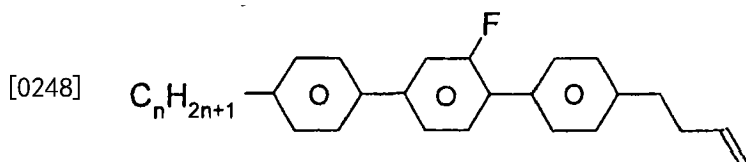
[0243] -所述介质包含至少一种式PUQU-n-F化合物；

[0244] -所述介质包含至少一种式APUQU-n-F化合物和至少一种式PGUQU-n-F化合物和至少一种式DPGU-n-F化合物；

[0245] -所述介质包含至少一种式PPGU-n-F化合物；

[0246] -所述介质包含至少一种式PGP-n-m的化合物、优选两种或三种化合物；

[0247] -所述介质包含至少一种具有下式的PGP-n-2V化合物



[0249] 其中n是1-6，优选2、3、4或5。

[0250] -所述介质包含至少一种式PYP-n-m化合物，优选含量为基于全部混合物计的1-20重量%。

[0251] -所述介质包含至少一种式IIA，IIB和IIC化合物，

[0252] -所述介质包含至少一种式PY-n-0m化合物，优选含量为基于全部混合物计的1-20重量%；

[0253] -所述介质包含至少一种式CY-n-0m化合物，优选含量为基于全部混合物计的1-20重量%；

[0254] -所述介质包含至少一种式Y-n0-0m化合物，优选含量为基于全部混合物计的1-20重量%；

[0255] -所述介质包含至少一种式PYP-n-m化合物，优选含量为基于全部混合物计的1-20重量%；

[0256] 已经发现， ≥ 20 重量%、优选 ≥ 25 重量%的式IA化合物与常规液晶材料混合，特别是与一种或多种式III至XXXI的化合物混合，会导致光稳定性明显提高并且导致低双折射值，同时观察到具有低的近晶-向列相转变温度的宽向列相，以及改善了贮存寿命。同时，该

混合物表现出相对低的阈值电压,曝露在UV光时具有非常好的VHR值,以及很高的清亮点。

[0257] 在本申请中,术语“烷基”或“烷基*”包括具有1-6个碳原子的直链和支链的烷基,特别是直链基团,甲基、乙基、丙基、丁基、戊基和己基。通常优选的是具有2-5个碳原子的基团。

[0258] 术语“烯基”或“烯基*”包括具有2-6个碳原子的直链和支链烯基,特别是直链基团。优选的烯基是C₂-C₇-1E-烯基、C₄-C₆-3E-烯基、特别是C₂-C₆-1E-烯基。特别优选的烯基的例子是乙烯基、1E-丙烯基、1E-丁烯基、1E-戊烯基、1E-己烯基、3-丁烯基、3E-戊烯基、3E-己烯基、4-戊烯基、4Z-己烯基、4E-己烯基和5-己烯基等。通常优选的是具有最多至5个碳原子的基团,特别是CH₂=CH, CH₃CH=CH。

[0259] 术语“氟烷基”优选包括具有末端氟的直链基团,即氟甲基、2-氟乙基、3-氟丙基、4-氟丁基、5-氟戊基、6-氟己基和7-氟庚基。但是,不排除氟的其它位置。

[0260] 术语“氧杂烷基”或“烷氧基”优选包括式C_nH_{2n+1}-O-(CH₂)_m的直链基团,其中n和m各自彼此独立地表示1至6。m还可以表示0。优选地,n=1且m=1-6或m=0且n=1-3。

[0261] 通过合适地选择R⁰和X⁰含义,可以以期望的方式改变寻址时间、阈值电压、透射特性线的陡度,等等。例如,与烷基和烷氧基相比,1E-烯基、3E-烯基、2E-链烯氧基等通常导致更短的寻址时间、改善的向列倾向和更高的弹性常数k₃₃(弯曲)与k₁₁(斜展)之间的比率。与烷基和烷氧基相比,4-烯基、3-烯基等通常得到更低的阈值电压和更低的k₃₃/k₁₁值。根据本发明的混合物的特征特别是高Δε值,因此与现有技术的混合物相比具有明显更快的响应时间。

[0262] 上述式的化合物的最佳混合比主要取决于期望的性能,取决于上述式的组分的选择以及取决于可能存在的任何其它组分的选择。

[0263] 上述范围内的合适的混合比可容易地根据情况而确定。

[0264] 根据本发明的混合物中上述式的化合物的总量并不是关键的。因此,混合物可以包含一种或多种用于优化各种性能目的其它组分。但是,观察到的混合物性能方面所期望的改善的效果越明显,上述式的化合物总浓度就越高。

[0265] 在特别优选的实施方式中,根据本发明的介质包含式III至IX(优选III、IV、V、VI和VII,特别是IIIIa和IVa)的化合物,其中X⁰表示F, OCF₃, OCHF₂, CF₃, OCF₂CHF₂CF₃, OCHF₂CF₃, CF₂H, OCH=CF₂, OCF=CF₂或OCF₂CF₂H。与式IA和IIA-IIC的化合物有利的协同作用会导致特别优异的性能。特别地,包含式IA化合物和至少一种式IIA、IIB和IIC化合物与至少一种式IIIIa和/或IVa化合物的混合物的显著特点在于它们的低阈值电压。

[0266] 在根据本发明的介质中可用的上述式及其子式的各个化合物是已知的,或可以与已知化合物类似地制备。

[0267] 本发明还涉及电光显示器,例如STN或MLC显示器,其具有两个与框架一起构成盒的平面平行的外板,用于切换外板上各个像素的集成非线性元件和位于盒中的具有正介电各向异性和高比电阻的含有这种类型介质的向列液晶混合物,还涉及这些介质用于电光学目的的用途。

[0268] 根据本发明的液晶混合物使得能够明显拓宽可用的参数范围。可实现的清亮点,低温粘度,热和UV稳定性以及高的光学各向异性的组合远优于现有技术中的先前的材料。

[0269] 根据本发明的混合物特别适用于TV,监视器,移动应用,智能手机,平板PC和PDA。

而且,根据本发明的混合物可以用于TN-TFT,FFS,VA-IPS,OCB和IPS显示器中。

[0270] 根据本发明的液晶混合物在20℃下的介电各向异性 $\Delta\epsilon$ 优选为 $\geq+3$,特别优选为 $\geq+8$,尤其优选为 ≥12 。

[0271] 根据本发明的液晶混合物在20℃下的双折射 Δn 优选为 ≥0.09 ,特别优选为 ≥0.10 。

[0272] 根据本发明的液晶介质具有从 $\leq-20^{\circ}\text{C}$ 至 $\geq70^{\circ}\text{C}$,特别优选从 $\leq-30^{\circ}\text{C}$ 至 $\geq80^{\circ}\text{C}$,非常特别优选从 $\leq-40^{\circ}\text{C}$ 至 $\geq90^{\circ}\text{C}$ 的向列相。

[0273] 因此,具有上述向列相范围的液晶混合物容许同时保持旋转粘度 γ_1 为 $\leq110\text{mPa}\cdot\text{s}$ 、特别优选 $\leq100\text{mPa}\cdot\text{s}$,并且从而可以获得具有快响应时间的优异的MLC显示器。旋转粘度在20℃下测定。

[0274] 术语“具有向列相”在此一方面指的是在相应温度下于低温下观察不到近晶相和介晶,且另一方面在由向列相加热时仍不出现澄清。低温下检测在相应温度下的流量式粘度计中进行,并且通过在具有时应于电光学应用的层厚度的测试盒中存储至少100小时而来检验。如果在相应测试盒中在 -20°C 的温度下储存稳定性为1000h或更高,则介质被认为在此温度下是稳定的。在 -30°C 和 -40°C 的温度下,相应的时间分别是500h和250h。在高温下,清亮点在毛细管中通过常规方法测量。

[0275] 根据本发明的液晶介质具有较低的阈值电压(V_0)数值。其优选在1.7V到3.0V的范围内,特别优选 $\leq2.5\text{V}$ 以及非常特别优选 $\leq2.3\text{V}$ 。

[0276] 另外,根据本发明的液晶介质在液晶盒中具有高的电压保持比数值。

[0277] 通常,具有低寻址电压或阈值电压的液晶介质显示出比具有较高寻址电压或阈值电压的那些液晶介质更低的电压保持比,并且反之亦然。

[0278] 对于本发明,术语“介电正性混合物或化合物”表示具有 $\Delta\epsilon>1.5$ 的混合物或化合物,术语“介电中性化合物”表示具有 $-1.5\leq\Delta\epsilon\leq1.5$ 的那些以及术语“介电负性化合物”表示具有 $\Delta\epsilon<-1.5$ 的那些。此处,化合物的介电各向异性通过以下方式确定:将10%的化合物溶解在液晶主体中并在于每一情形下具有20 μm 层厚度以及具有垂面和具有沿面的表面取向的至少一个测试盒中在1kHz下测定得到的混合物的电容。测量电压一般为0.5V到1.0V,但总是低于各个受试的液晶混合物的电容性阈值。

[0279] 本发明中所有上述温度值均以 $^{\circ}\text{C}$ 计。

[0280] 不言而喻,通过根据本发明混合物的组分的适当选择,在较高阈值电压下实现较高的清亮点(例如超过 100°C)或在较低的阈值电压下实现较低的清亮点并保留其它有益性质是可能的。在相应地仅仅略微增加的粘度下,同样可以获得具有较高 $\Delta\epsilon$ 以及由此低的阈值的混合物。根据本发明的MLC显示器优选在第一Gooch和Tarry的透射最小值(transmission minimum)操作[C.H.Gooch and H.A.Tarry,Electron.Lett.10,2-4,1974; C.H.Gooch and H.A.Tarry,Appl.Phys.,Vol.8,1575-1584,1975],其中除了特别有利的电光学性质,例如特性线的高陡度和对比度的低角度依赖性(德国专利30 22 818)外,在与在第二最小值下的类以显示器中相同的阈值电压下,较低的介电各向异性是足够的。由此使得使用本发明的混合物在第一最小值下能够获得比包含氰基化合物的混合物的情况显著更高的电阻率值。通过各个组分及其重量比的适当选择,本领域技术人员能够使用简单的路线方法设定为MLC显示器的预先确定的层厚度所需的双折射率。

[0281] 电压保持比 (HR) 的测量 [S. Matsumoto 等, Liquid Crystals 5, 1320 (1989); K. Niwa 等, Proc. SID Conference, San Francisco, 1984 年 6 月, 第 304 页 (1984); G. Weber 等, Liquid Crystals 5, 1381 (1989)] 已经表明, 根据本发明的包含式 IA 和 IB 化合物的混合物相比于包

含式 $\text{R}-\text{C}_6\text{H}_4-\text{C}_6\text{H}_4-\text{CN}$ 的氰基苯基环己烷或式 $\text{R}-\text{C}_6\text{H}_4-\text{C}(=\text{O})-\text{O}-\text{C}_6\text{H}_3(\text{F})-\text{CN}$ 的酯而不是式

IA、IIA 和 IIB 和 IIC 的化合物的类似混合物, 具有在 UV 曝露下明显更小的 HR 下降。

[0282] 根据本发明的混合物的光稳定性和 UV 稳定性显著更佳, 即它们显示出在曝露于光或 UV 时显著较小的 HR 下降。

[0283] 由起偏器、电极基板和表面处理的电极构成的本发明 MLC 显示器的构造相应于这类显示器的常规设计。术语“常规设计”在此处广义理解并且也包括 MLC 显示器的所有派生物和变形形式, 特别是包括基于 poly-Si TFT 或 MIM 的矩阵显示元件。

[0284] 然而, 根据本发明的显示器和迄今的基于扭曲向列盒的常规显示器之间的显著差异在于液晶层的液晶参数的选择。

[0285] 可根据本发明使用的液晶混合物本身以常规方式制备, 例如通过将一种或多种式 IA 的化合物与一种或多种式 IIA, IIB 和/或 IIC 化合物以及与一种或多种介晶性化合物, 优选至少一种式 III 至 XXX 化合物以及任选地与合适添加剂混合来制备。通常, 将以较小量使用的期望数量的组分有利地在升高的温度下溶于构成主要部分的组分中。也可以混合组分在有机溶剂中的溶液, 例如在丙酮、氯仿或甲醇中的溶液, 并在充分混合后再例如通过蒸馏除去溶剂。

[0286] 电介质还可以包含本领域技术人员已知的和文献中描述的其它添加剂, 例如 UV 稳定剂, 例如购自 Ciba Chemical 的 **Tinuvin®**, 如 **Tinuvin®** 770, 抗氧化剂, 如 TEMPOL, 微粒, 自由基清除剂, 纳米颗粒, 等等。例如, 可以添加 0-15% 的多向色性染料或手性掺杂剂。合适的稳定剂和掺杂剂在下面的表 C 和 D 中提到。

[0287] 还可将可聚合化合物, 所谓的反应性介晶 (RM), 例如公开在 U.S. 6,861,107 中的那些, 以基于混合物计优选 0.12-5 重量%、特别优选 0.2-2 重量% 的浓度加入到根据本发明的混合物中。这些混合物还可以任选地包含例如描述于 U.S. 6,781,665 中的引发剂。引发剂, 例如 Ciba 的 Irganox-1076, 优选以 0-1% 的量加入到包含可聚合化合物的混合物中。这类混合物可用于所谓的聚合物稳定 (PS) 的模式, 例如 PS-IPS, PS-FFS, PS-TN, PS-VA-IPS, 其中反应性介晶的聚合过程趋于在液晶混合物中进行。其前提是, 液晶混合物本身不包含任何可聚合的组分。

[0288] 在本发明的一个优选实施方式中, 可聚合化合物选自式 M 的化合物

[0289] $\text{R}^{\text{Ma}}-\text{A}^{\text{M1}}-(\text{Z}^{\text{M1}}-\text{A}^{\text{M2}})_{\text{m1}}-\text{R}^{\text{Mb}} \quad \text{M}$

[0290] 其中各基团具有以下含义:

[0291] R^{Ma} 和 R^{Mb} 各自彼此独立地表示 P、P-Sp-、H、卤素、SF₅、NO₂、烷基、烯基或炔基, 其中基团 R^{Ma} 和 R^{Mb} 的至少一个优选表示或者包含基团 P 或 P-Sp-,

[0292] P 表示可聚合基团,

[0293] Sp 表示间隔基团或单键,

[0294] A^{M1} 和 A^{M2} 各自彼此独立地表示优选具有 4-25 个环原子、优选 C 原子的芳族、杂芳族、脂环或杂环基团, 其也可以包括或包含稠环, 并且其可以任选地被 L 单或多取代,

[0295] L表示P、P-Sp-、OH、CH₂OH、F、Cl、Br、I、-CN、-NO₂、-NCO、-NCS、-OCN、-SCN、-C(=O)N(R^x)₂、-C(=O)Y¹、-C(=O)R^x、-N(R^x)₂、任选地被取代的甲硅烷基、任选取代的具有6-20个C原子的芳基,或具有1-25个C原子的直链或支链的烷基、烷氧基、烷基羰基、烷氧基羰基、烷基羰基氧基或烷氧基羰基氧基,其中另外地一个或多个H原子可以被F、Cl、P或P-Sp-,优选P、P-Sp-、H、OH、CH₂OH、卤素、SF₅、NO₂、烷基、烯基或炔基取代,

[0296] Y¹表示氢,

[0297] Z^M表示-0-、-S-、-CO-、-CO-O-、-OCO-、-O-CO-O-、-OCH₂-、-CH₂O-、-SCH₂-、-CH₂S-、-CF₂O-、-OCF₂-、-CF₂S-、-SCF₂-、-(CH₂)_{n1}-、-CF₂CH₂-、-CH₂CF₂-、-(CF₂)_{n1}-、-CH=CH-、-CF=CF-、-C≡C-、-CH=CH-、-COO-、-OCO-CH=CH-、CR⁰R⁰⁰或单键,

[0298] R⁰和R⁰⁰各自彼此独立地表示H或者具有1-12个C原子的烷基,

[0299] R^x表示P、P-Sp-、H、卤素,具有1-25个C原子的直链、支链或环状烷基,其中另外地一个或多个不相邻的CH₂基团可以被-0-、-S-、-CO-、-CO-O-、-O-CO-、-O-CO-O-以使得O和/或S原子不彼此直接键接的方式代替,并且其中一个或多个H原子也可以被F、Cl、P或P-Sp-代替,任选取代的具有6-40个C原子的芳基或芳氧基,或者任选取代的具有2-40个C原子的杂芳基或杂芳氧基,

[0300] m1表示0、1、2、3或4,以及

[0301] n1表示1、2、3或4,

[0302] 其中,来自基团R^{Ma}、R^{Mb}和取代基L的存在的至少一个,优选一个、两个或三个,特别优选一个或两个表示基团P或P-Sp-或包含至少一个基团P或P-Sp-。

[0303] 特别优选的式M化合物是如下这些,其中:

[0304] R^{Ma}和R^{Mb}各自彼此独立地表示P、P-Sp-、H、F、Cl、Br、I、-CN、-NO₂、-NCO、-NCS、-OCN、-SCN、SF₅或具有1-25个C原子的直链或支链的烷基,其中另外地一个或多个不相邻的CH₂基团可以各自彼此独立地被-C(R⁰)=C(R⁰⁰)-、-C≡C-、-N(R⁰⁰)-、-O-、-S-、-CO-、-CO-O-、-O-CO-、-O-CO-O-以使得O和/或S原子不彼此直接键接的方式代替,并且其中一个或多个H原子也可以被F、Cl、Br、I、CN、P或P-Sp-代替,其中基团R^{Ma}和R^{Mb}的至少一个优选表示或者包含基团P或P-Sp-,

[0305] A^{M1}和A^{M2}各自彼此独立地表示1,4-亚苯基、萘-1,4-二基、萘-2,6-二基、菲-2,7-二基、蒽-2,7-二基、茚-2,7-二基、香豆素、黄酮,其中在这些基团中一个或多个CH基团也可以被N代替,环己烷-1,4-二基,其中一个或多个不相邻的CH₂基团也可以被O和/或S代替,1,4-亚环己基、双环[1.1.1]戊烷-1,3-二基、双环[2.2.2]辛烷-1,4-二基、螺[3.3]庚烷-2,6-二基、哌啶-1,4-二基、十氢化萘-2,6-二基、1,2,3,4-四氢化萘-2,6-二基、茚满-2,5-二基或八氢-4,7-桥亚甲基茚满-2,5-二基,其中所有这些基团可以未取代或者被L单或多取代,

[0306] L表示P、P-Sp-、OH、CH₂OH、F、Cl、Br、I、-CN、-NO₂、-NCO、-NCS、-OCN、-SCN、-C(=O)N(R^x)₂、-C(=O)Y¹、-C(=O)R^x、-N(R^x)₂、任选取代的甲硅烷基、任选取代的具有6-20个C原子的芳基,或者具有1-25个C原子的直链或支化的烷基、烷氧基、烷基羰基、烷氧基羰基、烷基羰基氧基或烷氧基羰基氧基,其中一个或多个H原子也可以被F、Cl、P或P-Bp-代替,

[0307] P表示可聚合基团,

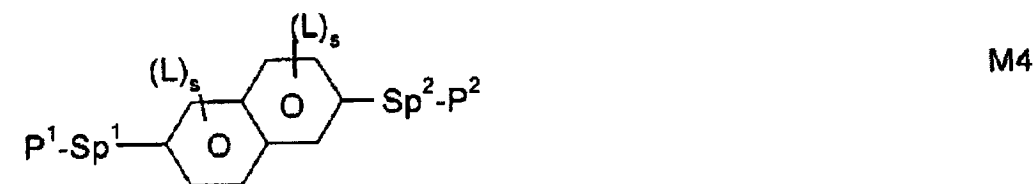
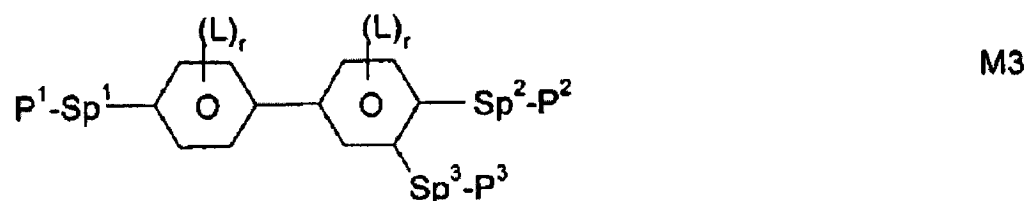
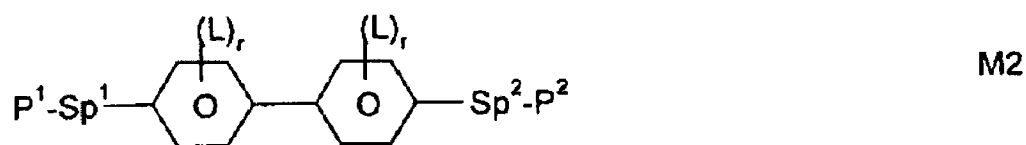
[0308] Y¹表示卤素,

[0309] R^x表示P、P-Sp-、H、卤素,具有1-25个C原子的直链、支化或环状烷基,其中一个或

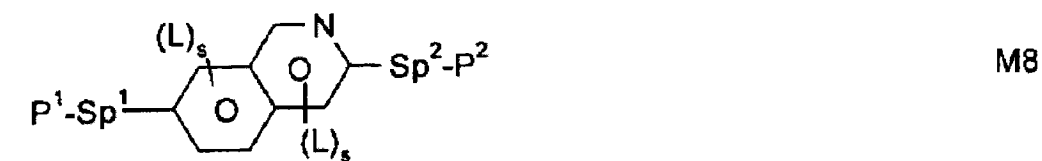
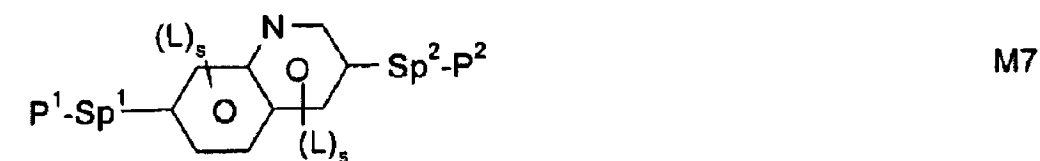
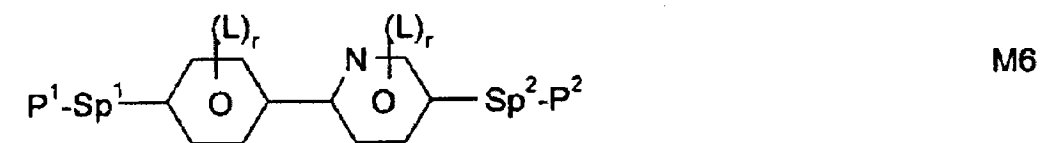
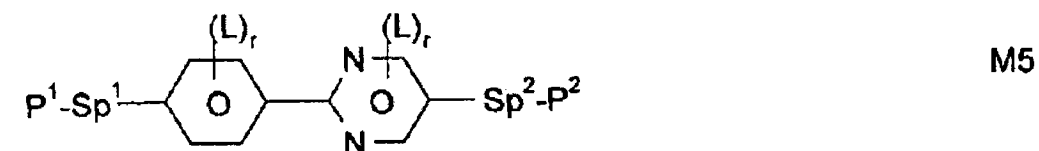
多个不相邻的CH₂基团也可以被-O-、-S-、-CO-、-CO-O-、-O-CO-、-O-CO-O-以使得O和/或S原子不彼此直接链接的方式代替,并且其中一个或多个H原子也可以被F、Cl、P或P-Sp-代替,任选取代的具有6-40个C原子的芳基或芳氧基,或者任选取代的具有2-40个C原子的杂芳基或杂芳氧基。

[0310] 非常特别优选的是其中R^{Ma}和R^{Mb}的一个或两个表示P或P-Sp-的式M的化合物。

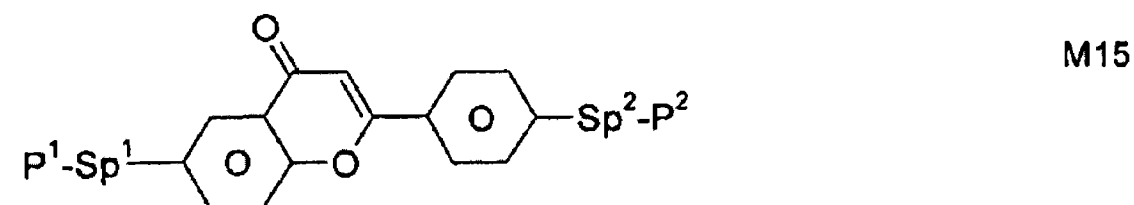
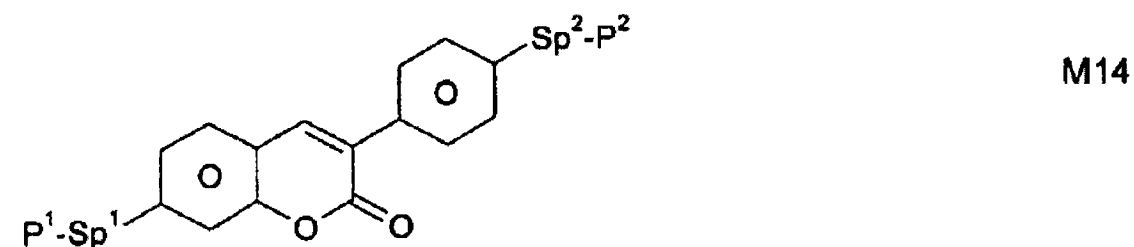
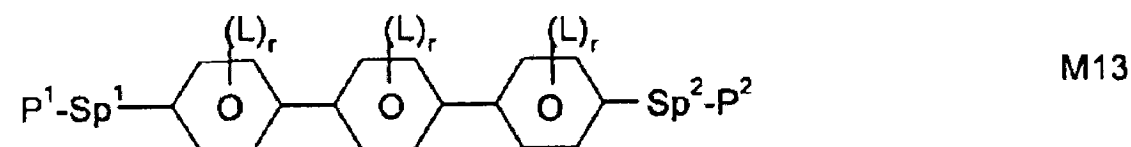
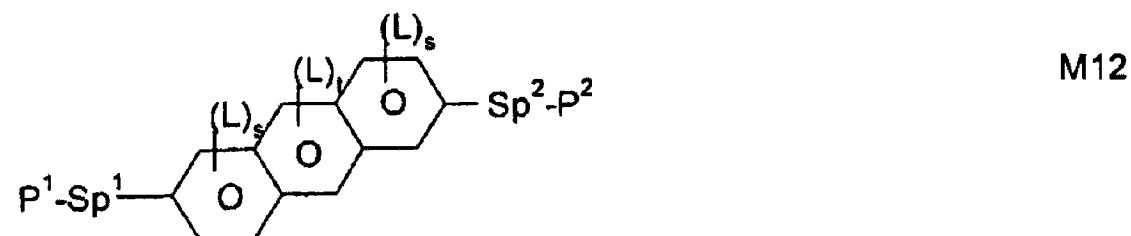
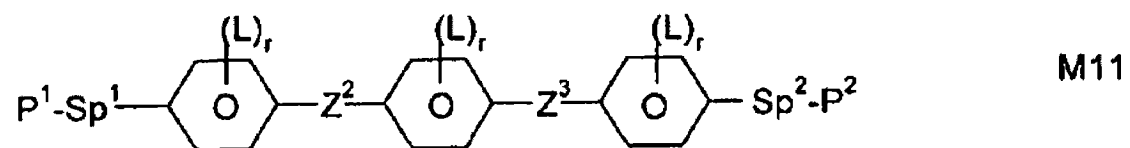
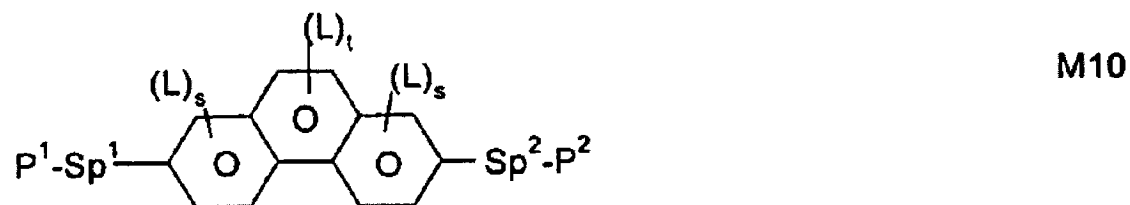
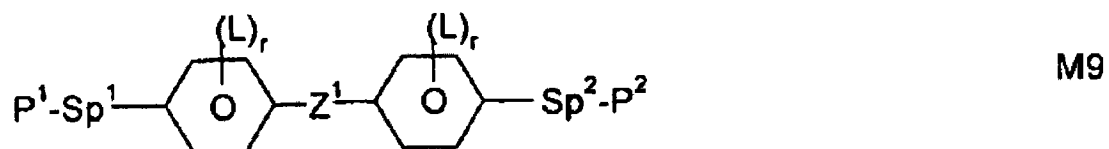
[0311] 用于根据本发明的液晶介质和PS模式显示器的合适和优选的RM例如选自下式:

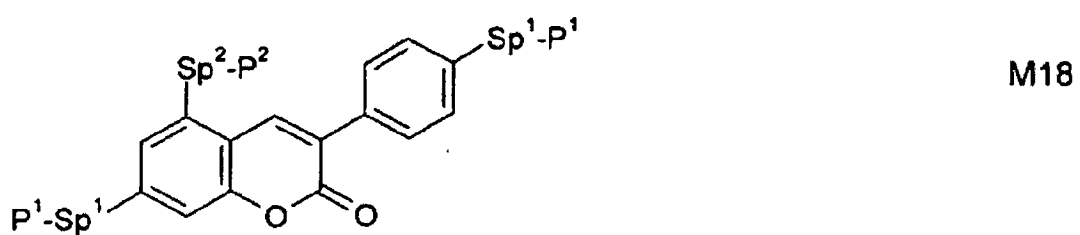
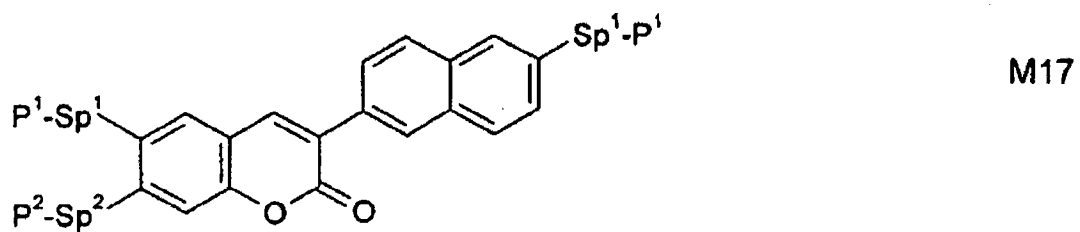
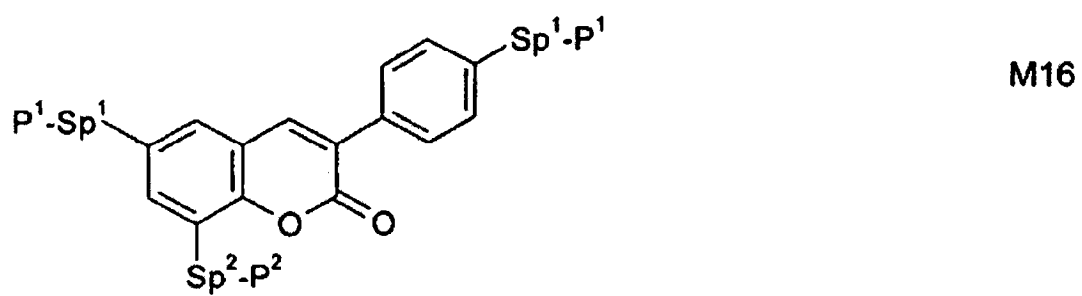


[0312]

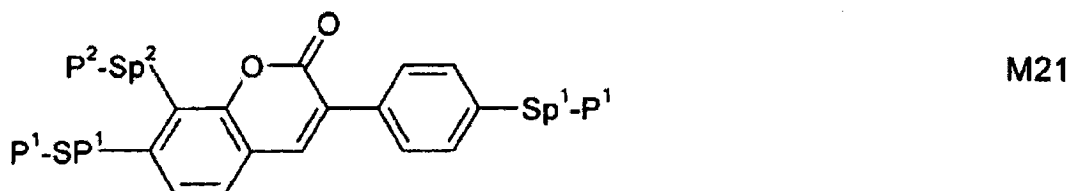
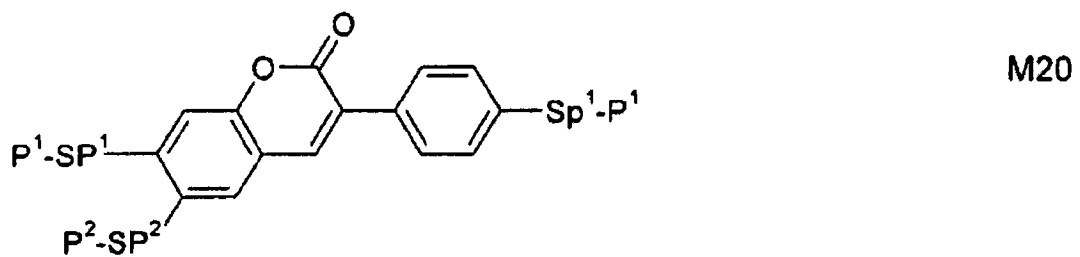
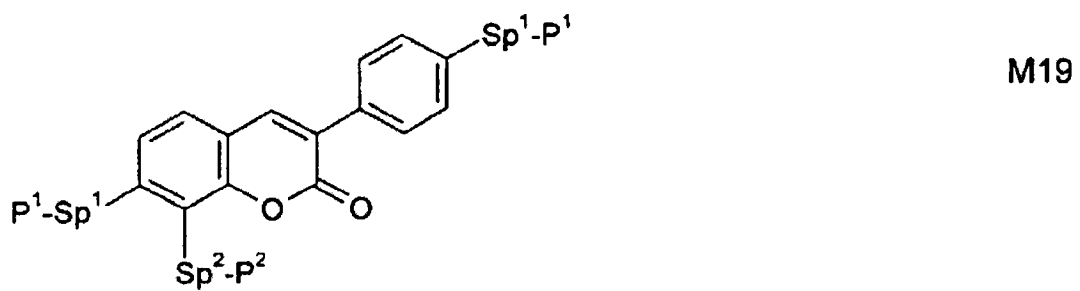


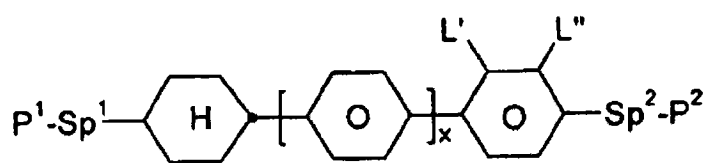
[0313]



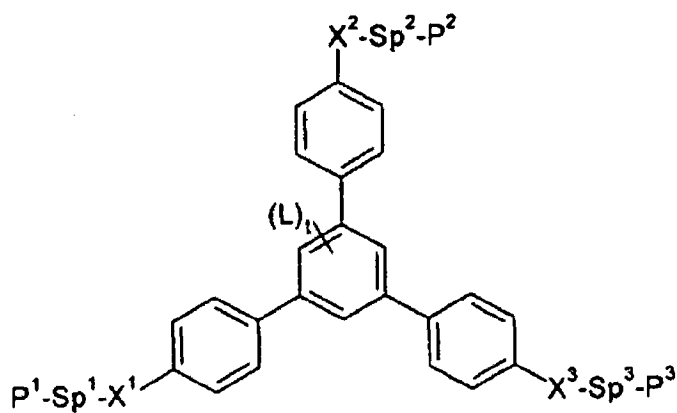


[0314]

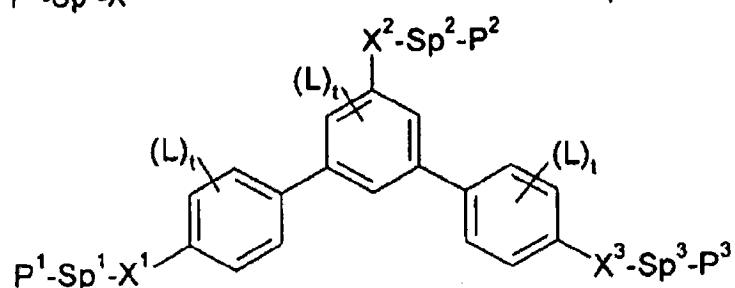




M22

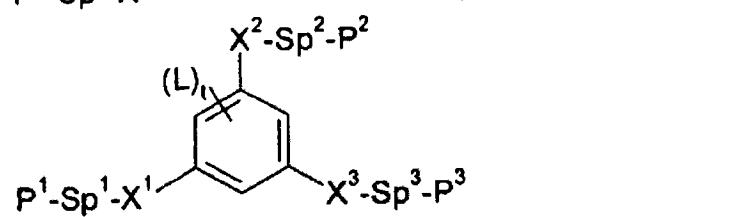


M23

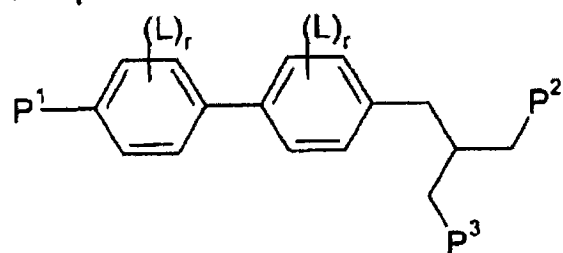


M24

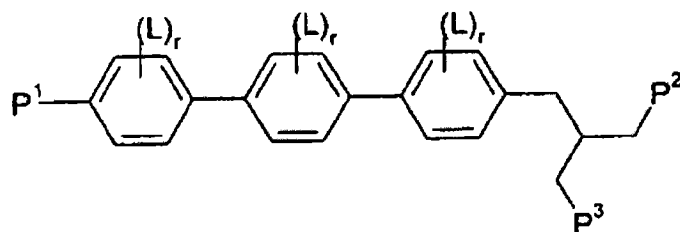
[0315]



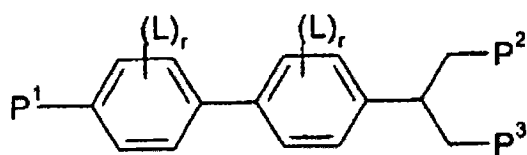
M25



M26

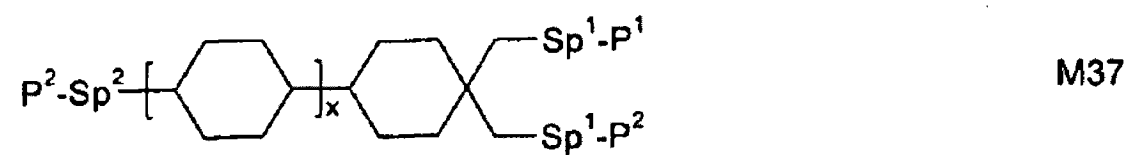
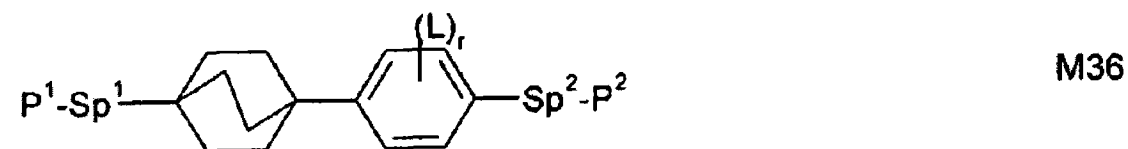
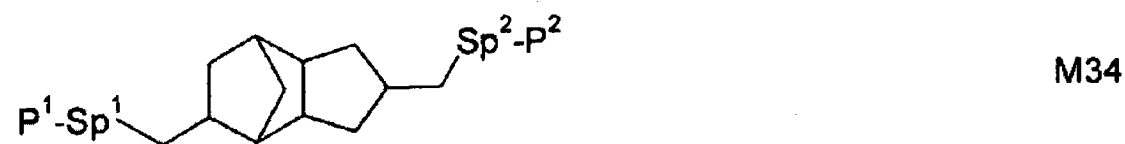
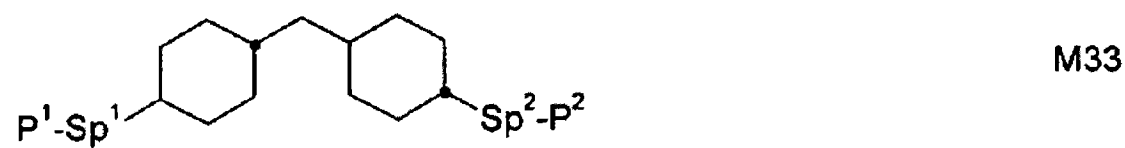
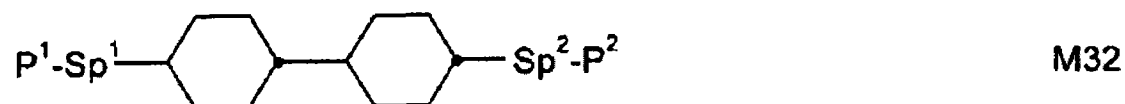
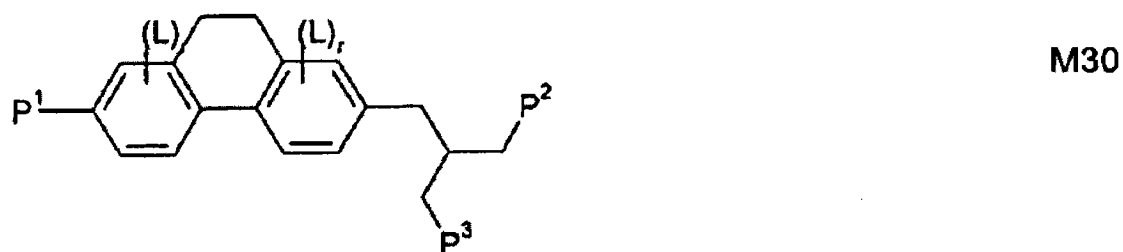
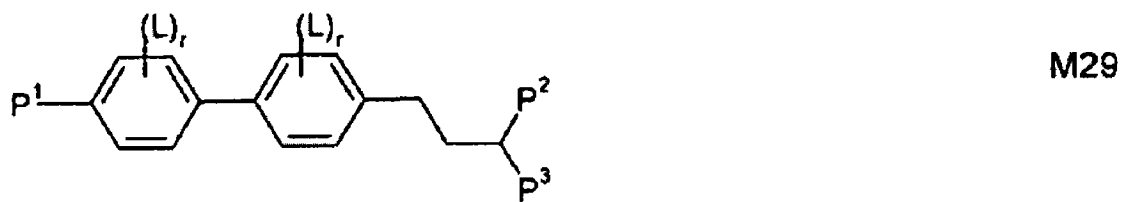


M27

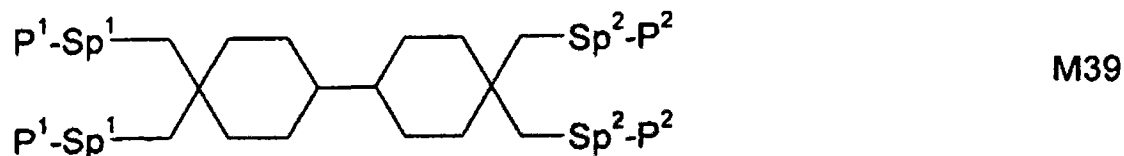
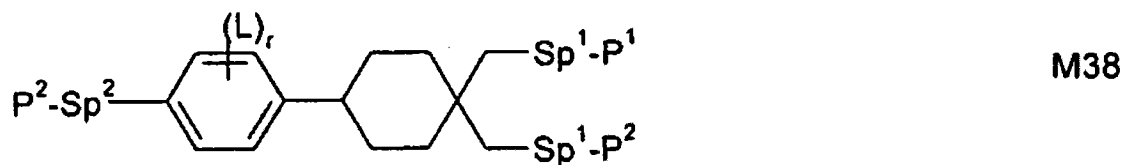


M28

[0316]



[0317]



[0318] 其中各基团具有以下含义：

[0319] P^1 和 P^2 各自彼此独立地表示可聚合基团，优选具有在上文和下文对于P所示含义之一，特别优选丙烯酸酯、甲基丙烯酸酯、氟代丙烯酸酯、氧杂环丁烷、乙烯基氧或环氧基团，

[0320] Sp^1 和 Sp^2 各自彼此独立地表示单键或者间隔基，优选具有在上文和下文对于Sp所示含义之一，并且特别优选是 $-(CH_2)_{p1}-$ 、 $-(CH_2)_{p1}-O-$ 、 $-(CH_2)_{p1}-CO-O-$ 或者 $-(CH_2)_{p1}-O-CO-O-$ ，其中 $p1$ 表示从1至12的整数，并且其中最后提及的基团与相邻环通过O原子连接，其中基

团 P^1-Sp^1 -和 P^2-Sp^2 -中的一个也可以表示 R^{aa} 。

[0321] R^{aa} 表示H、F、Cl、CN或具有1-25个C原子的直链或支链的烷基,其中一个或多个不相邻的 CH_2 基团也可以各自彼此独立地被 $-C(R^0)=C(R^{00})-$ 、 $-C\equiv C-$ 、 $-N(R^0)-$ 、 $-O-$ 、 $-S-$ 、 $-CO-$ 、 $-CO-O-$ 、 $-O-CO-$ 、 $-O-CO-O-$ 以使得O和/或S原子不彼此直接链接的方式代替,并且其中一个或多个H原子也可以被F、Cl、CN或 P^1-Sp^1 -代替,特别优选是具有1-12个C原子的直链或支链、任选单或多氟代的烷基、烷氧基、烯基、炔基、烷基羰基、烷氧基羰基或烷基羰基氧基(其中烯基和炔基具有至少两个C原子并且支链基团具有至少三个C原子),

[0322] R^0 、 R^{00} 各自彼此独立地并且当每次出现时相同或不同地表示H或者具有1-12个C原子的烷基,

[0323] R^y 和 R^z 各自彼此独立地表示H、F、 CH_3 或 CF_3 ,

[0324] Z^1 表示 $-O-$ 、 $-CO-$ 、 $-C(R^yR^z)-$ 或 $-CF_2CF_2-$,

[0325] Z^2 和 Z^3 各自彼此独立地表示 $-CO-O-$ 、 $-O-CO-$ 、 $-CH_2O-$ 、 $-OCH_2-$ 、 $-CF_2O-$ 、 $-OCF_2-$ 或 $-(CH_2)_n-$,其中n为2、3或4,

[0326] L当每次出现时相同或不同地表示F、Cl、CN或者具有1-12个C原子的直链或支化、任选单或多氟代的烷基、烷氧基、烯基、炔基、烷基羰基、烷氧基羰基或烷基羰基氧基,优选F,

[0327] L' 和 L'' 各自彼此独立地表示H、F或Cl,

[0328] r表示0、1、2、3或4,

[0329] s表示0、1、2或3,

[0330] t表示0、1或2,以及

[0331] x表示0或1。

[0332] 例如,合适的可聚合化合物列在表E中。

[0333] 根据本申请的液晶介质优选总共包含0.01-10%,优选0.2-4.0%,特别优选0.2-2.0%的可聚合化合物。

[0334] 特别优选的是式M的可聚合化合物。

[0335] 因此,本发明还涉及根据本发明的混合物在电光显示器中的用途以及根据本发明的混合物在快门镜中的应用,特别是3D应用,以及在TN,PS-TN,STN,TN-TFT,OCB,IPS,PS-IPS,FFS,PS-FFS以及PS-VA-IPS显示器中的应用。

[0336] 以下实施例旨在解释发明而非对其进行限制。上文和下文中,百分比数据表示重量百分比;所有温度以摄氏度表示。

[0337] 本申请中,1,4-亚环己基环和1,4-亚苯基环表示如下:



[0338]



[0339] 除了式IA化合物和选自式IIA, IIB和IIC化合物的至少一种化合物外,根据本发明的混合物优选包含一种或多种选自下述表A的化合物。

[0340] 在本申请和以下实施例中,液晶化合物的结构通过首字母缩略语来标明,并按照

下面的表A转换成化学式。所有基团 C_nH_{2n+1} 和 C_mH_{2m+1} 是分别具有n和m个C原子的直链烷基；n、m和k是整数以及优选表示0、1、2、3、4、5、6、7、8、9、10、11或12。表B中的编码是显而易见的。在表A中，仅指出了母结构的首字母缩略语。在个别情况下，母结构的首字母缩略语之后由短划线隔开地接有取代基 R^{1*} 、 R^{2*} 、 L^{1*} 和 L^{2*} 的编码。

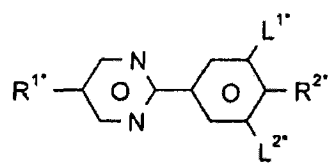
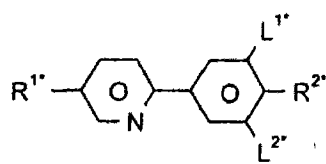
	编码 $R^{1*}, R^{2*}, L^{1*}, L^{2*}, L^{3*}$	R^{1*}	R^{2*}	L^{1*}	L^{2*}
[0341]	nm	C_nH_{2n+1}	C_mH_{2m+1}	H	H
	nOm	C_nH_{2n+1}	OC_mH_{2m+1}	H	H
	nO.m	OC_nH_{2n+1}	C_mH_{2m+1}	H	H
	n	C_nH_{2n+1}	CN	H	H
	nN.F	C_nH_{2n+1}	CN	F	H
	编码 $R^{1*}, R^{2*}, L^{1*}, L^{2*}, L^{3*}$	R^{1*}	R^{2*}	L^{1*}	L^{2*}
[0342]	nN.F.F	C_nH_{2n+1}	CN	F	F
	nF	C_nH_{2n+1}	F	H	H
	nCl	C_nH_{2n+1}	Cl	H	H
	nOF	OC_nH_{2n+1}	F	H	H
	nF.F	C_nH_{2n+1}	F	F	H
	nF.F.F	C_nH_{2n+1}	F	F	F
	nOCF ₃	C_nH_{2n+1}	OCF ₃	H	H
	nOCF ₃ .F	C_nH_{2n+1}	OCF ₃	F	H
	n-Vm	C_nH_{2n+1}	$-CH=CH-C_mH_{2m+1}$	H	H
	nV-Vm	$C_nH_{2n+1}-CH=CH-$	$-CH=CH-C_mH_{2m+1}$	H	H

[0343] 使用了以下缩写词：

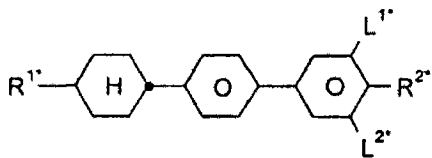
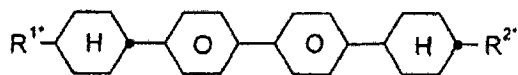
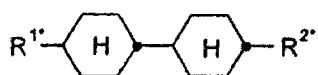
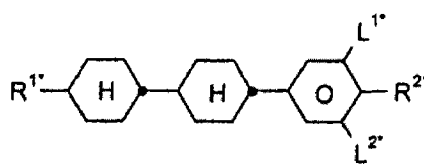
[0344] (n, m, m', z: 各自彼此独立地为1、2、3、4、5或6；(0) C_mH_{2m+1} 表示 OC_mH_{2m+1} 或 C_mH_{2m+1})

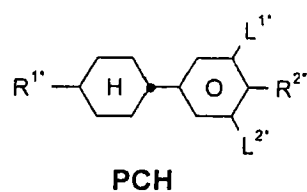
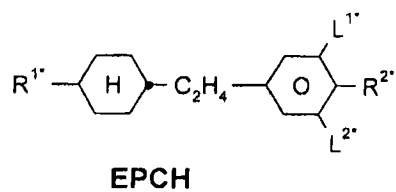
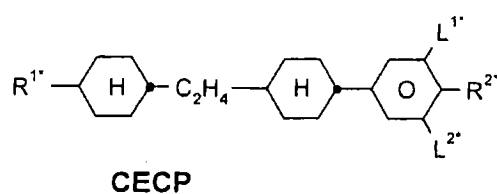
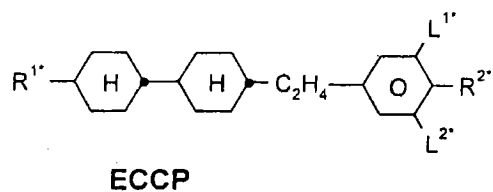
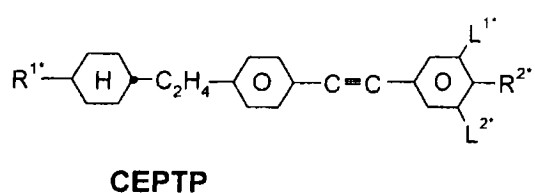
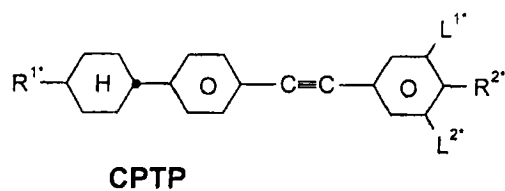
[0345] 优选的混合物组分如表A和B所示。

[0346] 表A

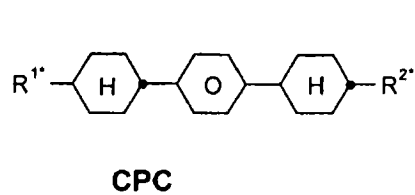
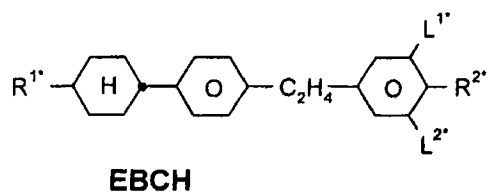
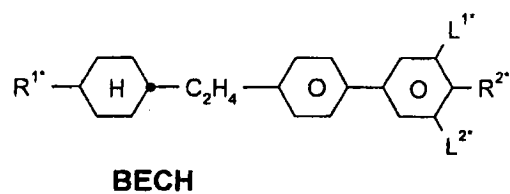
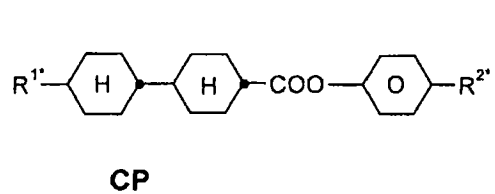
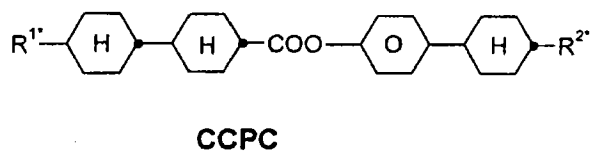
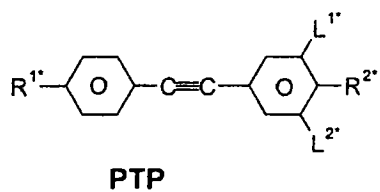
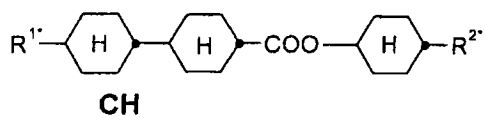
**PYP****PYRP**

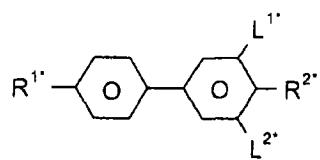
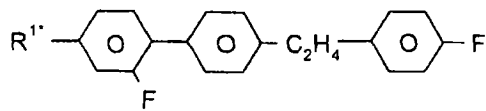
[0347]

**BCH****CBC****CCH****CCP**

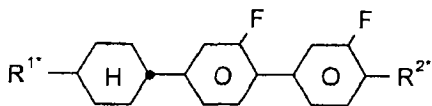
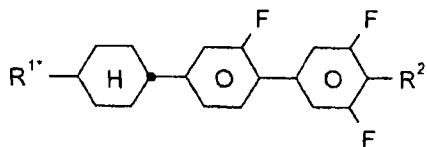
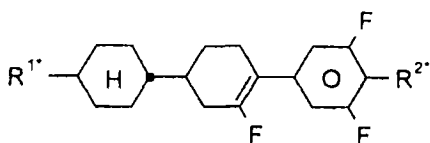


[0348]



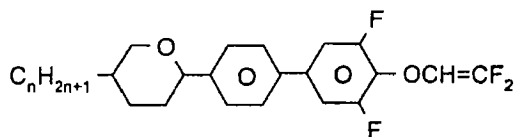
**B****FET-nF**

[0349]

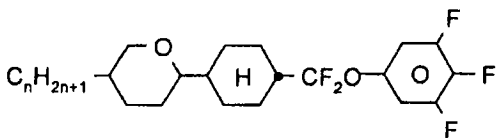
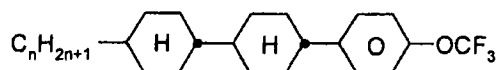
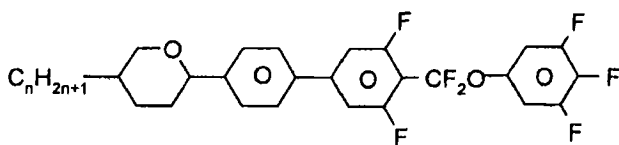
**CGG****CGU****CFU**

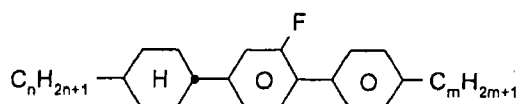
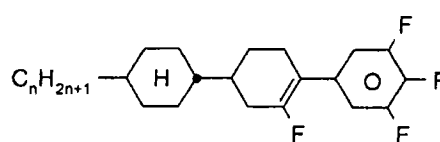
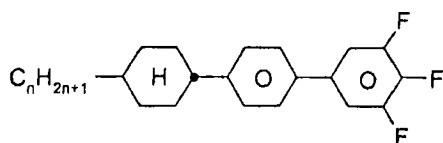
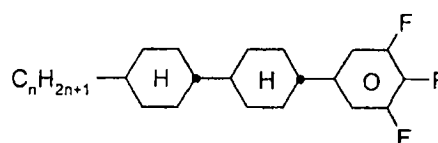
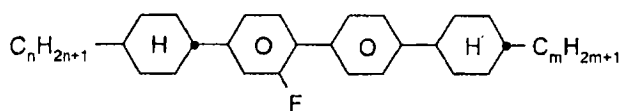
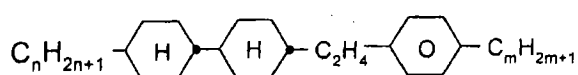
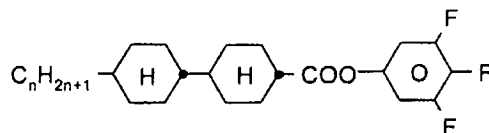
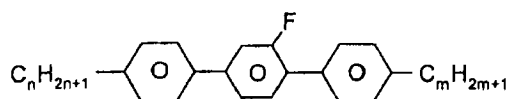
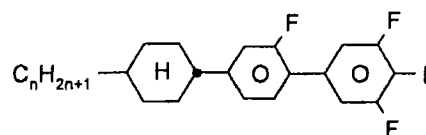
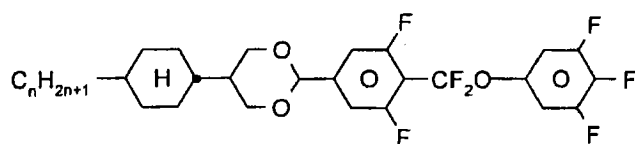
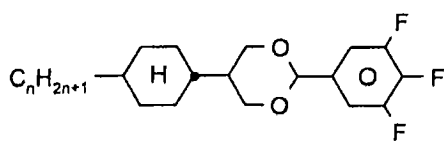
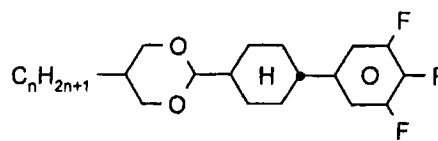
[0350] 表B

[0351] 在下式中, n 和 m 各自彼此独立地表示 0、1、2、3、4、5、6、7、8、9、10、11 或 12, 特别是 2、3、5, 还有 0、4、6。

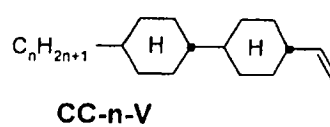
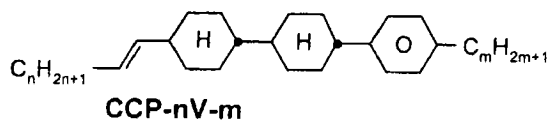
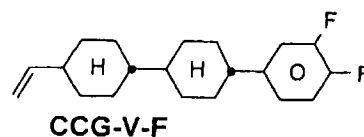
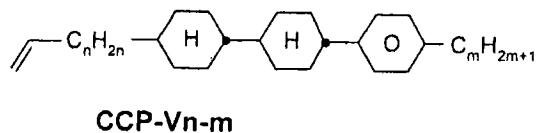
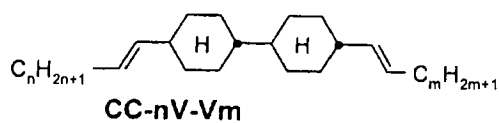
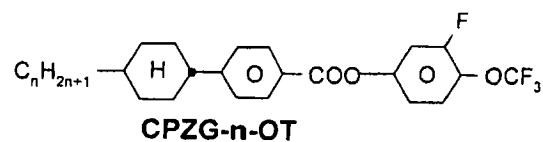
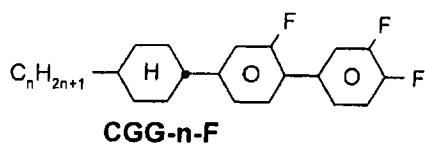
**APU-n-OXF**

[0352]

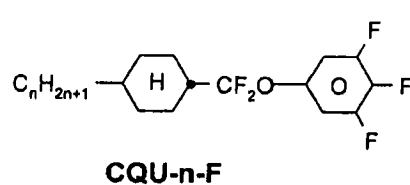
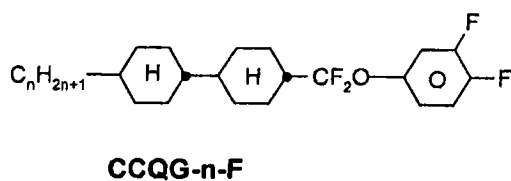
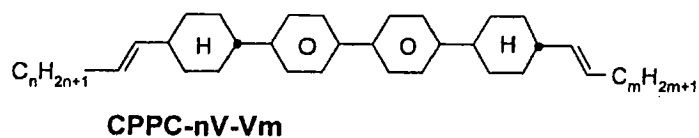
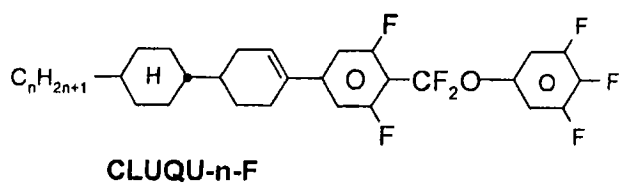
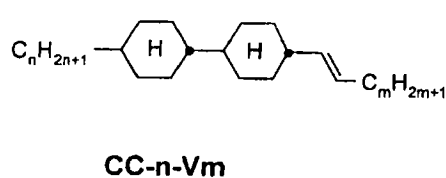
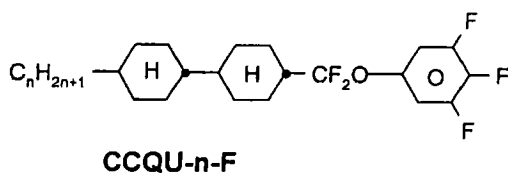
**ACQU-n-F****CCP-nOCF₃****APUQU-n-F**

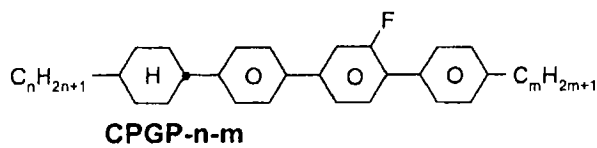
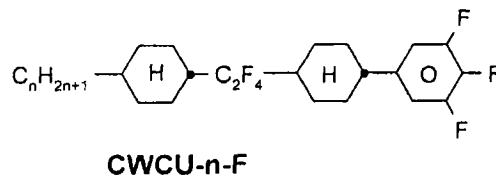
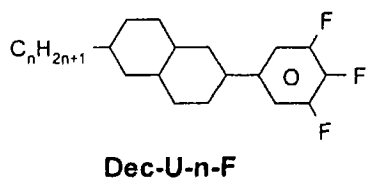
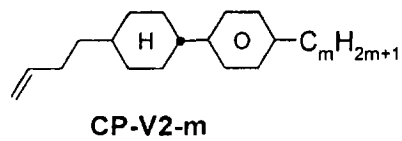
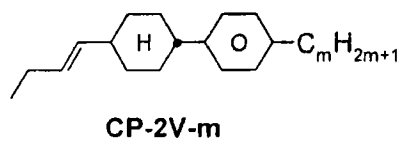
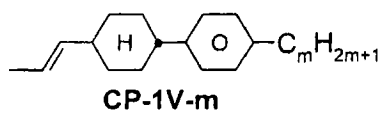
**BCH-n.Fm****CFU-n-F****BCH-nF.F.F****CCP-nF.F.F****CBC-nmF****ECCP-nm****CCZU-n-F****PGP-n-m****CGU-n-F****CDUQU-n-F****CDU-n-F****DCU-n-F**

[0353]

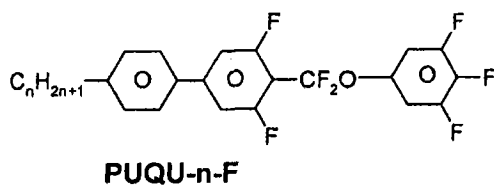
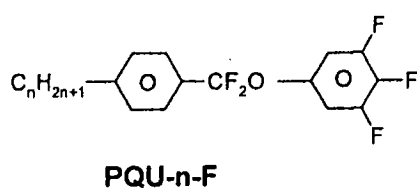
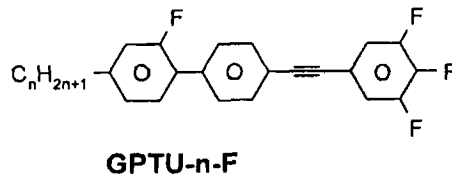
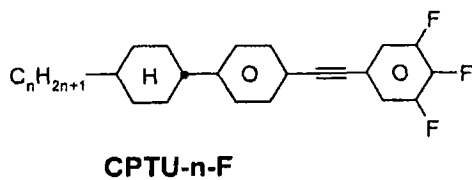
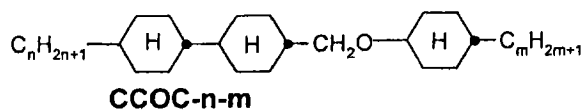
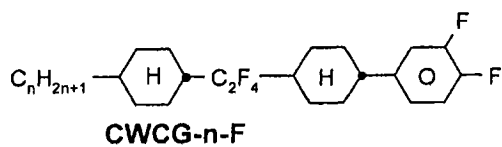


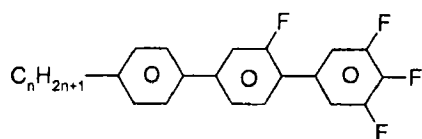
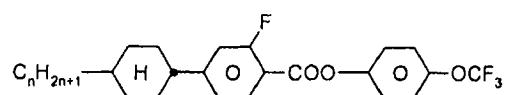
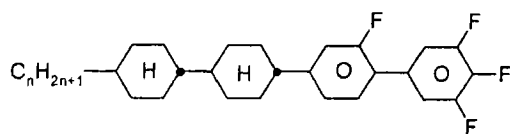
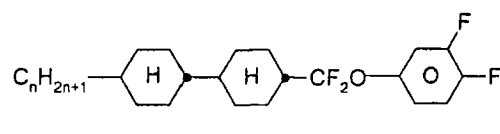
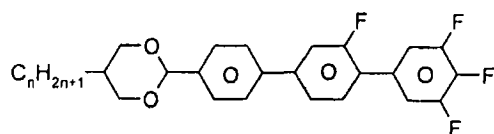
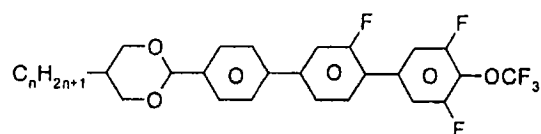
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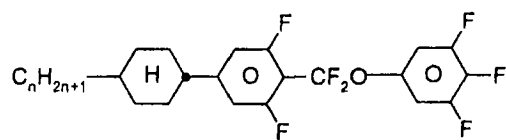
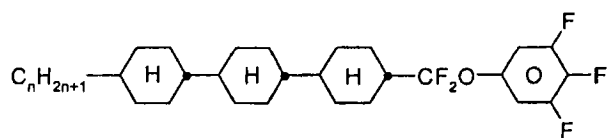
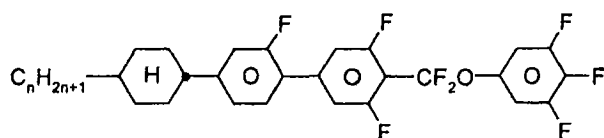
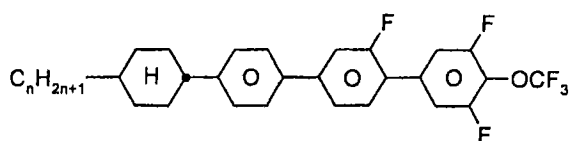


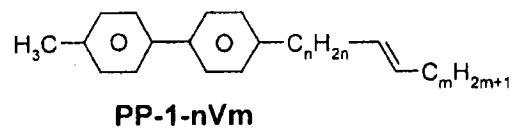
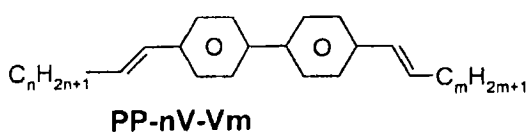
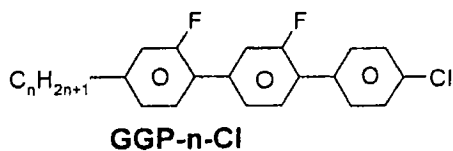
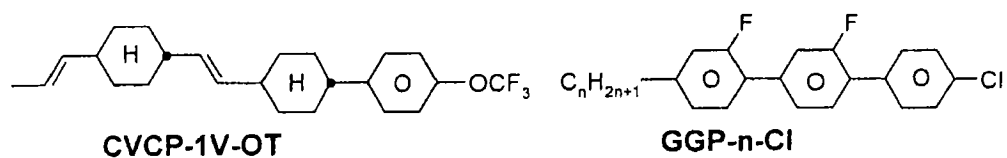
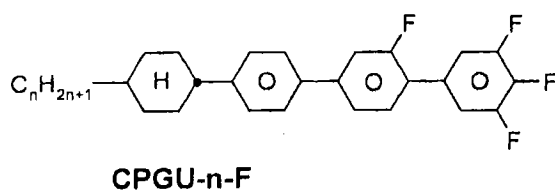
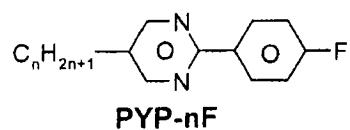
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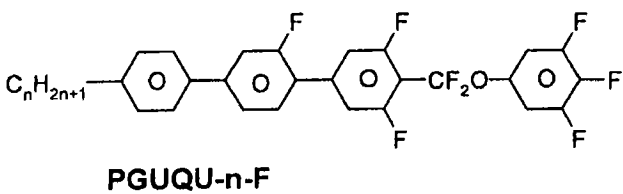
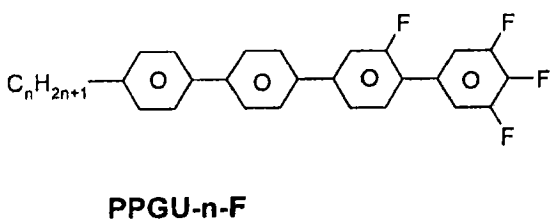
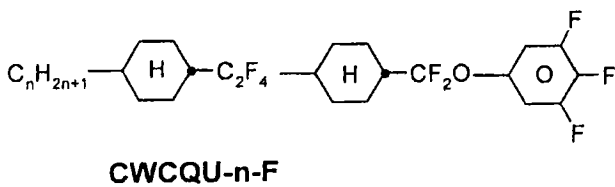
**PGU-n-F****CGZP-n-OT****CCGU-n-F****CCQG-n-F****DPGU-n-F****DPGU-n-OT**

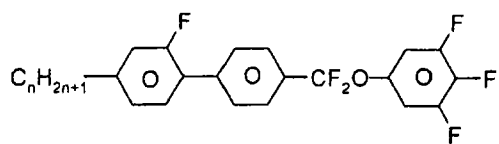
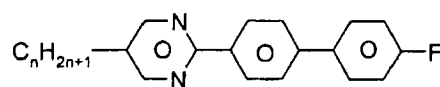
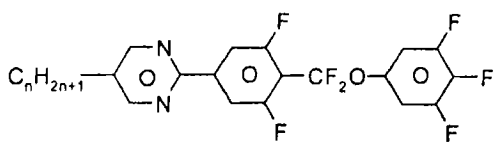
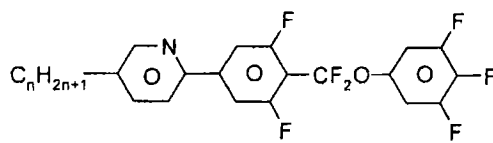
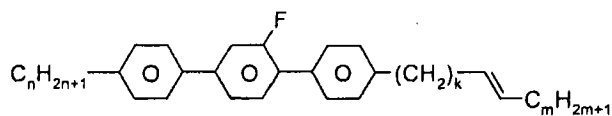
[0356]

**CUQU-n-F****CCCQU-n-F****CGUQU-n-F****CPGU-n-OT**

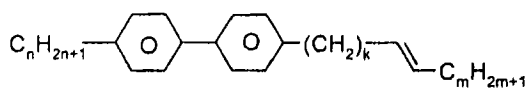
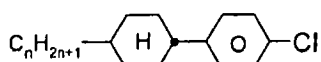
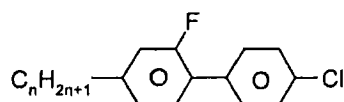
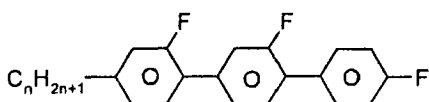
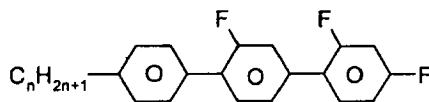
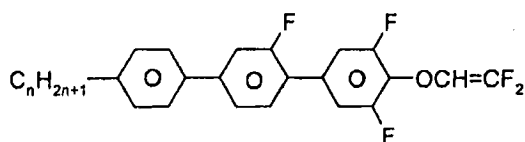
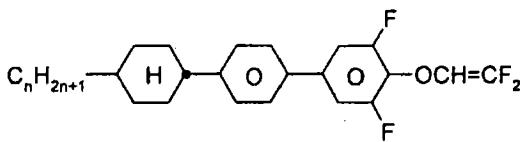


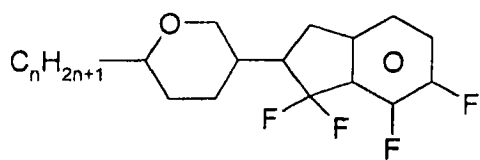
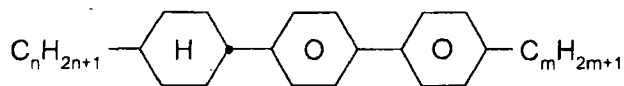
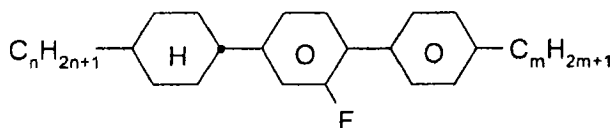
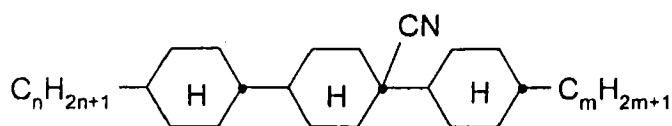
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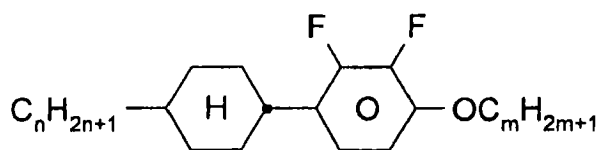
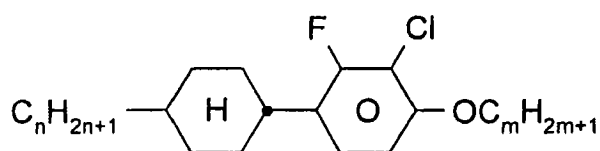
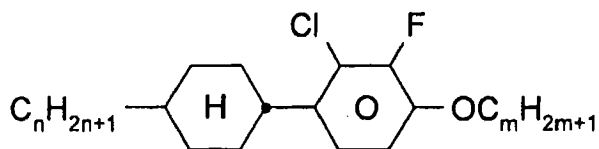
**GPQU-n-F****MPP-n-F****MUQU-n-F****NUQU-n-F****PGP-n-kVm**

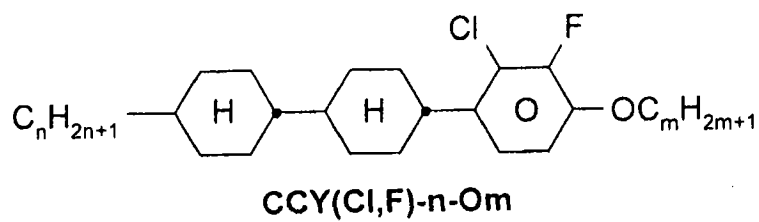
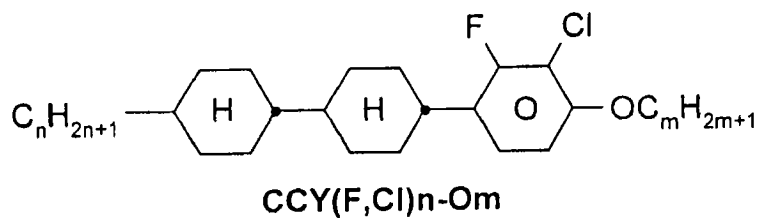
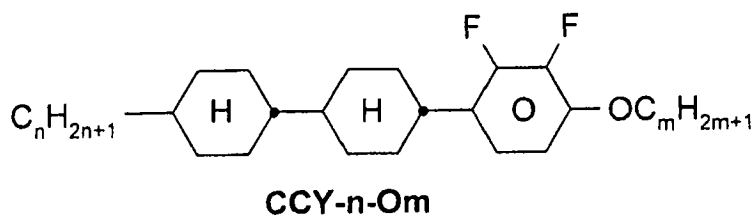
[0358]

**PP-n-kVm****PCH-nCl****GP-n-Cl****GGP-n-F****PGIGI-n-F****PGU-n-OXF****CPU-n-OXF**

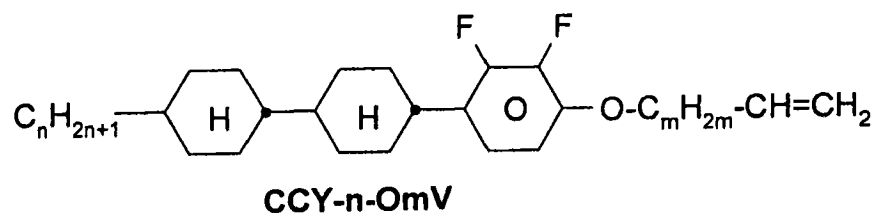
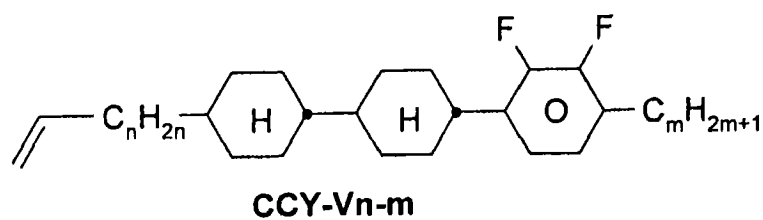
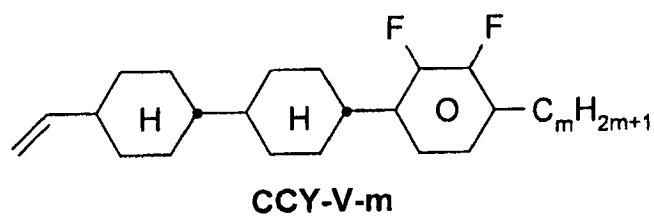
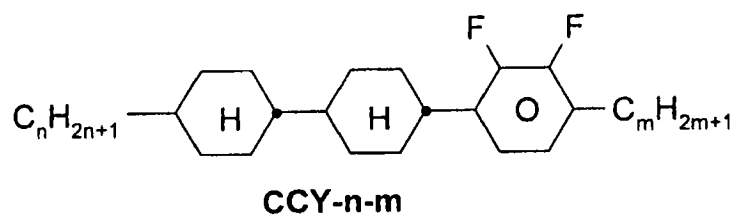
**AIK-n-F****BCH-nm****BCH-nmF****BCN-nm**

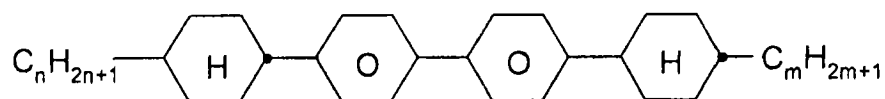
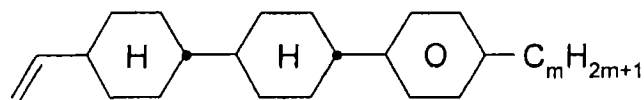
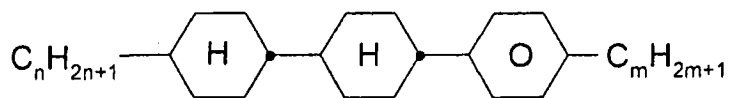
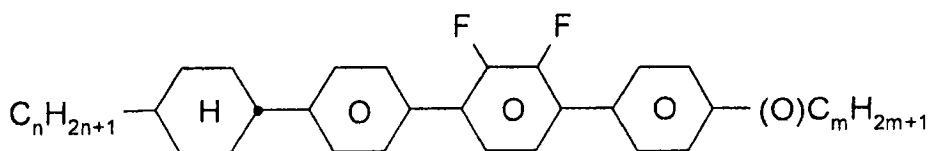
[0359]

**CY-n-Om****CY(F,Cl)n-Om****CY(Cl,F)n-Om**

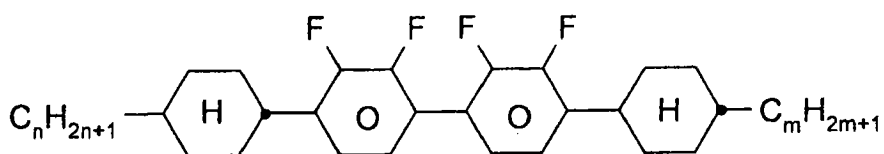
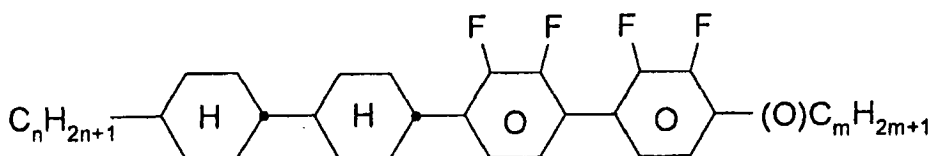
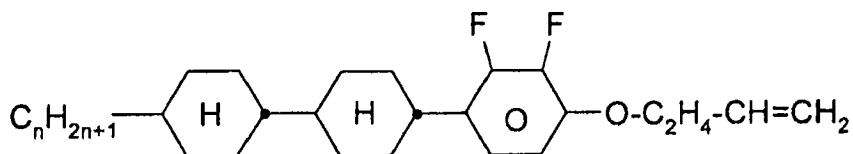


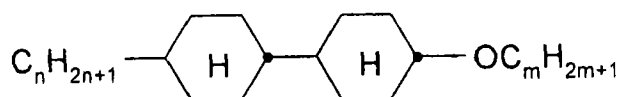
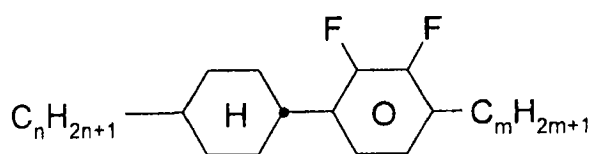
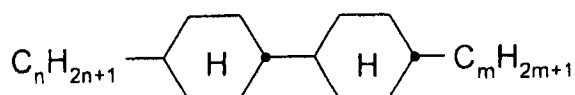
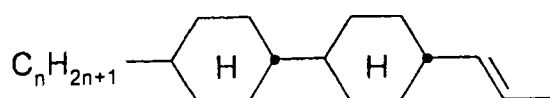
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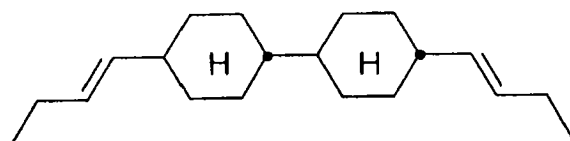
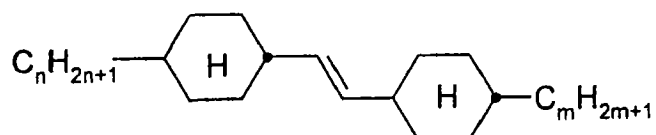
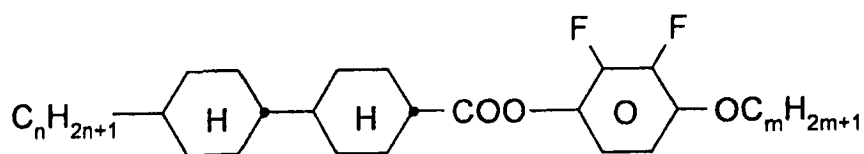
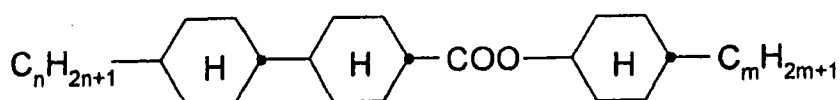
**CBC-nm****CCP-V-m****CCP-n-m**

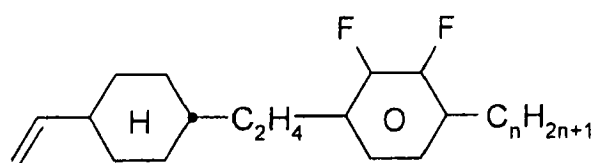
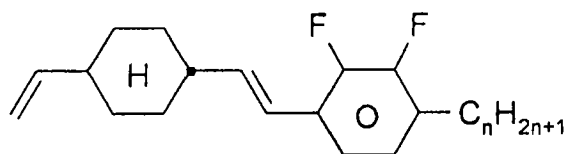
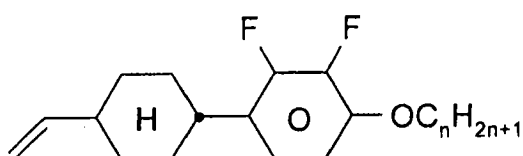
[0361]

CPYP-n-(O)m**CYYC-n-m****CCYY-n-(O)m****CCY-n-O2V**

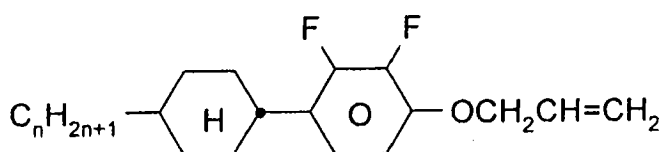
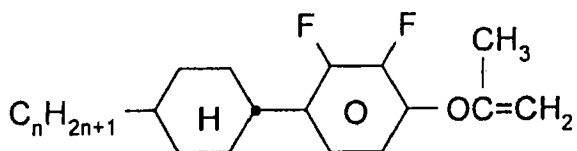
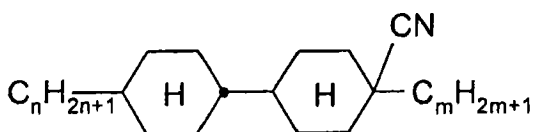
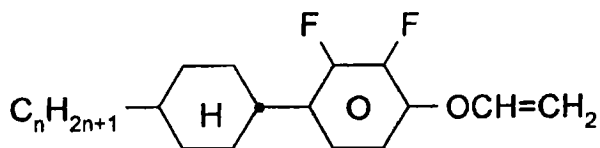
**CCH-nOm****CY-n-m****CCH-nm****CC-n-V1**

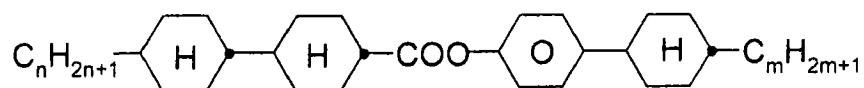
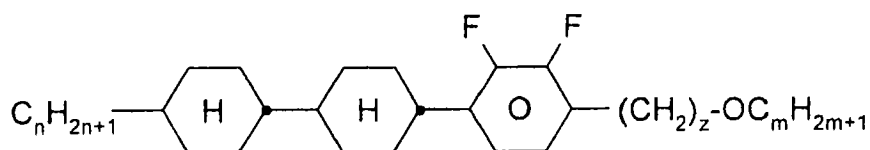
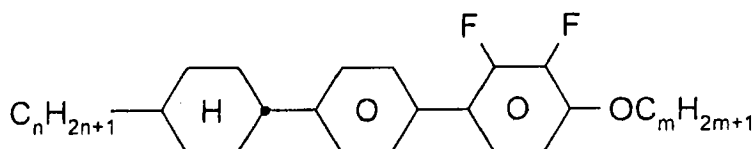
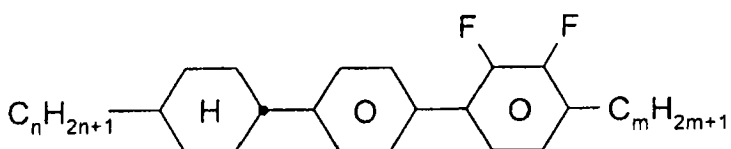
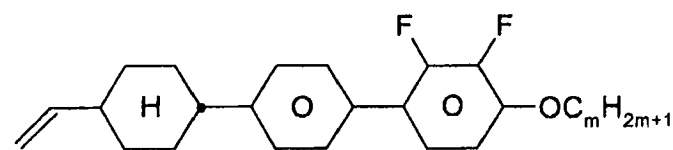
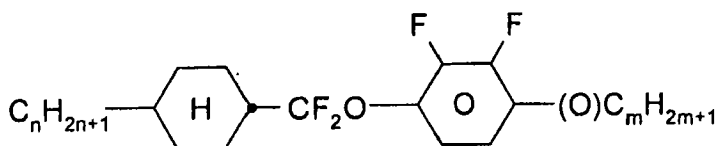
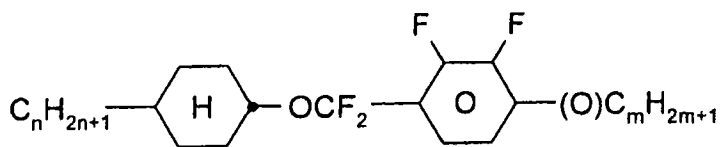
[0362]

**CC-2V-V2****CVC-n-m****CP-nOmFF****CH-nm**

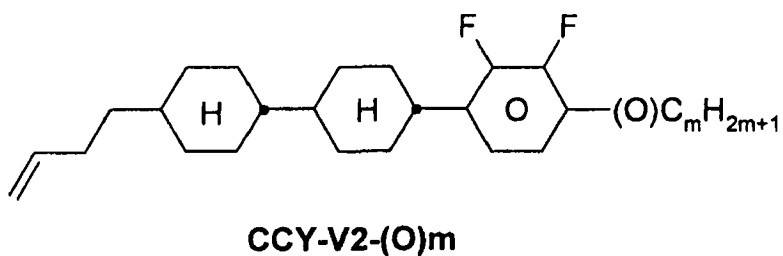
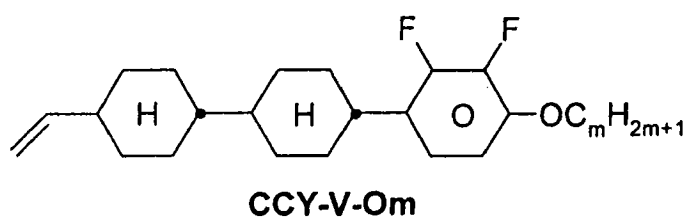
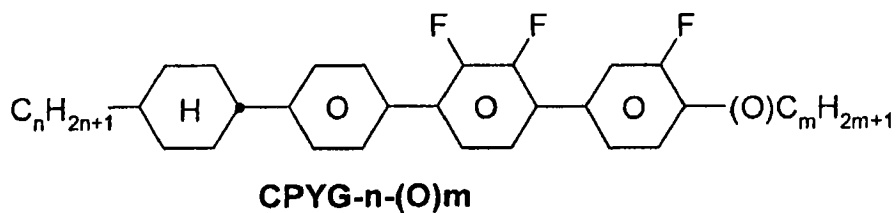
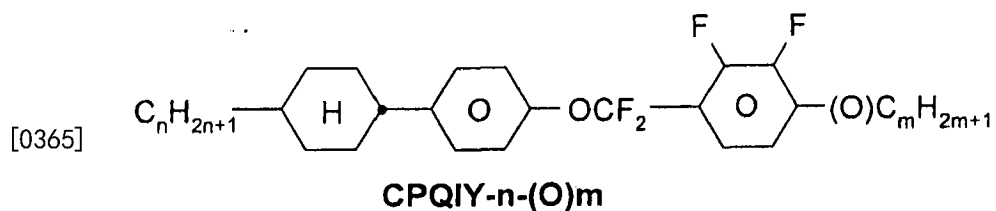
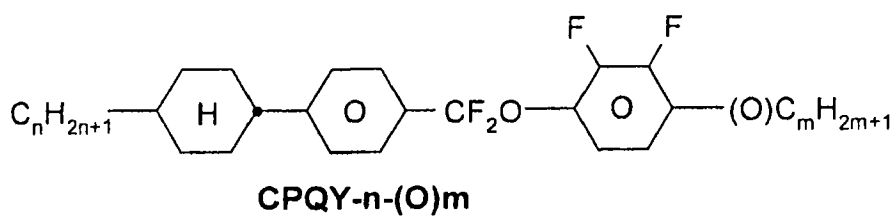
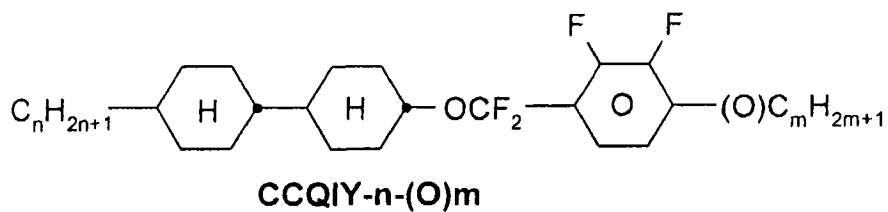
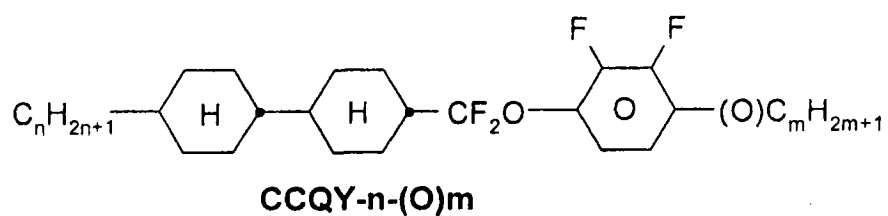
**CEY-V-n****CVY-V-n****CY-V-On**

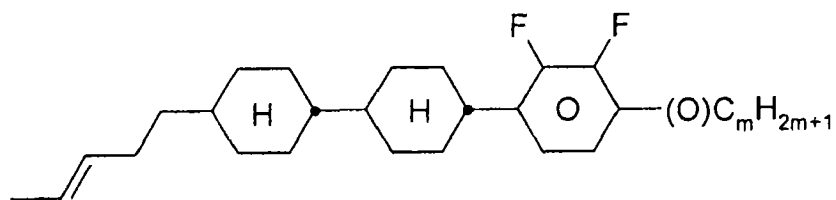
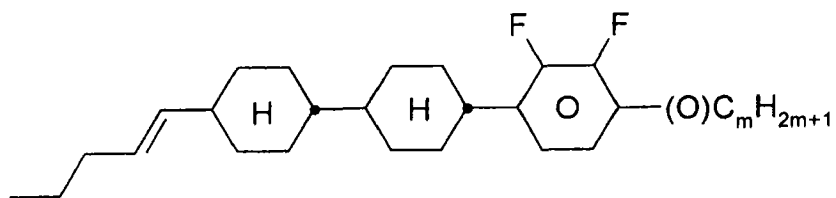
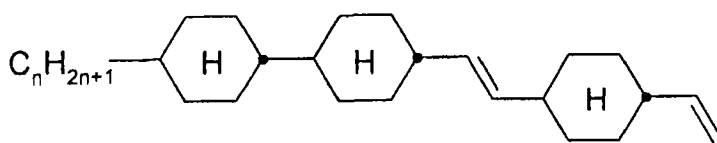
[0363]

**CY-n-O1V****CY-n-OC(CH₃)=CH₂****CCN-nm****CY-n-OV**

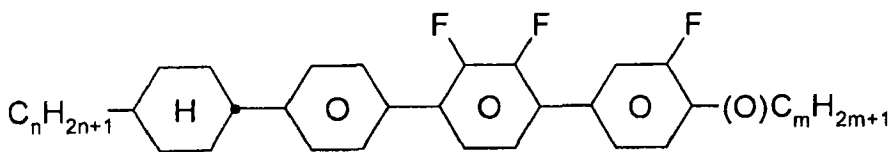
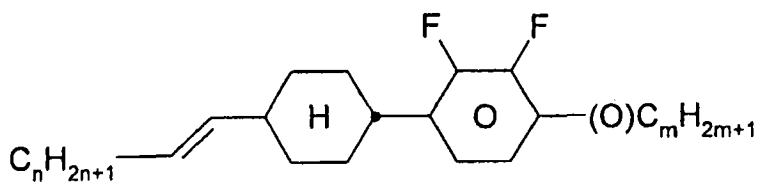
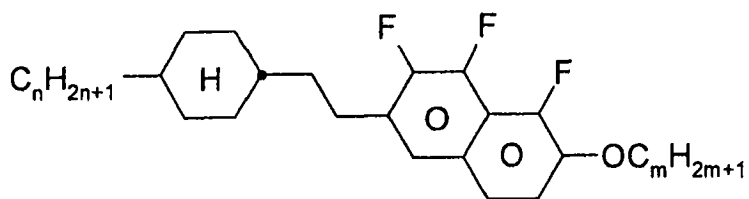
**CCPC-nm****CCY-n-zOm****CPY-n-Om****CPY-n-m****CPY-V-Om****CQY-n-(O)m****CQIY-n-(O)m**

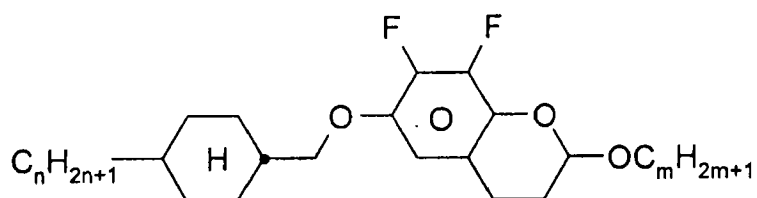
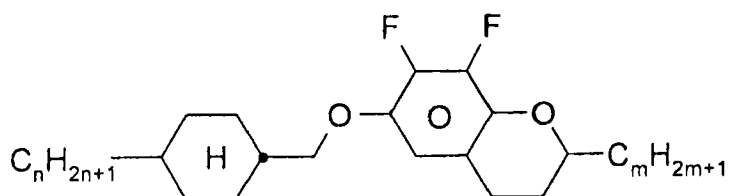
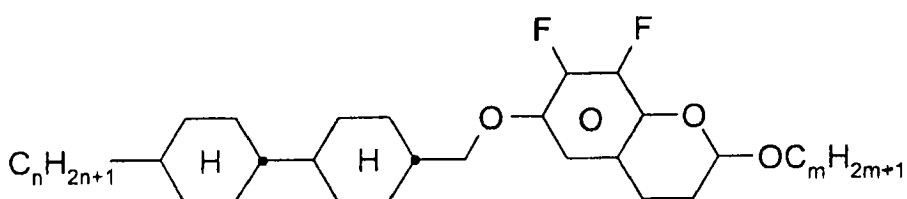
[0364]



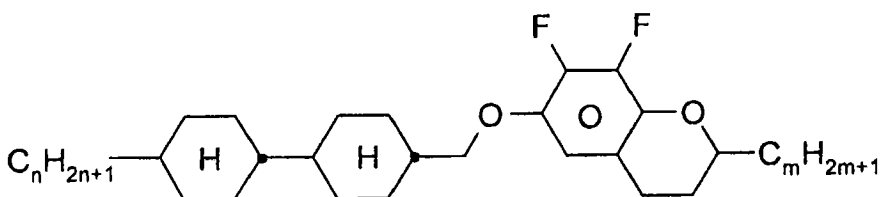
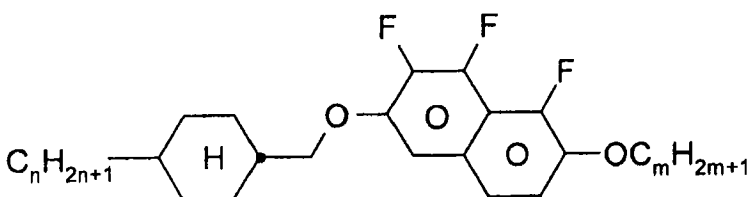
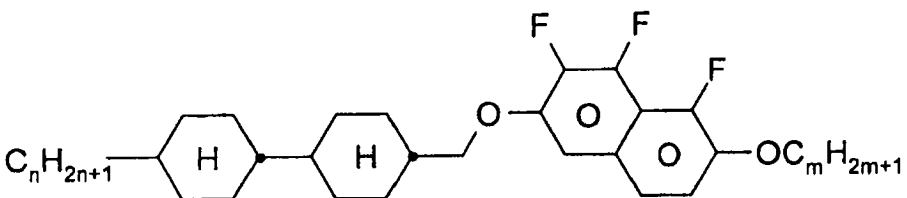
**CCY-1V2-(O)m****CCY-3V-(O)m****CCVC-n-V**

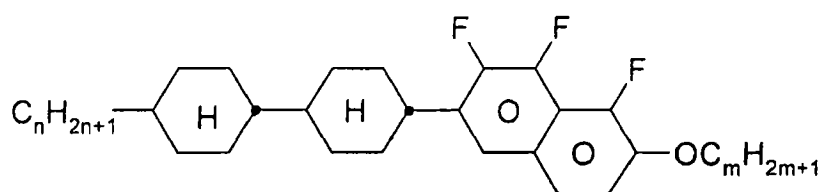
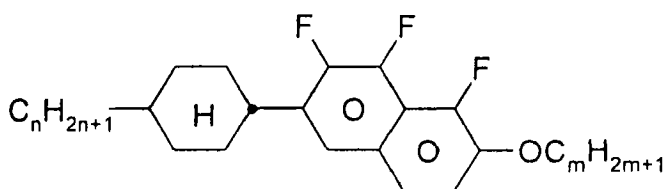
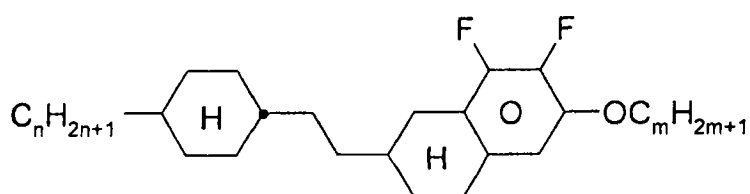
[0366]

**CPYG-n-(O)m****CY-nV-(O)m****CENaph-n-Om**

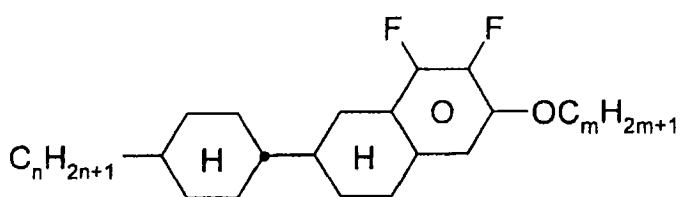
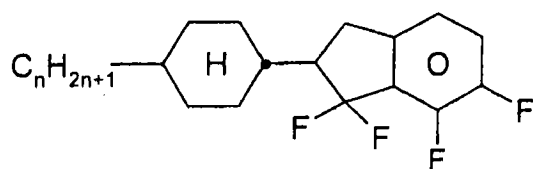
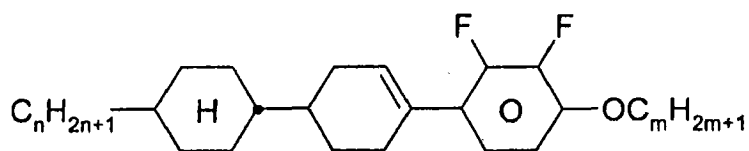
**COChrom-n-Om****COChrom-n-m****CCOChrom-n-Om**

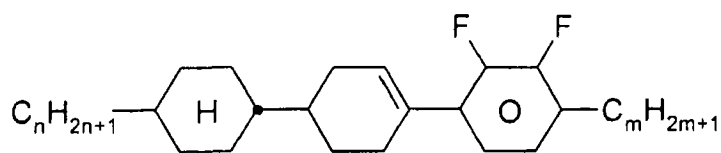
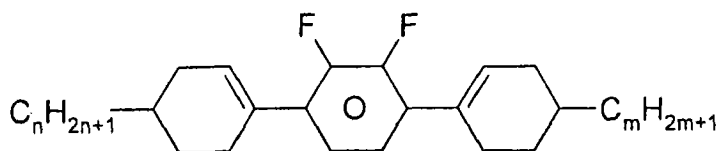
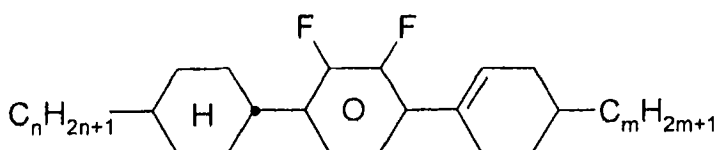
[0367]

**CCOChrom-n-m****CONaph-n-Om****CCONaph-n-Om**

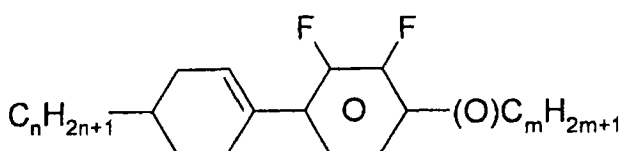
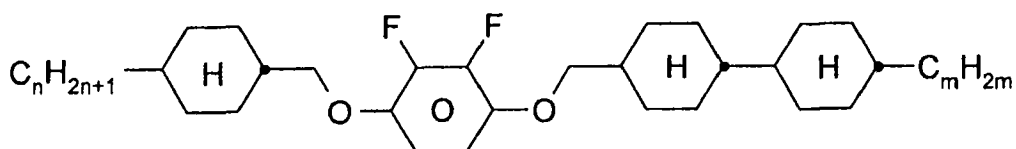
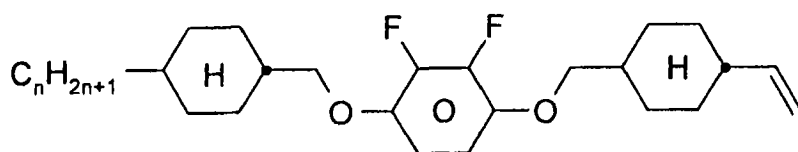
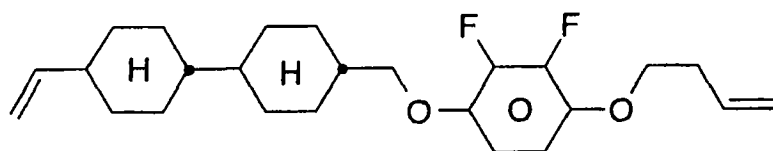
**CCNaph-n-Om****CNaph-n-Om****CETNaph-n-Om**

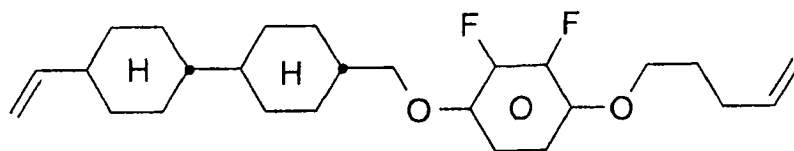
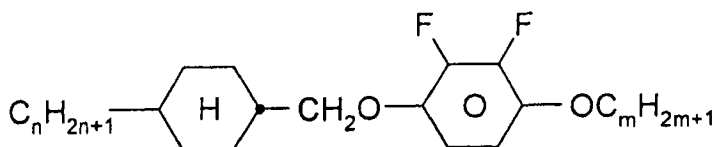
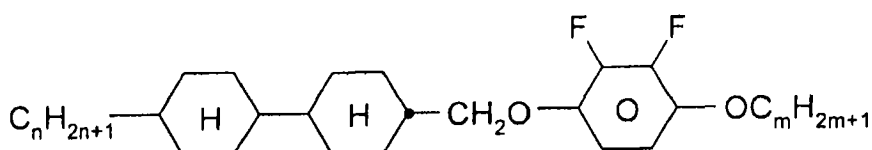
[0368]

**CTNaph-n-Om****CK-n-F****CLY-n-Om**

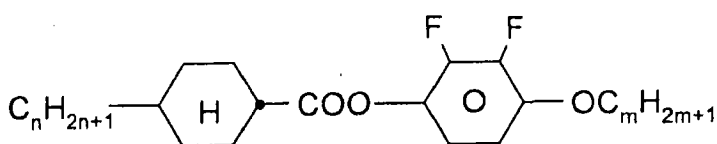
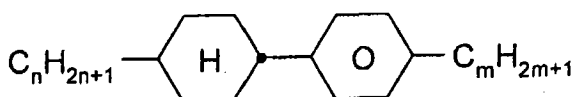
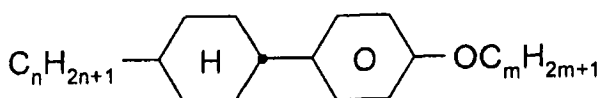
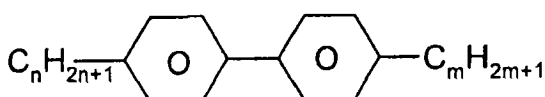
**CLY-n-m****LYLI-n-m****CYLI-n-m**

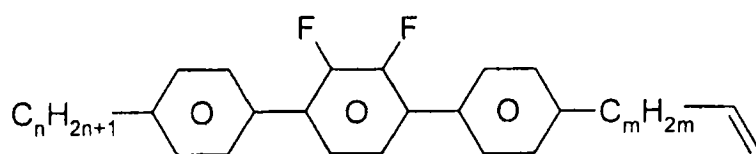
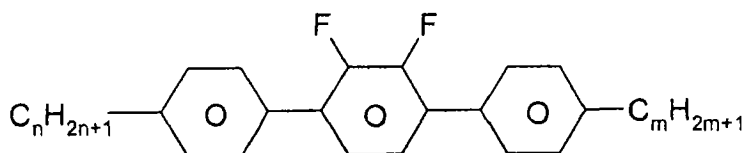
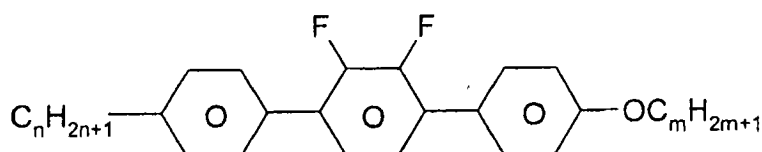
[0369]

**LY-n-(O)m****COYOICC-n-m****COYOIC-n-V****CCOY-V-O2V**

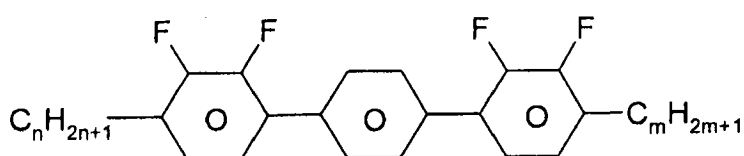
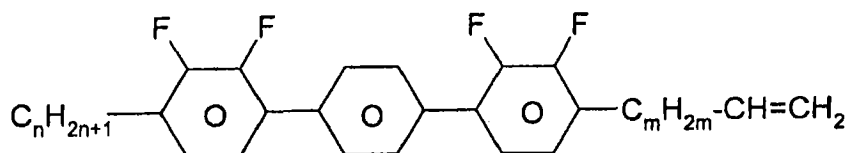
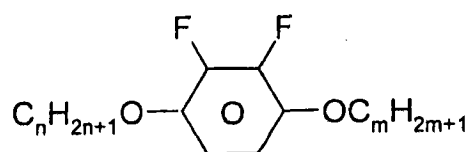
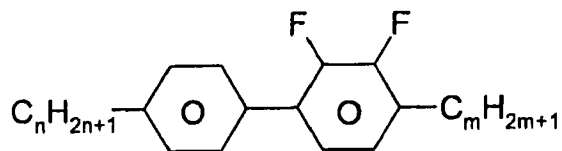
**CCOY-V-O3V****COY-n-Om****CCOY-n-Om**

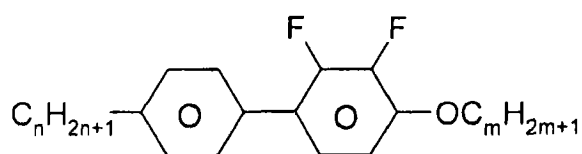
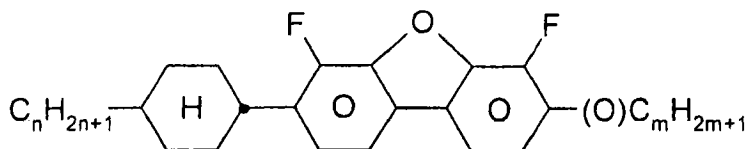
[0370]

**D-nOmFF****PCH-nm****PCH-nOm****PP-n-m**

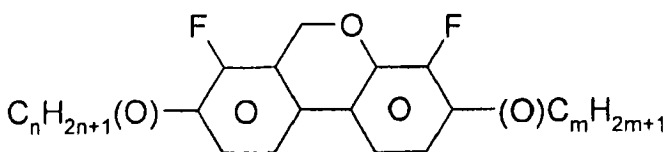
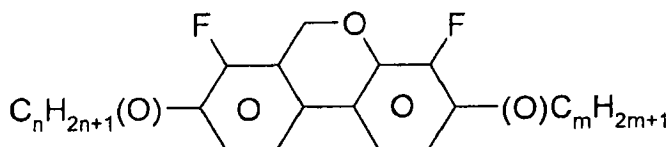
**PYP-n-mV****PYP-n-m****PYP-n-Om**

[0371]

**YPY-n-m****YPY-n-mV****Y-nO-Om****PY-n-m**

**PY-n-Om****C-DFDBF-n-(O)m**

[0372]

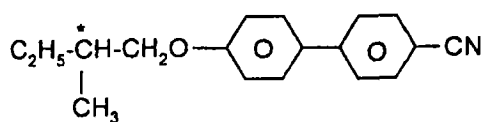
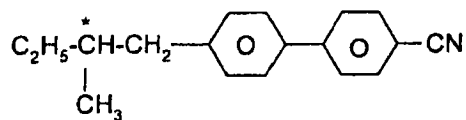
**DFDBC-n(O)-(O)m****DFDBC-n(O)-(O)m**

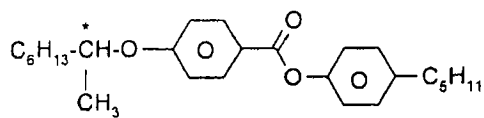
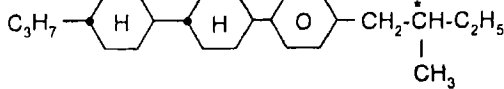
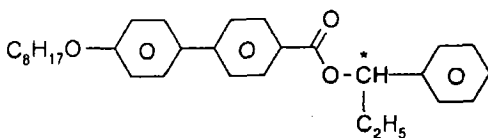
[0373] 特别优选的是除了式IA和IB化合物外还包含至少一种、两种、三种、四种或更多种来自表B中化合物的液晶混合物。

[0374] 表C

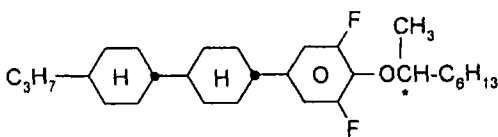
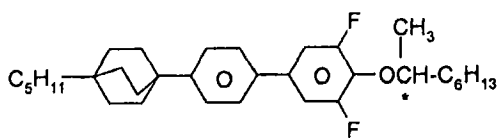
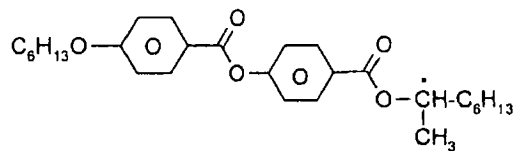
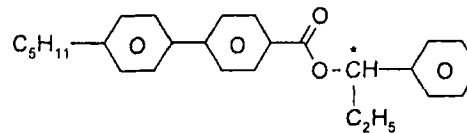
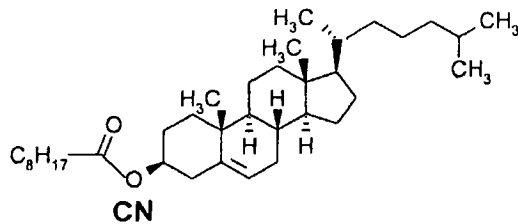
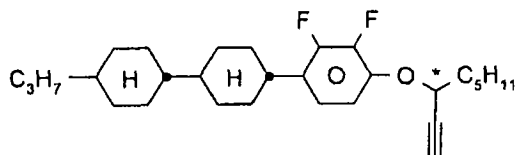
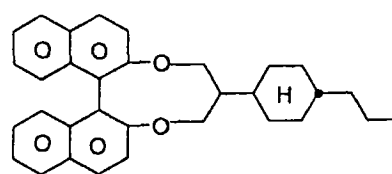
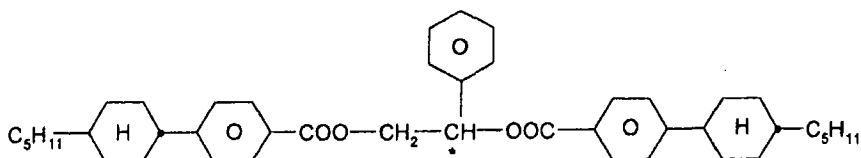
[0375] 表C中显示了一般加入根据本发明的混合物中的可能的掺杂剂。所述混合物优选包含0-10重量%，特别包含0.01-5重量%并且特别优选0.01-3重量%的掺杂剂。

[0376]

**C 15****CB 15**

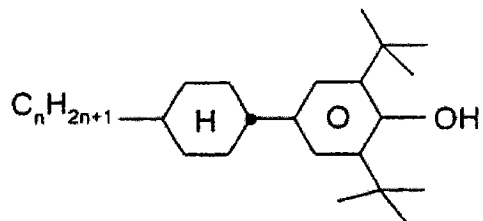
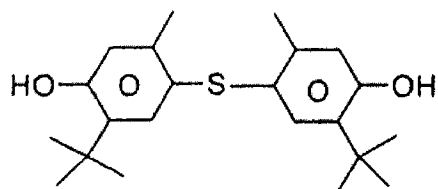
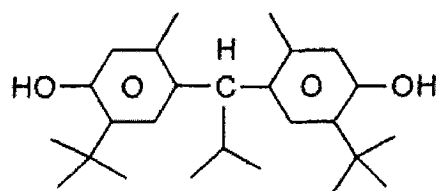
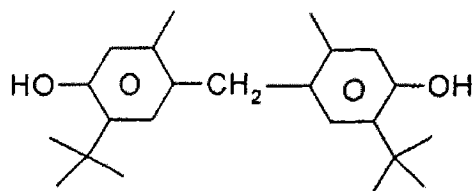
**CM 21****CM 44****CM 47**

[0377]

**R/S-2011****R/S-4011****R/S-811****CM 45****CN****R/S-3011****R/S-5011****R/S-1011**

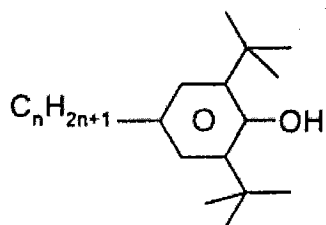
[0378] 表D

[0379] 下面将介绍可以例如以0-10重量%的量加入到根据本发明的混合物中的稳定剂。

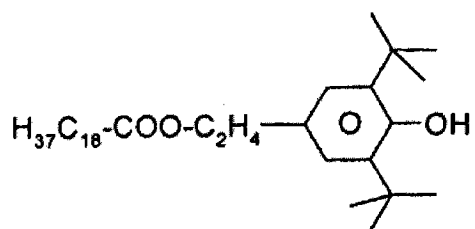
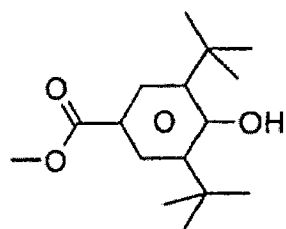
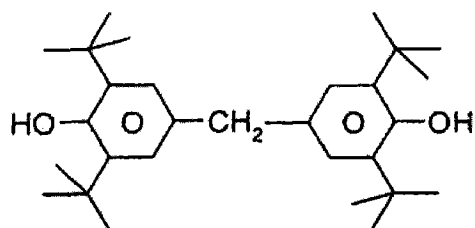
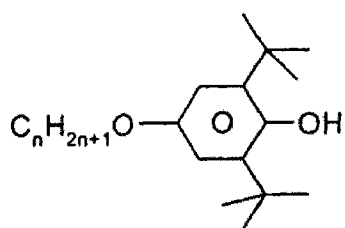
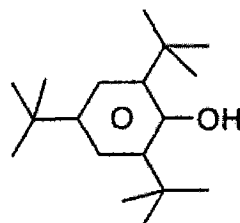


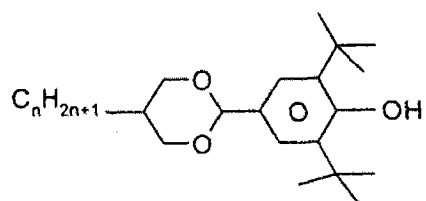
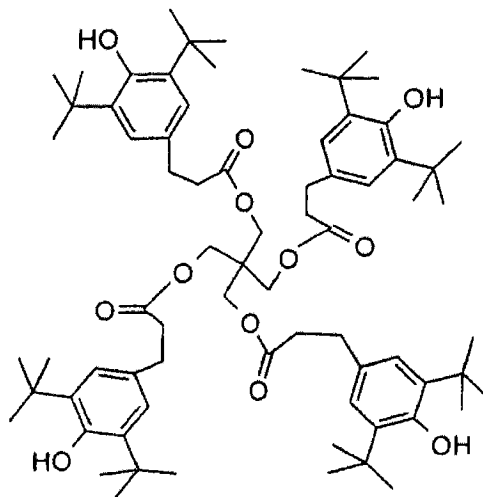
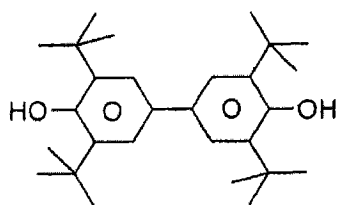
$n = 1, 2, 3, 4, 5, 6$ 或 7

[0380]



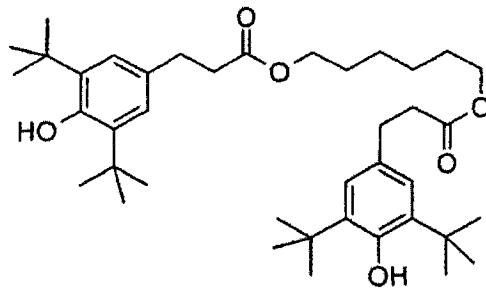
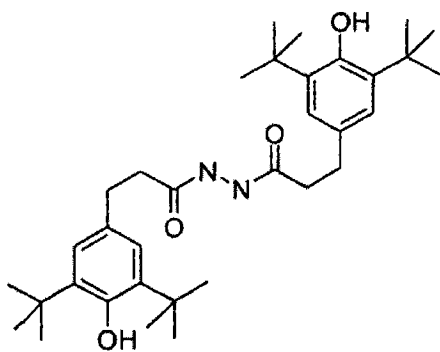
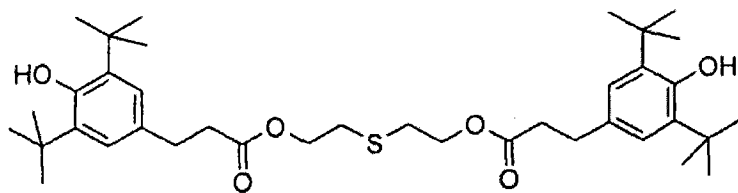
$n = 1, 2, 3, 4, 5, 6$ 或 7

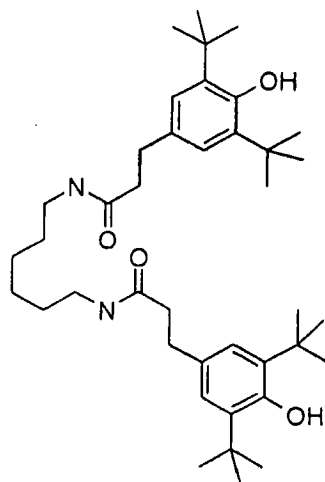
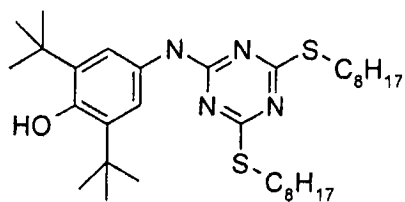




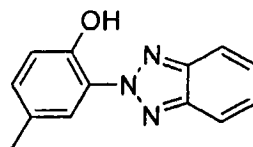
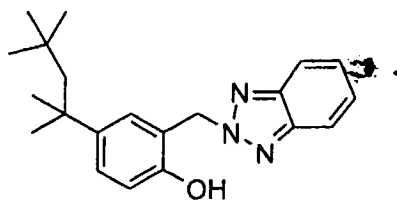
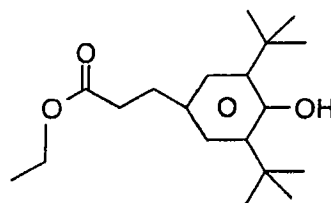
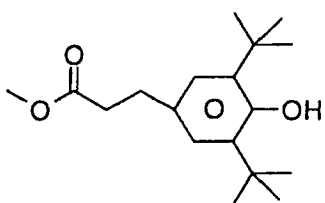
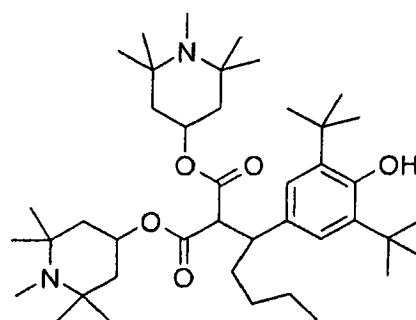
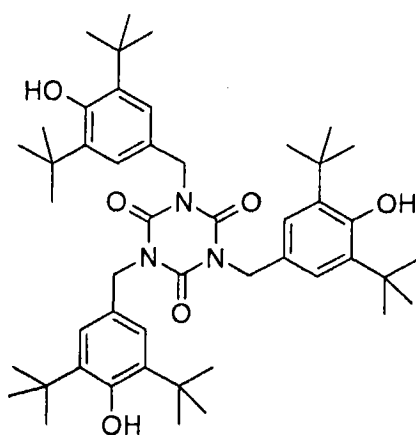
[0381]

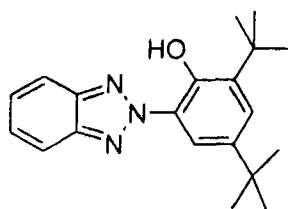
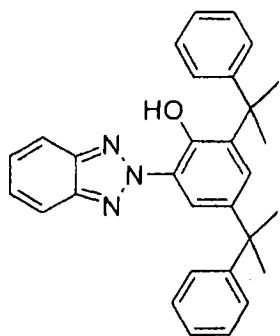
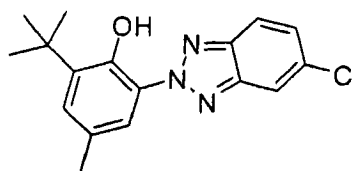
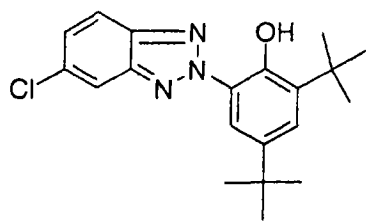
$n = 1, 2, 3, 4, 5, 6$ 或 7



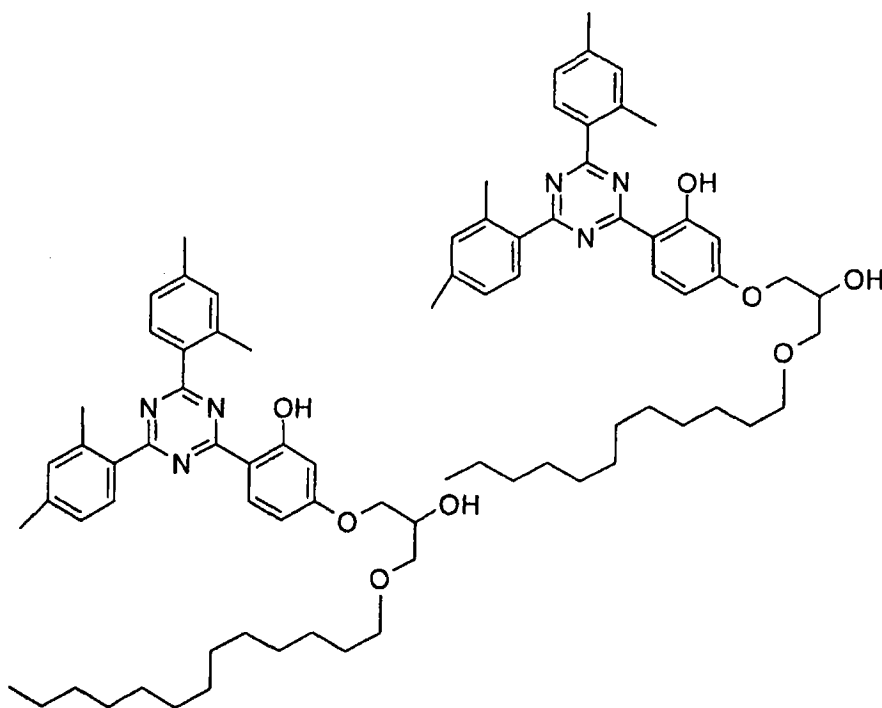
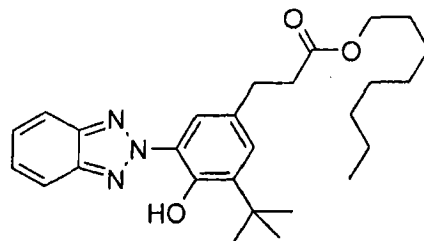
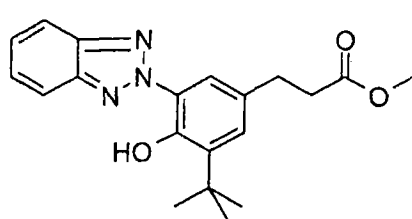


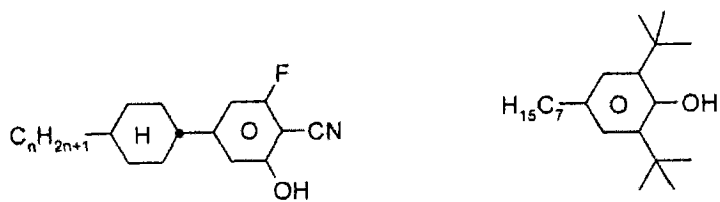
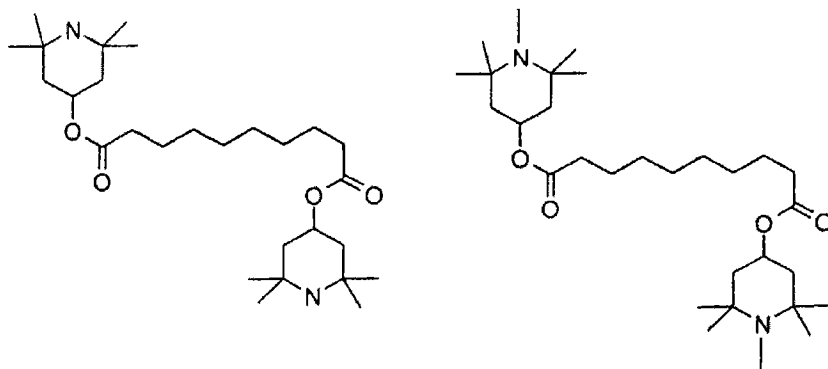
[0382]



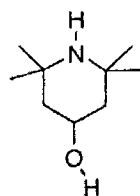
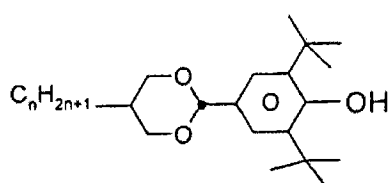


[0383]

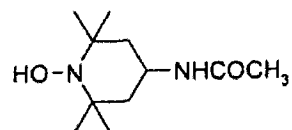
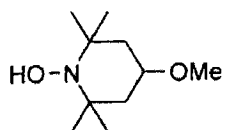
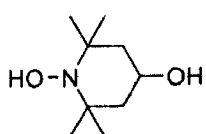
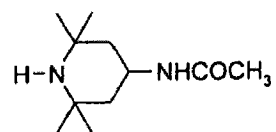
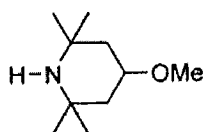
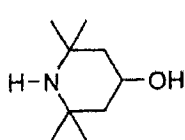




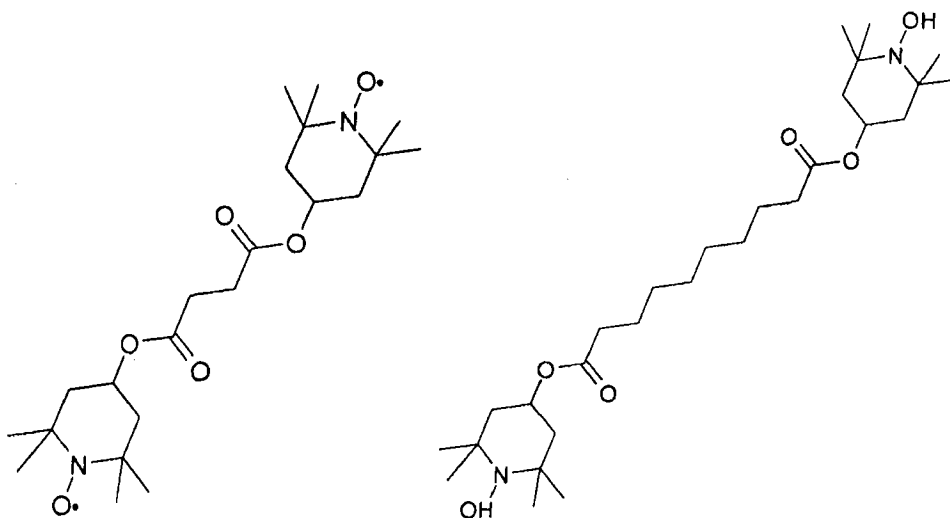
[0384]



n = 1, 2, 3, 4, 5, 6 或 7

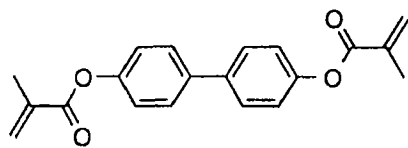


[0385]

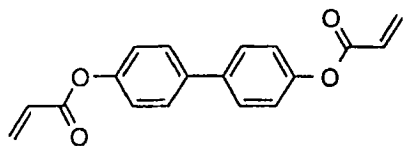


[0386] 表E

[0387] 下面将介绍可以例如以0.01-1重量%的量加入到根据本发明的混合物中的可聚合化合物。对于聚合也可必要地加入引发剂,优选量为0-1%。

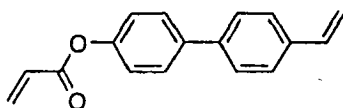


RM-1

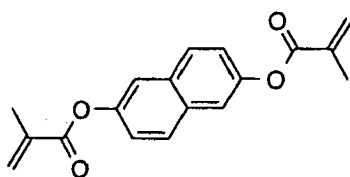


RM-2

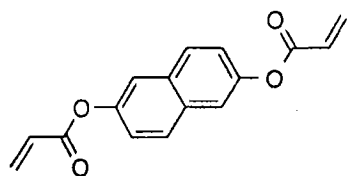
[0388]



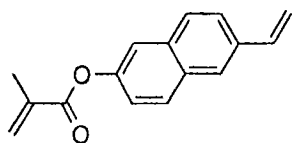
RM-3



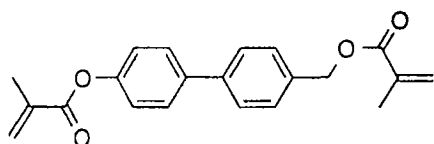
RM-4



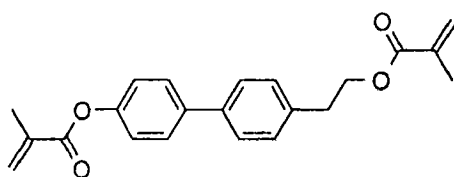
RM-5



RM-6

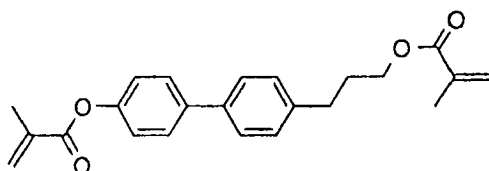


RM-7

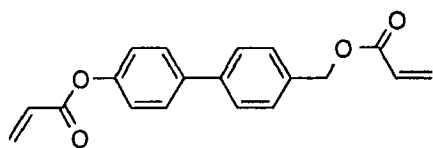


RM-8

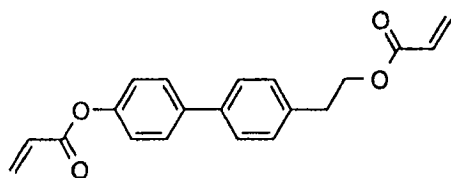
[0389]



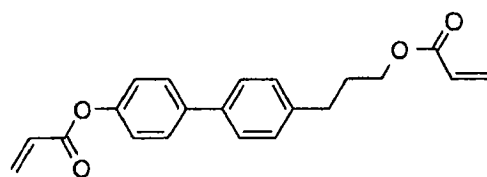
RM-9



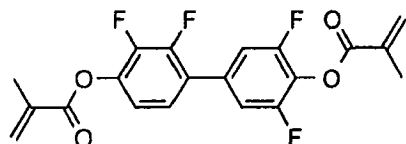
RM-10



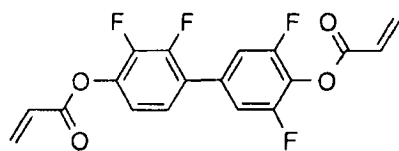
RM-11



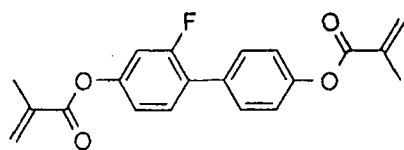
RM-12



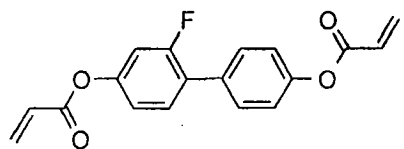
RM-13



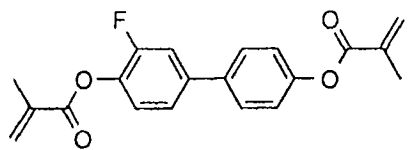
RM-14



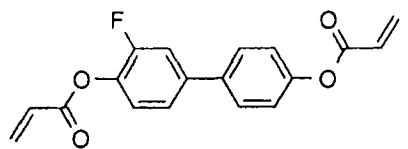
RM-15



RM-16

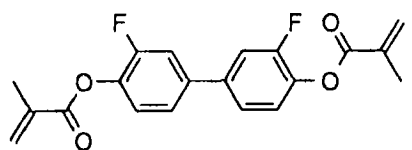


RM-17

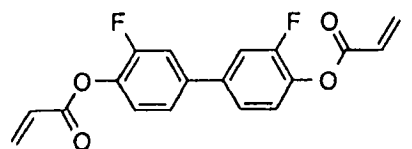


RM-18

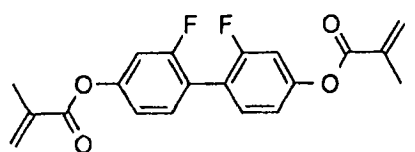
[0390]



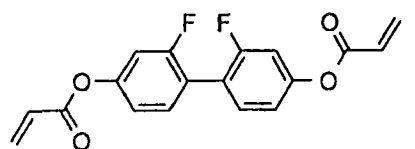
RM-19



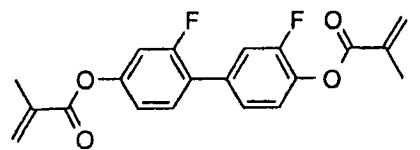
RM-20



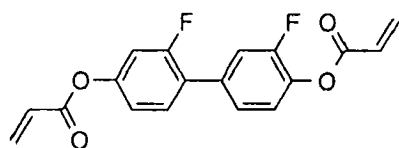
RM-21



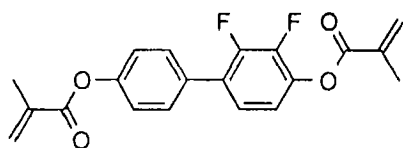
RM-22



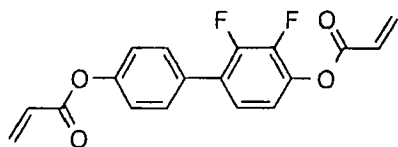
RM-23



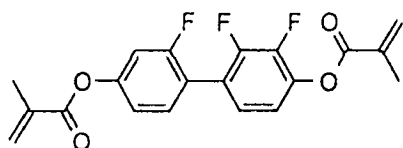
RM-24



RM-25

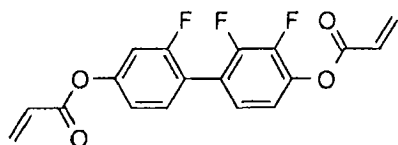


RM-26

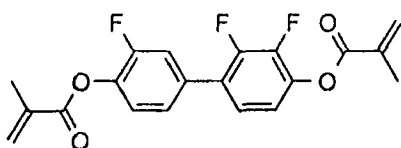


RM-27

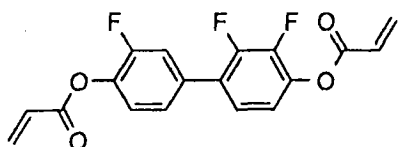
[0391]



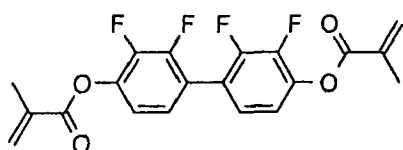
RM-28



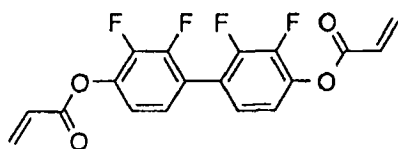
RM-29



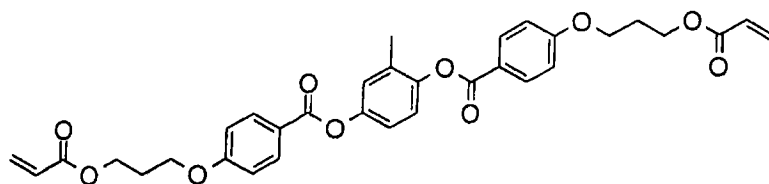
RM-30



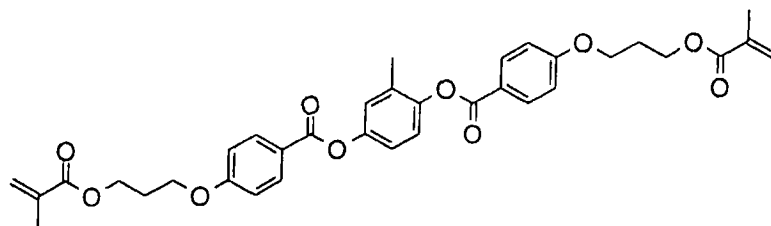
RM-31



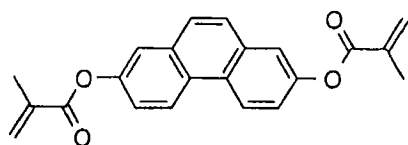
RM-32



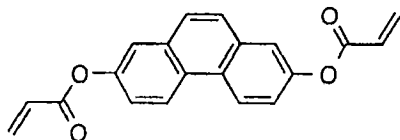
RM-33



RM-34

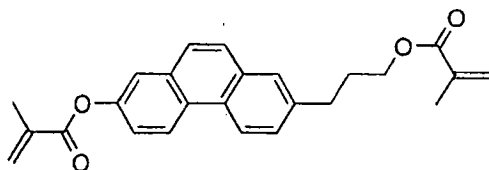


RM-35

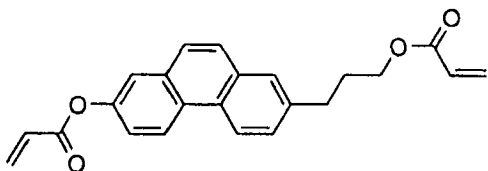


RM-36

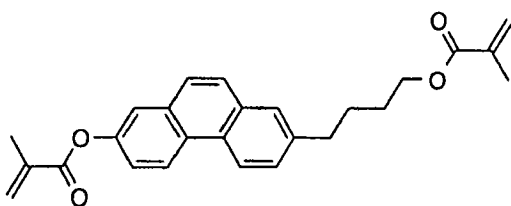
[0392]



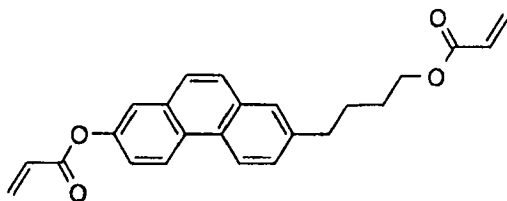
RM-37



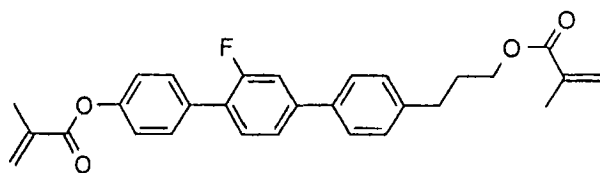
RM-38



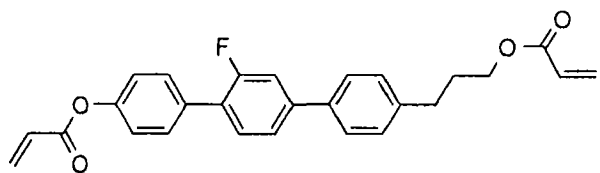
RM-39



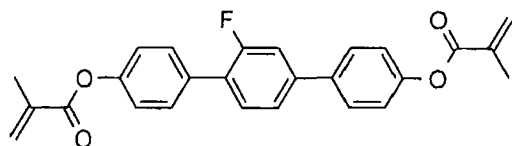
RM-40



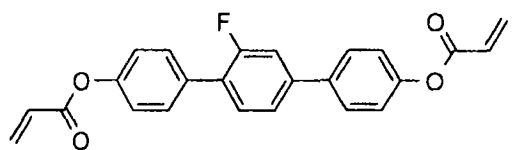
RM-41



RM-42

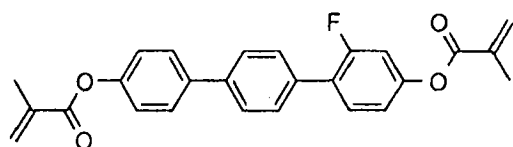


RM-43

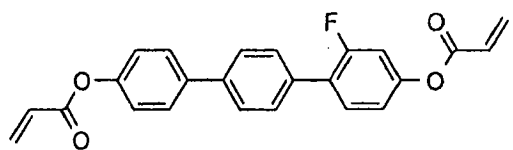


RM-44

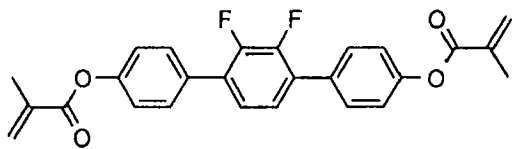
[0393]



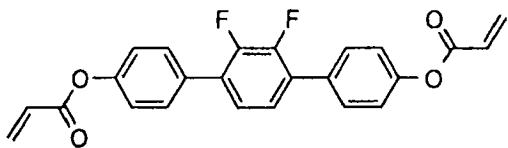
RM-45



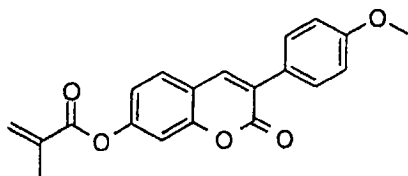
RM-46



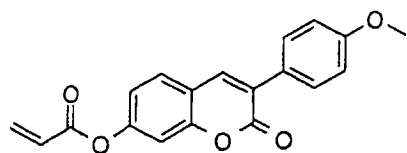
RM-47



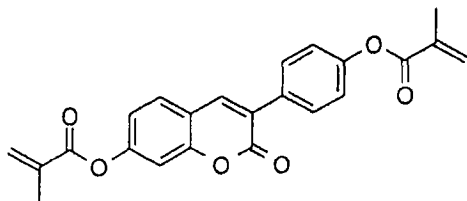
RM-48



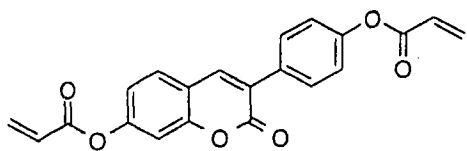
RM-49



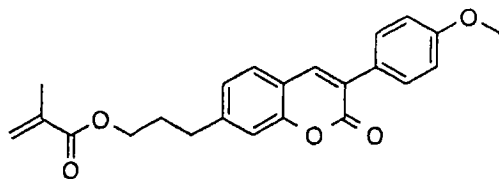
RM-50



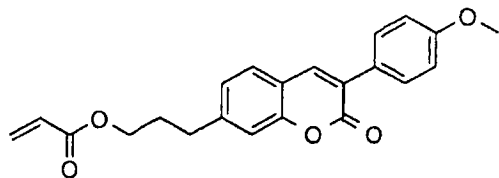
RM-51



RM-52

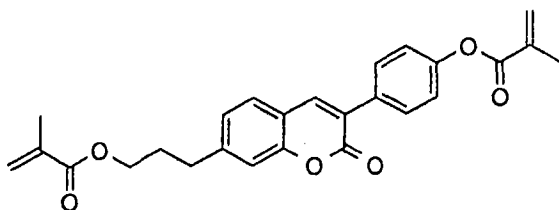


RM-53

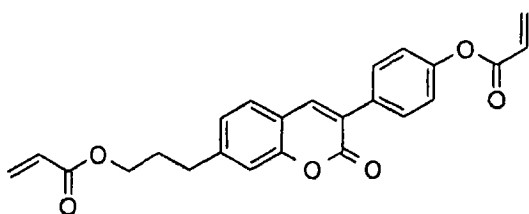


[0394]

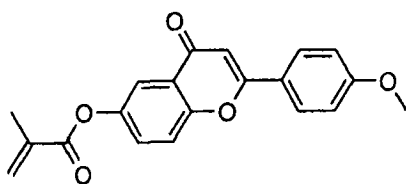
RM-54



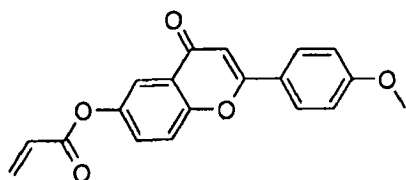
RM-55



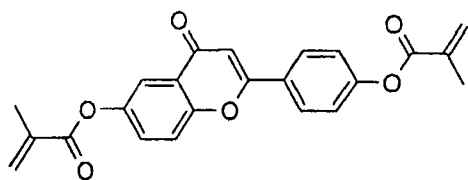
RM-56



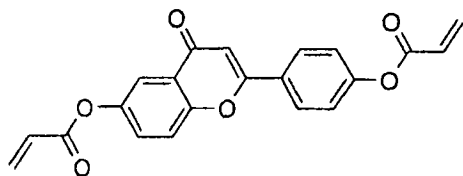
RM-57



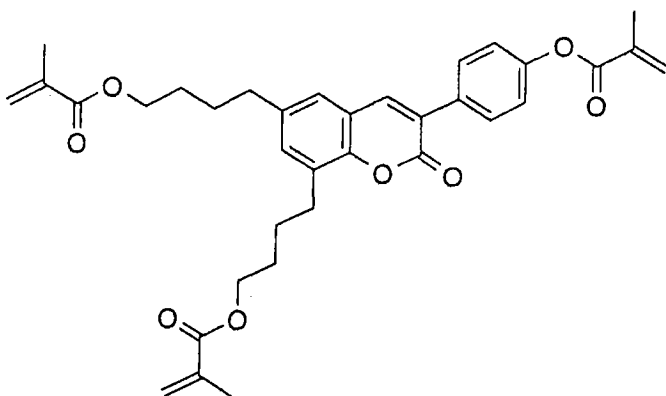
RM-58



RM-59

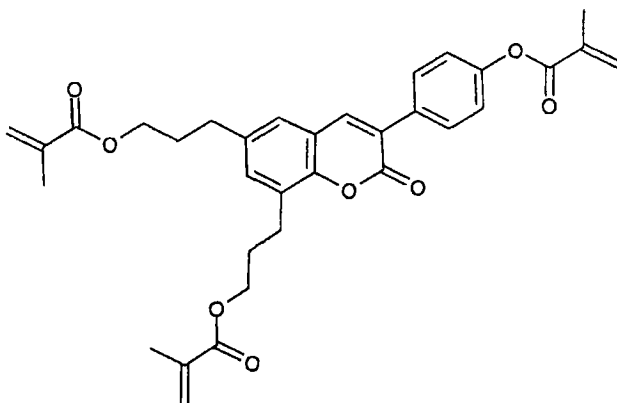


RM-60

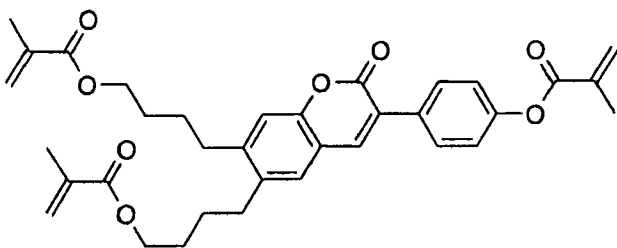


RM-61

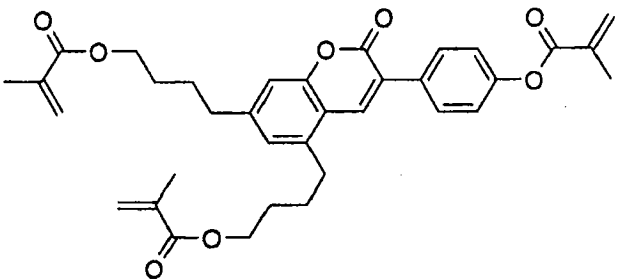
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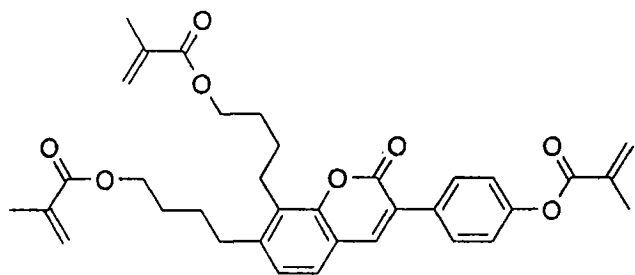
RM-62



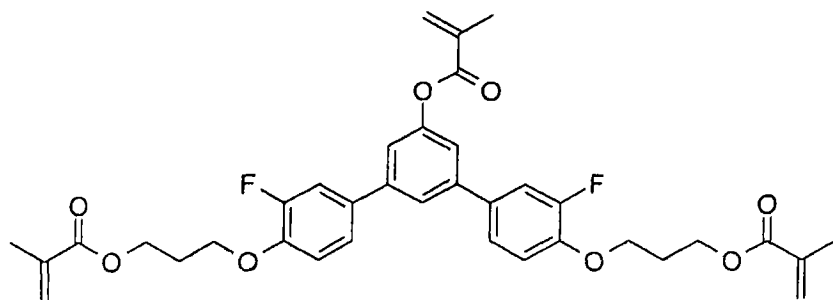
RM-63



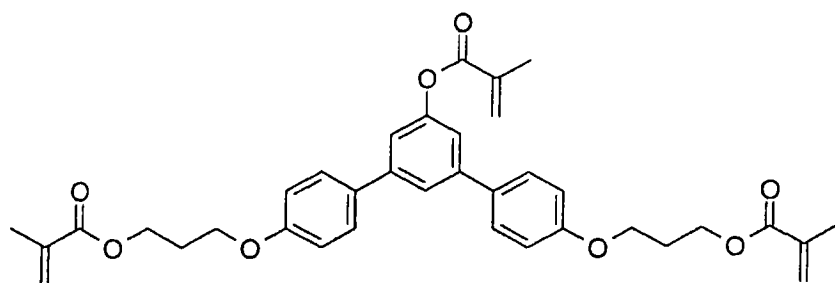
RM-64



RM-65

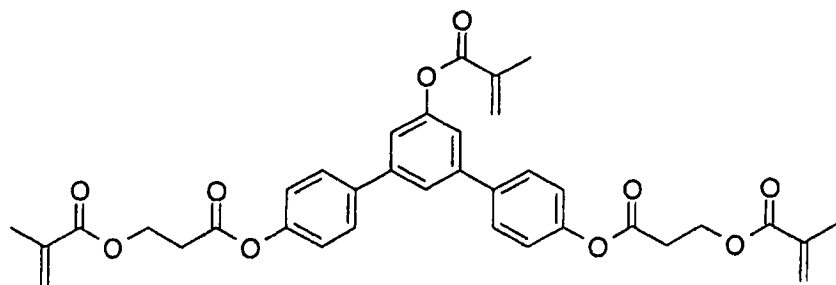


RM-66

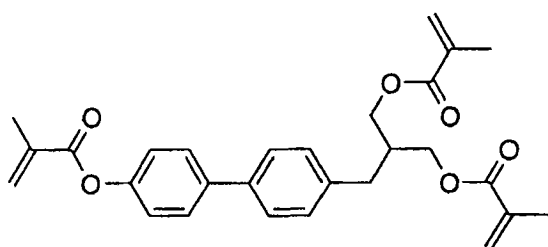


RM-67

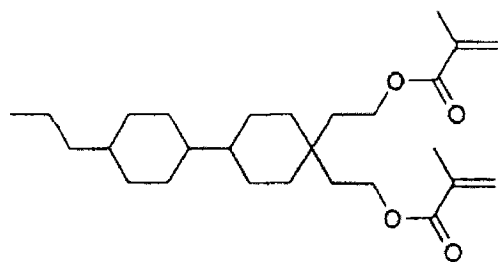
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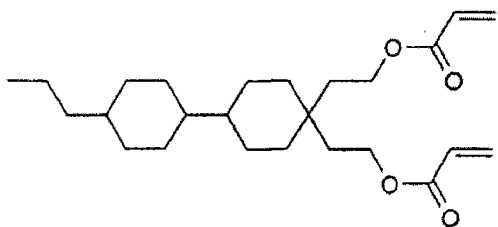
RM-68



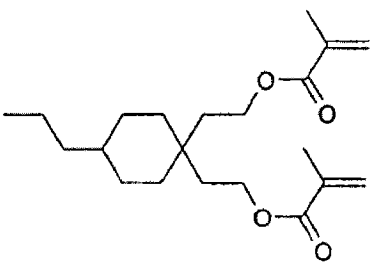
RM-69



RM-70

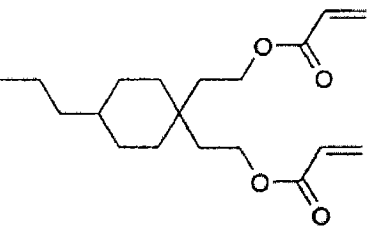


RM-71

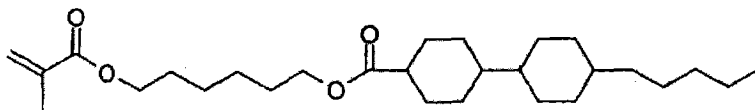


RM-72

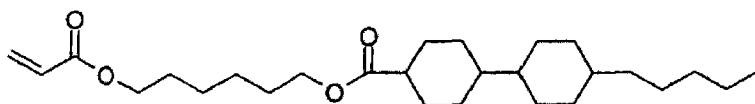
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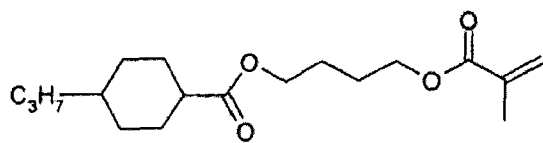
RM-73



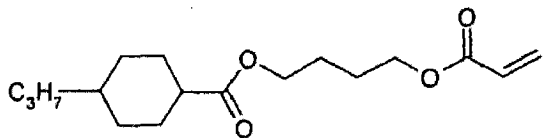
RM-74



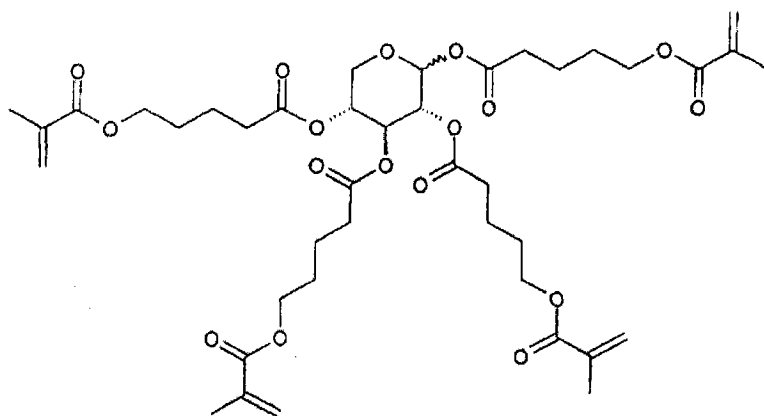
RM-75



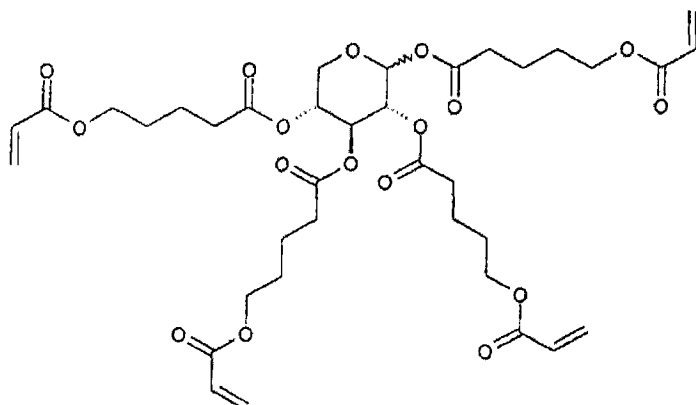
RM-76



RM-77

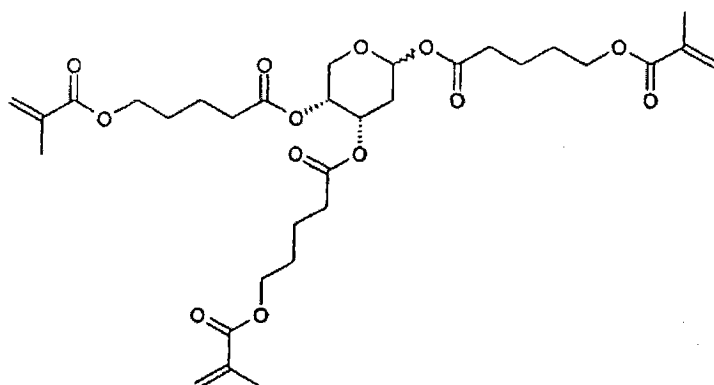


RM-78

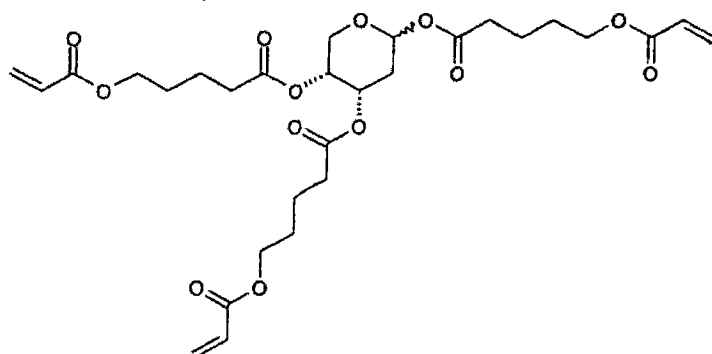


RM-79

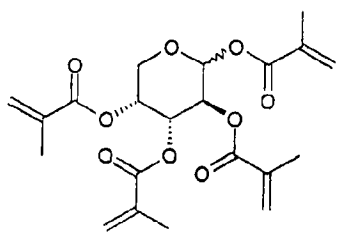
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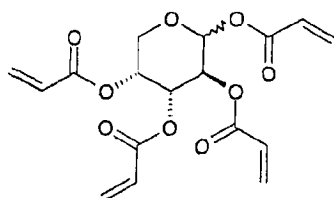
RM-80



RM-81

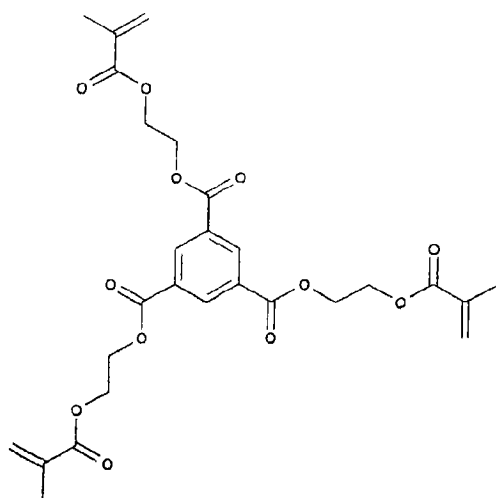


RM-82

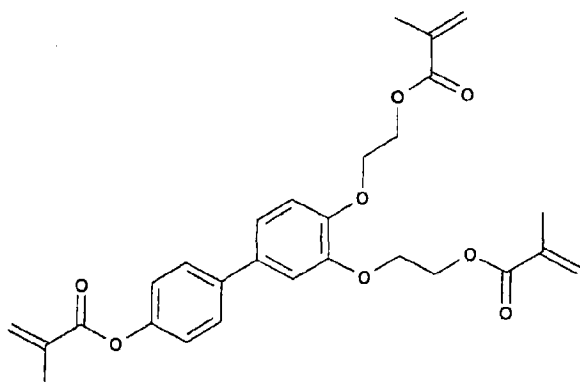


RM-83

[0399]

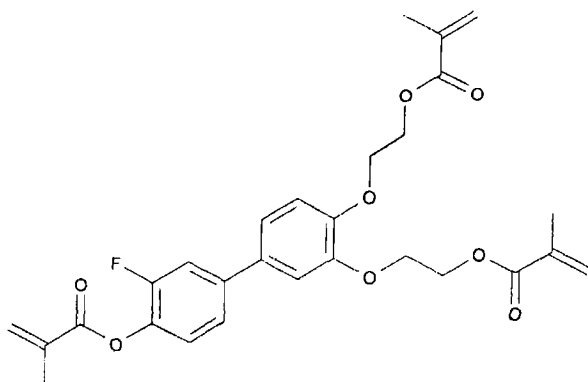


RM-84



RM-85

[0400]



RM-86

[0401] 下列实施例旨在解释本发明,而非对其进行限制。

[0402] 在上下文中,百分比数据表示重量百分比。所有温度都以摄氏度表示。m.p.表示熔点,c.l.p.=清亮点。此外,C=结晶态,N=向列相,S=近晶相,且I=各向同性相。这些符号之间的数据代表转变温度。此外,

[0403] $-\Delta n$ 表示在20℃和589nm下的光学各向异性,

[0404] $-\gamma_1$ 表示在20℃下的旋转粘度(mPa·s),

[0405] $-\Delta \epsilon$ 表示在20℃和1kHz下的介电各向异性($\Delta \epsilon = \epsilon_{||} - \epsilon_{\perp}$,其中 $\epsilon_{||}$ 表示与分子纵轴平行的介电常数,且 $\epsilon_{\perp}$ 表示与其垂直的介电常数),

[0406] $-V_{10}$ 表示10%透射(与板表面垂直的视角)的电压(V)(阈值电压),在20℃下在第一最小值处(即在 $d \cdot \Delta n$ 值为0.5 μm 处)的TN盒(90度扭曲)中测定,

[0407] $-V_0$ 表示在20℃下反向平行摩擦的盒中电容式测定的Freedericks阈值电压。

[0408] 除非另有明确说明,所有物理性质根据“Merck Liquid Crystals,Physical Properties of Liquid Crystals”,status Nov.1997,Merck KGaA(德国)进行测定并适用于20℃温度。

实施例

[0409] 混合物M1

CC-3-V	16.87 %	清亮点 [°C]:	82.0
CC-3-V1	4.26 %	Δn [589 nm, 20°C]:	0.108
CCQU-2-F	6.39 %	$\Delta \epsilon$ [1 kHz, 20°C]:	9.3
CCQU-3-F	9.23 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	8.37
CCP-2F.F.F	4.26 %	K_1 [20 °C]:	12.5
PUQU-3-F	11.36 %	K_3 [20 °C]	13.4
CCP-V-1	9.94 %	γ_1 [20 °C, m·Pas]:	112
APUQU-3-F	8.52 %	LTS 块体 -25 °C	> 1000 h
PGUQU-3-F	5.68 %	LTS 块体 -30 °C	> 1000 h

[0410] CY-3-O2	6.96 %
CY-5-O2	1.015 %
CLY-3-O2	2.03 %
CCY-3-O2	2.90 %
CCY-3-O3	1.305 %
CCY-4-O2	1.16 %
CPY-2-O2	2.90 %
CPY-3-O2	2.32 %
PYP-2-3	1.74 %
PYP-2-4	1.16 %

[0411] 混合物M2

	CY-3-O2	8.50 %	清亮点 [°C]:	80.0
	CCY-3-O2	6.00 %	Δn [589 nm, 20°C]:	0.109
	CPY-2-O2	6.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.5
	PYP-2-3	3.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	8.97
	CC-3-V	30.50 %	K_1 [20 °C]:	12.5
[0412]	CLY-3-O2	5.00 %	K_3 [20 °C]:	13.5
	CCQU-3-F	11.50 %	γ_1 [20 °C, mPa·s]:	105
	APUQU-2-F	8.50 %		
	APUQU-3-F	8.00 %		
	PGUQU-3-F	7.50 %		
	PUQU-3-F	5.50 %		
[0413]	<u>混合物M3</u>			
	CCY-3-O2	5.00 %	清亮点 [°C]:	78.5
	CPY-2-O2	8.00 %	Δn [589 nm, 20°C]:	0.109
	CC-3-V	31.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.7
	CLY-3-O2	8.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	9.58
	CCQU-3-F	7.50 %	K_1 [20 °C]:	12.6
[0414]	APUQU-2-F	11.50 %	K_3 [20 °C]:	13.2
	APUQU-3-F	12.00 %	γ_1 [20 °C, mPa·s]:	105
	DPGU-4-F	3.00 %		
	PUQU-3-F	5.50 %		
	PY-3-O2	5.50 %		
	Y-4O-O4	3.00 %		
[0415]	<u>混合物M4</u>			
	CC-3-V	34.00 %	清亮点 [°C]:	77.5
	CCQU-2-F	5.50 %	Δn [589 nm, 20°C]:	0.107
	CCQU-3-F	9.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.6
	APUQU-2-F	11.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	8.03
	APUQU-3-F	11.00 %	K_1 [20 °C]:	12.2
[0416]	PUQU-3-F	3.00 %	K_3 [20 °C]:	12.4
	PY-3-O2	4.00 %	γ_1 [20 °C, mPa·s]:	87
	PYP-2-3	6.50 %		
	CLY-3-O2	7.00 %		
	CPY-2-O2	2.50 %		
	BCH-3F.F.F	6.00 %		
[0417]	<u>混合物M5</u>			

	CY-3-O2	5.50 %	清亮点 [°C]:	78.5
	CCY-3-O2	4.50 %	Δn [589 nm, 20°C]:	0.109
	CPY-2-O2	5.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.3
	PYP-2-3	3.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	8.95
	CC-3-V	30.50 %	K_1 [20 °C]:	12.4
[0418]	CLY-3-O2	7.00 %	K_3 [20 °C]:	13.4
	CCQU-3-F	8.00 %	γ_1 [20 °C, mPa·s]:	103
	APUQU-2-F	12.00 %		
	APUQU-3-F	12.00 %		
	PUQU-3-F	5.50 %		
	BCH-3F.F.F	3.50 %		
	PY-3-O2	3.00 %		
[0419]	<u>混合物M6</u>			
	CCY-3-O2	5.00 %	清亮点 [°C]:	78.0
	CPY-2-O2	8.00 %	Δn [589 nm, 20°C]:	0.109
	CC-3-V	31.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.9
	CLY-3-O2	8.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	9.55
	CCQU-3-F	8.00 %	K_1 [20 °C]:	12.5
[0420]	APUQU-2-F	11.50 %	K_3 [20 °C]:	13.3
	APUQU-3-F	12.00 %	γ_1 [20 °C, mPa·s]:	104
	PGUQU-3-F	3.00 %		
	PUQU-3-F	5.50 %		
	PY-3-O2	5.50 %		
	Y-4O-O4	2.50 %		
[0421]	<u>混合物M7</u>			
	CC-3-V	34.50 %	清亮点 [°C]:	78.5
	CCQU-3-F	9.50 %	Δn [589 nm, 20°C]:	0.109
	APUQU-2-F	8.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.5
	APUQU-3-F	10.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	7.93
[0422]	PUQU-3-F	7.50 %	K_1 [20 °C]:	12.3
	PYP-2-3	4.50 %	K_3 [20 °C]:	12.7
	CLY-3-O2	8.00 %	γ_1 [20 °C, mPa·s]:	88
	CPY-2-O2	6.50 %		
	BCH-3F.F.F	11.50 %		
[0423]	<u>混合物M8</u>			

	CC-3-V	33.00 %	清亮点 [°C]:	77.5
	CCQU-3-F	8.50 %	Δn [589 nm, 20°C]:	0.109
	APUQU-2-F	10.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	9.5
	APUQU-3-F	10.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	8.25
[0424]	PUQU-3-F	5.50 %	K_1 [20 °C]:	12.1
	PYP-2-3	4.00 %	K_3 [20 °C]:	12.8
	CLY-3-O2	8.00 %	γ_1 [20 °C, mPa·s]:	90
	CPY-2-O2	7.50 %		
	BCH-3F.F.F	12.00 %		
	Y-4O-O4	1.50 %		
[0425]	<u>混合物M9</u>			
	CCY-3-O2	5.00 %	清亮点 [°C]:	79.5
	CPY-2-O2	8.00 %	Δn [589 nm, 20°C]:	0.109
	CC-3-V	31.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	9.4
	CLY-3-O2	8.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	9.36
	CCQU-3-F	7.50 %	K_1 [20 °C]:	12.6
[0426]	APUQU-2-F	11.50 %	K_3 [20 °C]:	13.4
	APUQU-3-F	12.00 %	γ_1 [20 °C, mPa·s]:	104
	CPGU-3-OT	3.00 %		
	PUQU-3-F	6.00 %		
	PY-3-O2	5.00 %		
	Y-4O-O4	3.00 %		
[0427]	<u>混合物M10</u>			
	CCY-3-O2	5.00 %	清亮点 [°C]:	77.0
	CPY-2-O2	8.00 %	Δn [589 nm, 20°C]:	0.109
	CC-3-V	27.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	9.4
	PCH-301	5.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	9.49
	CLY-3-O2	8.00 %	K_1 [20 °C]:	12.1
	CCQU-3-F	8.00 %	K_3 [20 °C]:	12.9
[0428]	APUQU-2-F	11.50 %	γ_1 [20 °C, mPa·s]:	107
	APUQU-3-F	11.50 %		
	DPGU-4-F	3.00 %		
	PUQU-3-F	5.50 %		
	PY-3-O2	4.50 %		
	Y-4O-O4	3.00 %		
[0429]	<u>混合物M11</u>			

	APUQU-2-F	8.50 %	清亮点 [°C]:	78.0
	APUQU-3-F	8.00 %	Δn [589 nm, 20°C]:	0.107
	CC-3-V	44.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.8
	CCP-30CF ₃	7.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	6.81
[0430]	CCP-V-1	7.00 %	K_1 [20 °C]:	12.3
	DPGU-4-F	3.50 %	K_3 [20 °C]:	13.4
	PGP-2-2V	3.50 %	γ_1 [20 °C, mPa·s]:	66
	PGUQU-4-F	5.00 %		
	PUQU-3-F	8.50 %		
	PYP-2-3	4.00 %		
[0431]	<u>混合物M12</u>			
	APUQU-2-F	8.50 %	清亮点 [°C]:	78.0
	APUQU-3-F	8.00 %	Δn [589 nm, 20°C]:	0.107
	CC-3-V	44.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.7
	CCP-30CF ₃	7.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	6.94
	CCP-V-1	6.00 %	K_1 [20 °C]:	12.4
[0432]	DPGU-4-F	3.50 %	K_3 [20 °C]:	13.4
	PGP-2-2V	2.50 %	γ_1 [20 °C, mPa·s]:	66
	PGUQU-4-F	5.00 %		
	PUQU-3-F	8.50 %		
	PYP-2-3	4.00 %		
	CPY-2-O2	2.00 %		
[0433]	<u>混合物M13</u>			
	CY-3-O2	6.50 %	清亮点 [°C]:	77.0
	CLY-3-O2	6.00 %	Δn [589 nm, 20°C]:	0.111
	CCY-3-O2	8.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	9.5
	CPY-2-O2	7.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	9.88
	CPY-3-O2	5.50 %	K_1 [20 °C]:	12.1
[0434]	CC-3-V	27.00 %	K_3 [20 °C]:	13.2
	PUQU-3-F	15.00 %	γ_1 [20 °C, mPa·s]:	114
	APUQU-2-F	10.00 %		
	APUQU-3-F	10.00 %		
	CCQU-3-F	4.00 %		
	Y-4O-O4	1.00 %		
[0435]	<u>混合物M14</u>			

[0436]	CC-3-V	34.50 %	清亮点 [°C]:	76.5
	PGP-2-2V	4.50 %	$\Delta\epsilon$ [1 kHz, 20°C]:	19.4
	PGU-2-F	3.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	11.06
	PGU-3-F	6.50 %		
	APUQU-2-F	8.00 %		
	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	3.00 %		
	<u>混合物M15</u>			
[0438]	CC-3-V	31.50 %	清亮点 [°C]:	75.0
	PGP-2-2V	4.50 %	$\Delta\epsilon$ [1 kHz, 20°C]:	19.9
	PGU-2-F	3.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	11.57
	PGU-3-F	6.50 %	K_1 [20 °C]:	12.2
	APUQU-2-F	8.00 %	K_3 [20 °C]:	11.5
	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	6.00 %		
	<u>混合物M16</u>			
[0440]	CC-3-V	25.50 %	清亮点 [°C]:	71.5
	PGP-2-2V	4.50 %	$\Delta\epsilon$ [1 kHz, 20°C]:	21.0
	PGU-2-F	3.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	12.66
	PGU-3-F	6.50 %		
	APUQU-2-F	8.00 %		
	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	12.00 %		
	<u>混合物M17</u>			

[0441]

	CC-3-V	19.50 %	清亮点 [°C]:	67.5
	PGP-2-2V	4.50 %	$\Delta\epsilon$ [1 kHz, 20°C]:	22.4
	PGU-2-F	3.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	13.92
	PGU-3-F	6.50 %	K_1 [20 °C]:	13.1
	APUQU-2-F	8.00 %	K_3 [20 °C]:	12.7
[0442]	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	18.00 %		
[0443]	<u>混合物M18</u>			
	CC-3-V	13.50 %	清亮点 [°C]:	64.0
	PGP-2-2V	4.50 %	$\Delta\epsilon$ [1 kHz, 20°C]:	24.3
	PGU-2-F	3.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	15.31
	PGU-3-F	6.50 %		
	APUQU-2-F	8.00 %		
[0444]	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	24.00 %		
[0445]	<u>混合物M19</u>			
	CC-3-V	25.50 %	清亮点 [°C]:	80.0
	PGP-2-2V	7.00 %	Δn [589 nm, 20°C]:	0.155
	PGU-3-F	2.00 %	$\Delta\epsilon$ [1 kHz, 20°C]:	22.4
	APUQU-2-F	8.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	12.95
	APUQU-3-F	8.50 %	K_1 [20 °C]:	14.5
[0446]	PGUQU-3-F	5.00 %	K_3 [20 °C]:	15.7
	PGUQU-4-F	9.00 %	γ_1 [20 °C, mPa·s]:	145
	PGUQU-5-F	9.00 %		
	DPGU-4-F	8.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	12.00 %		
[0447]	<u>混合物M20</u>			

	CC-3-V	25.50 %	清亮点 [°C]:	78.0
	CCP-V-1	7.00 %	Δn [589 nm, 20°C]:	0.139
	PGU-3-F	2.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	20.1
	APUQU-2-F	10.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	12.18
	APUQU-3-F	10.50 %	K_1 [20 °C]:	12.6
[0448]	PGUQU-3-F	4.00 %	K_3 [20 °C]:	12.6
	PGUQU-4-F	9.00 %	γ_1 [20 °C, mPa·s]:	127
	PGUQU-5-F	9.00 %		
	DPGU-4-F	5.00 %		
	BCH-3F.F.F	6.00 %		
	PY-3-O2	12.00 %		
[0449]	<u>混合物M21</u>			
	CC-3-V	31.50 %	清亮点 [°C]:	75.0
	PGP-2-2V	4.50 %	Δn [589 nm, 20°C]:	0.138
	PGU-2-F	3.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	19.2
	PGU-3-F	6.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	11.33
	APUQU-2-F	8.00 %	K_1 [20 °C]:	11.5
	APUQU-3-F	8.00 %	K_3 [20 °C]:	11.4
[0450]	PGUQU-3-F	4.00 %	γ_1 [20 °C, mPa·s]:	109
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	CY-3-O2	6.00 %		
[0451]	<u>混合物M22</u>			
	CC-3-V	25.50 %	清亮点 [°C]:	79.5
	PGP-2-2V	7.00 %	Δn [589 nm, 20°C]:	0.141
	PGU-3-F	2.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	20.3
	APUQU-2-F	10.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	12.37
	APUQU-3-F	11.00 %	K_1 [20 °C]:	12.4
	PGUQU-3-F	4.00 %	K_3 [20 °C]:	12.4
[0452]	PGUQU-4-F	8.00 %	γ_1 [20 °C, mPa·s]:	133
	PGUQU-5-F	7.00 %		
	DPGU-4-F	7.00 %		
	BCH-3F.F.F	6.00 %		
	CY-3-O2	12.00 %		
[0453]	<u>混合物M23</u>			

[0454]	CC-3-V	19.50 %	清亮点 [°C]:	68.0
	PGP-2-2V	4.50 %	Δn [589 nm, 20°C]:	0.142
	PGU-2-F	3.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	19.8
	PGU-3-F	6.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	13.10
	APUQU-2-F	8.00 %	K_1 [20 °C]:	10.7
	APUQU-3-F	8.00 %	K_3 [20 °C]:	10.5
	PGUQU-3-F	4.00 %	γ_1 [20 °C, mPa·s]:	135
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	CY-3-O2	18.00 %		
[0455]	<u>混合物M24</u>			
[0456]	CC-3-V	37.50 %	清亮点 [°C]:	77.0
	PGU-2-F	3.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	18.7
	PGU-3-F	6.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	10.64
	APUQU-2-F	8.00 %		
	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PYP-2-3	4.50 %		
[0457]	<u>混合物M25</u>			
[0458]	CC-3-V	31.50 %	清亮点 [°C]:	84.0
	PGP-2-2V	4.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	21.1
	PGU-2-F	3.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	11.47
	PGU-3-F	6.50 %	γ_1 [20 °C, mPa·s]:	121
	APUQU-2-F	8.00 %		
	APUQU-3-F	8.00 %		
	PGUQU-3-F	4.00 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	8.00 %		
	DPGU-4-F	6.00 %		
	BCH-3F.F.F	6.00 %		
	PYP-2-3	6.00 %		
[0459]	<u>混合物M26</u>			

	CC-3-V	35.00 %	清亮点 [°C]:	80
	CC-3-V1	11.00 %	Δn [589 nm, 20°C]:	0.1058
	CCP-V-1	4.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.4
	PGP-2-2V	10.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.8
[0460]	CCP-3OCF ₃	8.00 %	K_1 [20 °C]:	13.2
	APUQU-2-F	7.00 %	K_3 [20 °C]:	14.4
	APUQU-3-F	8.00 %	γ_1 [20 °C, mPa·s]:	69
	PGUQU-3-F	3.00 %	V_0 [V]:	1.65
	CPGU-3-OT	3.00 %		
	CY-3-O2	10.00 %		
[0461]	<u>混合物M27</u>			
	CC-3-V	44.50 %	清亮点 [°C]:	79.5
	CC-3-V1	9.00 %	Δn [589 nm, 20°C]:	0.1057
	CCP-V-1	8.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.7
	CCP-3OCF ₃	4.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.3
	PGP-2-3	3.00 %	K_1 [20 °C]:	13.3
[0462]	PGP-2-4	3.50 %	K_3 [20 °C]	14.2
	APUQU-3-F	6.00 %	γ_1 [20 °C, mPa·s]:	60
	PGUQU-3-F	4.50 %	V_0 [V]	1.65
	PGUQU-4-F	7.00 %		
	CPGU-3-OT	5.00 %		
	PY-3-O2	5.00 %		
[0463]	<u>混合物M28</u>			
	CC-3-V	41.00 %	清亮点 [°C]:	78.5
	CC-3-V1	5.50 %	Δn [589 nm, 20°C]:	0.1054
	CCP-V-1	11.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.7
	PGP-2-4	2.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.8
	CCP-3OCF ₃	6.50 %	K_1 [20 °C]:	13.0
[0464]	APUQU-3-F	6.50 %	K_3 [20 °C]	14.2
	PGUQU-3-F	3.00 %	γ_1 [20 °C, mPa·s]:	63
	PGUQU-4-F	9.00 %	V_0 [V]	1.59
	CPGU-3-OT	5.00 %		
	PY-3-O2	10.00 %		
[0465]	<u>混合物M29</u>			

	CC-3-V	33.50 %	清亮点 [°C]:	79.5
	CCP-V-1	12.50 %	Δn [589 nm, 20°C]:	0.1077
	PGP-2-2V	6.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.5
	CCP-3-1	7.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	4.3
	CCP-3-3	6.00 %	K_1 [20 °C]:	12.8
[0466]	CCP-3OCF ₃	2.00 %	K_3 [20 °C]	13.7
	APUQU-3-F	8.00 %	γ_1 [20 °C, mPa·s]:	69
	PGUQU-3-F	3.00 %	V_0 [V]	1.61
	PGUQU-4-F	7.00 %		
	CPGU-3-OT	5.00 %		
	Y-40-O4	10.00 %		
[0467]	<u>混合物M30</u>			
	CC-3-V	39.50 %	清亮点 [°C]:	84.9
	CC-3-V1	2.50 %	Δn [589 nm, 20°C]:	0.1086
	CCP-3OCF ₃	8.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	8.3
	CCP-V-1	14.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.2
	CCP-V2-1	2.50 %	K_1 [20 °C]:	13.0
[0468]	CPGU-3-OT	1.50 %	K_3 [20 °C]	14.9
	DPGU-4-F	4.00 %	γ_1 [20 °C, mPa·s]:	69
	PGUQU-3-F	8.00 %	V_0 [V]	1.32
	PGUQU-4-F	4.50 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	11.50 %		
	PYP-2-3	3.00 %		
[0469]	<u>混合物M31</u>			
	APUQU-3-F	4.00 %	清亮点 [°C]:	84.4
	CC-3-V	42.00 %	Δn [589 nm, 20°C]:	0.1090
	CC-3-V1	4.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	8.6
	CCP-3-1	5.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.4
	CCP-3OCF ₃	9.00 %	K_1 [20 °C]:	13.4
[0470]	CCP-V-1	6.00 %	K_3 [20 °C]	14.4
	DPGU-4-F	5.00 %	γ_1 [20 °C, mPa·s]:	70
	PGU-2-F	6.00 %	V_0 [V]	1.32
	PGUQU-3-F	8.00 %		
	PGUQU-4-F	7.00 %		
	PPGU-3-F	1.00 %		
	PY-3-O2	3.00 %		
[0471]	<u>混合物M32</u>			

	BCH-32	1.00 %	清亮点 [°C]:	84.5
	CBC-33	3.00 %	Δn [589 nm, 20°C]:	0.1082
	CC-3-V	42.50 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	8.2
	CC-3-V1	7.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.4
	CCP-3OCF ₃	9.50 %	K_1 [20 °C]:	13.3
	CPGU-3-OT	6.50 %	K_3 [20 °C]	14.5
[0472]	CY-5-O2	4.00 %	γ_1 [20 °C, mPa·s]:	71
	DPGU-4-F	5.00 %	V_0 [V]	1.34
	PGU-2-F	1.00 %		
	PGU-3-F	3.00 %		
	PGUQU-3-F	6.00 %		
	PGUQU-4-F	5.00 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	5.50 %		
[0473]	<u>混合物M33</u>			
	APUQU-2-F	4.00 %	清亮点 [°C]:	74.5
	APUQU-3-F	8.00 %	Δn [589 nm, 20°C]:	0.1212
	BCH-3F.F.F	4.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	10.9
	CBC-33	2.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	11.57
	CC-3-V	45.50 %	K_1 [25 °C]:	11.1
[0474]	CCP-V-1	2.00 %	K_3 [25 °C]:	11.5
	PGP-2-2V	5.00 %	γ_1 [25 °C, mPa·s]:	55
	PGU-2-F	8.00 %		
	PGUQU-3-F	8.00 %		
	PGUQU-4-F	7.00 %		
	PPGU-3-F	1.00 %		
	PYP-2-3	2.50 %		
[0475]	<u>混合物M34</u>			
	CC-3-V	38.00 %	清亮点 [°C]:	78
	CC-3-V1	2.00 %	Δn [589 nm, 20°C]:	0.1059
	CCP-V-1	12.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.0
	CCP-3-1	3.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	4.3
[0476]	CCP-3OCF ₃	8.00 %	K_1 [20 °C]:	13.1
	APUQU-3-F	8.00 %	K_3 [20 °C]:	14.2
	PGUQU-3-F	3.50 %	γ_1 [20 °C, mPa·s]:	63
	PGUQU-4-F	5.50 %	V_0 [V]	1.67
	CPGU-3-OT	5.00 %		
	PY-3-O2	15.00 %		
[0477]	<u>混合物M35</u>			

	APUQU-2-F	8.50 %	清亮点 [°C]:	75.5
	APUQU-3-F	8.00 %	Δn [589 nm, 20°C]:	0.1005
	CC-3-V	44.50 %	$\Delta \epsilon$ [1 kHz, 20°C]:	9.6
	CCP-3OCF ₃	7.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	3.8
[0478]	CCP-V-1	8.00 %	K_1 [20 °C]:	12.6
	DPGU-4-F	3.50 %	K_3 [20 °C]:	13.8
	PGUQU-4-F	3.50 %	γ_1 [20 °C, mPa·s]:	65
	PUQU-3-F	5.50 %		
	COY-3-O2	8.00 %		
	PY-3-O2	3.00 %		
[0479]	<u>混合物M36</u>			
	CC-3-V	8.00 %	清亮点 [°C]:	102.5
	CPGP-5-2	5.00 %	Δn [589 nm, 20°C]:	0.1995
	CPGP-4-3	5.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	5.1
	CPGP-5-3	5.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	4.0
	PCH-301	10.00 %		
	PGIGI-3-F	6.00 %		
	PGP-2-2V	16.00 %		
[0480]	PGP-2-3	5.00 %		
	PGP-2-4	5.00 %		
	PGP-2-5	10.00 %		
	PGUQU-4-F	6.00 %		
	PGUQU-5-F	2.00 %		
	PP-1-2V1	4.00 %		
	PUQU-3-F	10.00 %		
	Y-4O-O4	3.00 %		
[0481]	<u>混合物M37</u>			
	CC-3-V	29.50 %	清亮点 [°C]:	80
	CC-3-V1	6.00 %	Δn [589 nm, 20°C]:	0.1056
	CCP-V-1	12.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	6.1
	CCP-3-1	5.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	4.3
	CCP-3OCF ₃	8.00 %	K_1 [20 °C]:	13.7
[0482]	CCP-50CF ₃	2.00 %	K_3 [20 °C]:	14.8
	APUQU-2-F	8.00 %	γ_1 [20 °C, mPa·s]:	74
	APUQU-3-F	8.00 %	V_0 [V]	1.57
	PGUQU-3-F	3.00 %		
	PGUQU-4-F	3.50 %		
	PY-3-O2	15.00 %		
[0483]	<u>混合物M38</u>			

[0484]	APUQU-2-F	6.00 %	清亮点 [°C]:	79.5
	APUQU-3-F	6.00 %	Δn [589 nm, 20°C]:	0.1094
	CC-3-V	40.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	11.5
	CCP-30CF ₃	9.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	4.5
	CCP-V-1	1.00 %	K_1 [20 °C]:	12.2
	CPGU-3-OT	5.50 %	K_3 [20 °C]:	13.0
	CCQU-3-F	1.00 %	γ_1 [20 °C, mPa·s]:	85
	CY-3-O2	10.00 %	V_0 [V]	1.08
	PGUQU-3-F	4.50 %		
	PGUQU-4-F	8.00 %		
	PGUQU-5-F	5.00 %		
	DPGU-4-F	4.00 %		
[0485]	<u>混合物M39</u>			
[0486]	CC-3-V	50.00 %	清亮点 [°C]:	79.5
	CC-3-V1	6.50 %	Δn [589 nm, 20°C]:	0.1053
	PUQU-3-F	1.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.9
	APUQU-2-F	1.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	4.1
	APUQU-3-F	9.00 %	K_1 [20 °C]:	12.9
	PGUQU-3-F	5.00 %	K_3 [20 °C]:	14.8
	PGUQU-4-F	9.00 %	γ_1 [20 °C, mPa·s]:	66
	CPY-2-O2	1.50 %	V_0 [V]	44.93
	CPY-3-O2	14.50 %		
	PYP-2-4	2.50 %		
[0487]	<u>混合物M40</u>			
[0488]	CC-3-V	51.00 %	清亮点 [°C]:	79.5
	CC-3-V1	4.00 %	Δn [589 nm, 20°C]:	0.1089
	PUQU-3-F	1.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	5.9
	APUQU-3-F	7.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	4.2
	PGUQU-3-F	5.00 %	K_1 [20 °C]:	12.8
	PGUQU-4-F	9.00 %	K_3 [20 °C]:	14.6
	PGUQU-5-F	2.50 %	γ_1 [20 °C, mPa·s]:	67
	CPY-2-O2	1.50 %	V_0 [V]	45.11
	CPY-3-O2	14.50 %		
	PYP-2-4	4.00 %		
[0489]	<u>混合物M41</u>			

[0490]	CC-3-V	52.00 %	清亮点 [°C]:	79.0
	CC-3-V1	3.00 %	Δn [589 nm, 20°C]:	0.1058
	CCP-30CF ₃	1.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	4.9
	PUQU-3-F	1.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	4.2
	APUQU-3-F	9.00 %	K_1 [20 °C]:	12.7
	PGUQU-3-F	5.00 %	K_3 [20 °C]:	14.5
	PGUQU-4-F	6.50 %	γ_1 [20 °C, mPa·s]:	65
	CPY-2-O2	2.00 %	V_0 [V]	1.69
	CPY-3-O2	15.00 %		
[0491]	PYP-2-4	5.00 %		
	<u>混合物M42</u>			
	CC-3-V	41.00 %	清亮点 [°C]:	79.0
	CC-3-V1	7.00 %	Δn [589 nm, 20°C]:	0.1055
	CCP-V-1	5.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	5.1
	CCP-30CF ₃	8.00 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	4.1
	APUQU-3-F	9.00 %	K_1 [20 °C]:	13.4
	PGUQU-3-F	5.00 %	K_3 [20 °C]:	14.6
	PGUQU-4-F	3.00 %	γ_1 [20 °C, mPa·s]:	65
[0492]	CPGU-3-OT	5.00 %	V_0 [V]	1.70
	CPY-2-O2	3.00 %		
	CPY-3-O2	3.00 %		
	PY-3-O2	9.00 %		
	PYP-2-4	2.00 %		
[0493]	<u>混合物M43</u>			
	APUQU-2-F	6.00 %	清亮点 [°C]:	80.2
	APUQU-3-F	6.00 %	Δn [589 nm, 25°C]:	0.1043
	BCH-32	4.50 %	$\Delta \epsilon$ [1 kHz, 25°C]:	8.4
	CC-3-V	31.00 %	$\epsilon_{\perp}$ [1 kHz, 25 °C]:	4.0
	CC-3-V1	3.50 %	K_1 [25 °C]:	11.6
	CCP-3-1	3.50 %	K_3 [25 °C]:	13.1
	CCP-V-1	18.00 %	γ_1 [25 °C, mPa·s]:	60
	CDUQU-3-F	4.00 %	V_0 [V]	1.24
[0494]	PGP-2-2V	2.00 %		
	PGUQU-3-F	5.50 %		
	PGUQU-4-F	5.00 %		
	PPGU-3-F	0.50 %		
	PUQU-3-F	4.50 %		
	Y-4O-O4	6.00 %		
[0495]	<u>混合物M44</u>			

	BCH-3F.F.F	10.00 %	清亮点 [°C]:	85.4
	CC-3-V	23.50 %	Δn [589 nm, 20°C]:	0.1071
	CC-3-V1	7.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	6.8
	CCGU-3-F	5.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.5
	CCP-30CF ₃	9.00 %	K_1 [20 °C]:	13.4
	CCP-3F.F.F	8.00 %	K_3 [20 °C]:	14.8
[0496]	CCP-V-1	11.00 %	γ_1 [20 °C, mPa·s]:	83
	CCP-V2-1	3.00 %	V_0 [V]	1.48
	DPGU-4-F	3.00 %		
	PGP-2-2V	3.00 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	10.50 %		
	PY-3-O2	6.00 %		
[0497]	<u>混合物M45</u>			
	CC-3-V	33.00 %	清亮点 [°C]:	84.8
	CCP-3-1	6.00 %	Δn [589 nm, 20°C]:	0.1182
	CCP-30CF ₃	4.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	8.5
	CCP-V-1	13.50 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.9
	CDUQU-3-F	1.00 %	K_1 [20 °C]:	12.8
	CPGP-5-2	2.00 %	K_3 [20 °C]:	14.8
[0498]	CPGU-3-OT	4.50 %	γ_1 [20 °C, mPa·s]:	82
	DPGU-4-F	5.00 %	V_0 [V]	1.29
	PGU-2-F	3.00 %		
	PGUQU-3-F	7.00 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	12.00 %		
	PY-3-O2	8.00 %		
[0499]	<u>混合物M46</u>			

	BCH-3F.F.F	8.00 %	清亮点 [°C]:	85.5
	CC-3-V	22.00 %	Δn [589 nm, 20°C]:	0.1028
	CC-3-V1	7.00 %	$\Delta \varepsilon$ [1 kHz, 20°C]:	6.8
	CCGU-3-F	7.00 %	$\varepsilon_{\perp}$ [1 kHz, 20 °C]:	3.6
	CCP-30CF ₃	9.00 %	K_1 [20 °C]:	13.2
	CCP-3F.F.F	8.00 %	K_3 [20 °C]:	14.9
[0500]	CCP-V-1	12.00 %	γ_1 [20 °C, mPa·s]:	83
	CCP-V2-1	2.00 %	V_0 [V]	1.47
	CCGU-3-F	4.50 %		
	PGP-2-2V	2.00 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	11.50 %		
	PY-3-O2	6.00 %		
[0501]	<u>混合物M47</u>			
	PUQU-3-F	12.00 %	清亮点 [°C]:	86.3
	APUQU-3-F	6.00 %	Δn [589 nm, 25°C]:	0.1194
	PGUQU-3-F	5.00 %	$\Delta \varepsilon$ [1 kHz, 25°C]:	6.9
	PGUQU-4-F	5.00 %	$\varepsilon_{\perp}$ [1 kHz, 25 °C]:	3.8
	CC-3-V	28.00 %	K_1 [25 °C]:	13.3
[0502]	CC-3-V1	5.00 %	K_3 [25 °C]:	14.2
	CCP-V-1	12.00 %	γ_1 [25 °C, mPa·s]:	70
	CCP-V2-1	12.00 %	V_0 [V]	1.45
	PYP-2-3	10.00 %		
	CPY-3-O2	2.00 %		
	PY-3-O2	3.00 %		
[0503]	<u>混合物M48</u>			
	APUQU-3-F	6.00 %	清亮点 [°C]:	115.1
	CBC-33	4.00 %	Δn [589 nm, 25°C]:	0.1211
	CBC-53F	3.25 %	$\Delta \varepsilon$ [1 kHz, 25°C]:	1.8
	CC-3-V	27.25 %	$\varepsilon_{\perp}$ [1 kHz, 25 °C]:	3.2
	CC-3-V1	7.00 %		
	CCGU-3-F	6.00 %		
[0504]	CCP-3-1	4.00 %		
	CCP-V-1	12.00 %		
	CPGP-5-2	3.75 %		
	PGP-2-3	5.00 %		
	PGP-2-4	4.75 %		
	PUQU-3-F	11.75 %		
	CCY-3-O2	5.25 %		
[0505]	<u>混合物M49</u>			

[0506]	APUQU-2-F	6.00 %	清亮点 [°C]:	80.4
	APUQU-3-F	5.50 %	Δn [589 nm, 25°C]:	0.1038
	CC-3-V	32.00 %	$\Delta \epsilon$ [1 kHz, 25°C]:	11.4
	CCP-3-1	7.00 %	$\epsilon_{\perp}$ [1 kHz, 25 °C]:	4.1
	CCP-30CF ₃	7.00 %	K ₁ [25 °C]:	11.4
	CCP-V-1	6.00 %	K ₃ [25 °C]:	11.7
	CDUQU-3-F	8.00 %	γ_1 [25 °C, mPa·s]:	71
	CPGU-3-OT	5.00 %	V ₀ [V]	1.06
	DPGU-4-F	4.00 %		
	PGU-2-F	2.50 %		
	PGUQU-3-F	4.00 %		
	PPGU-3-F	0.50 %		
	PUQU-3-F	6.50 %		
	Y-4O-O4	6.00 %		
[0507]	<u>混合物M50</u>			
	BCH-32	1.00 %	清亮点 [°C]:	85.7
	CC-3-V	35.00 %	Δn [589 nm, 20°C]:	0.1104
	CC-3-V1	5.00 %	$\Delta \epsilon$ [1 kHz, 20°C]:	8.4
	CCP-30CF ₃	8.50 %	$\epsilon_{\perp}$ [1 kHz, 20 °C]:	3.6
	CCP-V-1	15.00 %	K ₁ [20 °C]:	13.2
	CPGU-3-OT	4.50 %	K ₃ [20 °C]:	14.1
[0508]	DPGU-4-F	6.00 %	V ₀ [V]	1.33
	PGU-2-F	6.00 %		
	PGUQU-3-F	5.00 %		
	PGUQU-4-F	5.00 %		
	PPGU-3-F	1.00 %		
	PUQU-3-F	5.00 %		
	Y-4O-O4	3.00 %		