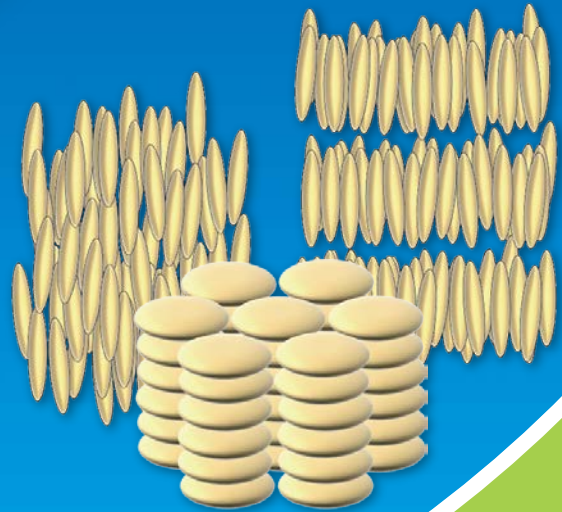
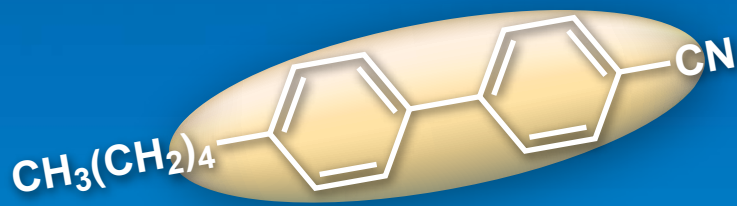


# Liquid Crystal Materials



Nematic & Smectic Liquid Crystals

Cholesteric Liquid Crystals

Discotic Liquid Crystals

# Liquid Crystal Materials

Liquid crystals are states (or compounds) having both fluidity like liquids and long range order like crystals. To be specific, liquid crystalline states involve an ordered molecular orientation but they partially or fully lack positional orders of gravity center in the arranged molecules compared to normal crystal states. Thermotropic and lyotropic liquid crystals are two main classes of liquid crystals. The former liquid crystalline phase appears by changing temperature, and the latter phase appears by changing solution concentration of amphiphilic compounds, etc.

Most thermotropic liquid crystalline molecules have either a calamitic or discotic molecular shape. Calamitic liquid crystals usually exhibit several mesophases: nematic, smectic, and cholesteric phases. Forming these liquid crystalline states enables these compounds to exhibit characteristic functions such as optical anisotropy and ferroelectricity. Besides calamitic and discotic liquid crystals, other liquid crystals with unique molecular shapes e.g. banana-shaped ones with bent-cores<sup>1,2)</sup> and shuttlecock-shaped fullerene derivatives<sup>3)</sup> have been investigated extensively.

The nematic phase is a state in which molecules are oriented along the direction of the molecular long axis but the molecular gravity centers are randomly located like an isotropic liquid (Figure 1(a)). A nematic phase usually appears at a higher temperature than the other mesophases when there are several possible ones. The TN (Twisted Nematic) mode<sup>4)</sup> of liquid crystal displays requires fast responding nematic liquid crystal molecules having large dielectric constant anisotropy, e.g. 5CB (4-Cyano-4'-pentyl-biphenyl).

The smectic phases show a positionally ordered molecular arrangement with organization along the molecular long axis as well as with layered organizations shown in Figure 1(b). These phases appear at the lower temperature range with lower fluidity than those of nematic phases. Smectic phases are diverse due to a distinct molecular arrangement in the layers and distinct orders of inter- and intra- layers.

The cholesteric phase shown in Figure 1(c) usually involves cholesteryl compounds. On the basis of chirality of the molecules, the phase demonstrates twisted molecular arrangements, resulting in helical structures with certain periodicity (pitch). The phase may be categorized into nematic phases and called a chiral nematic phase. An addition of chiral inducers into nematic liquid crystals also provides the cholesteric phase. Since the helical pitch is thermally responsive to changing reflective colors, they are applicable for liquid crystal thermometers.

The discotic phases, the state composed by disk-like molecules (Figure 1(d)), are divided into more specific ones such as discotic nematic and discotic columnar types according to the molecular arrangements. It is a relatively new liquid crystalline phase initially

found in 1977.<sup>5)</sup>

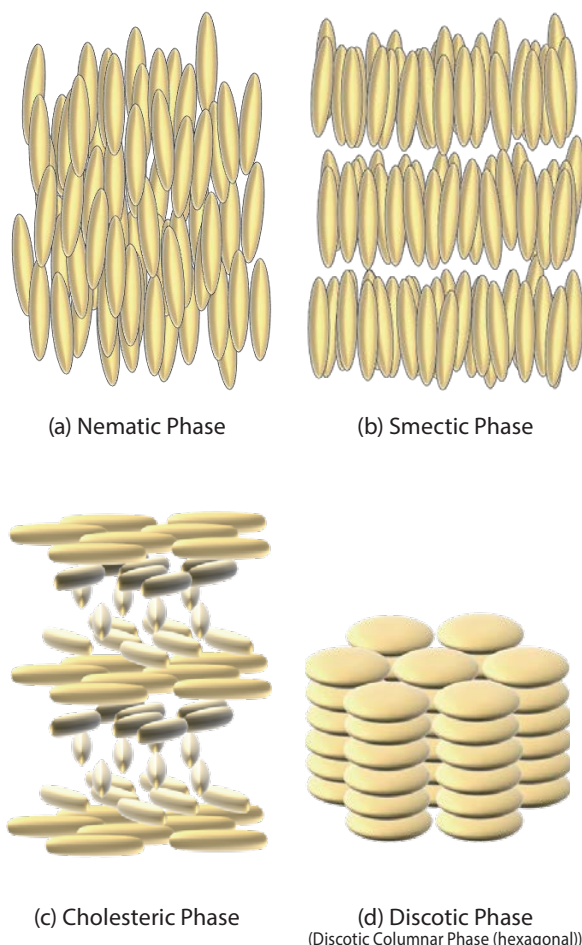


Figure 1. Illustration of typical liquid crystal phases

## ● Liquid Crystalline Phases with Complex 3D Structures

Some mesophases with complex 3D molecular arrangements also have been discovered. One representative example is the blue phase, which is expected to be a powerful candidate for fast response displays without an oriented film and a polarizer<sup>6,7)</sup> and to be photonic crystals for laser oscillations.<sup>8,9)</sup> Since the blue phases involve basic units, the so-called double-twist cylinders, all recognized phases, i.e., body centered cubic (Blue Phase I), simple cubic (Blue Phase II), and amorphous (Blue phase III) are optically isotropic. They are normally observed within a small temperature range (typically  $\sim 1$  °C) between cholesteric and isotropic phases. This fact has caused limitations on their application. In recent years, several research groups reported active examples e.g. extension of temperature range up to  $\sim 60$  °C by forming polymers in the blue phase (polymer-stabilized blue phase)<sup>10)</sup> and up to  $\sim 40$  °C by developing two biphenyl-linked compounds.<sup>11)</sup>

## ● Polymer Dispersed Liquid Crystals

Polymer dispersed liquid crystals (PDLC) are applied to “smart windows” which can switch the transparency of windows by turning voltage on and off. In the PDLC films, liquid crystal domains are dispersed into the polymer matrix. Turning the voltage on can make the film transparent, because the refractive index of the liquid crystal domains becomes almost similar to that of the polymer matrix with respect to incident light by making liquid crystalline molecules align with the electric field. On the other hand, turning the voltage off makes the film translucent, because the refractive index of the liquid crystal becomes different from that of the matrix by forming a random location of the liquid crystalline molecules. In addition to the smart windows, the PDLCs are also expected to be used as materials for reflective displays working with low power such as an electronic paper.

## ● Liquid Crystalline Semiconductors

There are many organic semiconductors having liquid crystallinity. Liquid crystalline semiconductors have provided much interest for enabling production of devices in a wet process at low cost, improvement of molecular orientation and carrier mobility utilizing their self-organizing ability in a post-process, and fabrication of flexible devices with high bending strength more than crystalline organic semiconductors. In addition to calamitic liquid crystalline semiconductors,<sup>12)</sup> discotic ones have been developed.<sup>13)</sup> The discotic liquid crystalline semiconductors demonstrate efficient carrier mobility along with the columnar direction of the stacked molecules, therefore, they can be used as materials for organic photovoltaics (OPVs).<sup>14)</sup>

## ● Applications of Liquid Crystal Media for Providing Functions

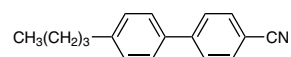
Liquid crystals are also utilized as reaction media for providing some specific functions to other materials. A few decades ago, acetylene was polymerized in liquid crystal solvents to control the orientation of the polymer-aggregated fibril structure enhancing electrical conductivity to the oriented direction.<sup>15)</sup> Other examples for such studies are synthesis of mesoporous silica in the reaction media composed of lyotropic liquid crystals<sup>16)</sup> and realization of oriented carbon nanotubes in liquid crystal media.<sup>17)</sup>

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Nematic / Smectic  
Liquid CrystalsCyanobiphenyls &  
Analog

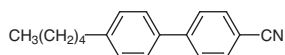
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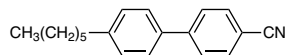
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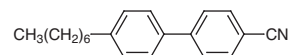
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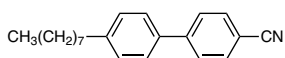
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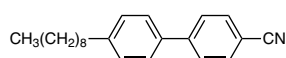
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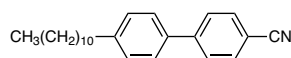
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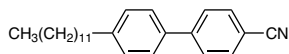
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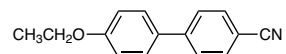
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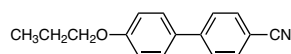
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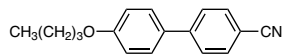
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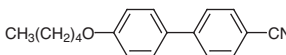
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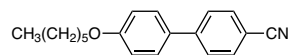
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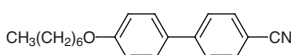
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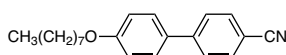
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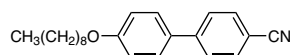
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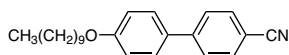
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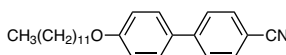
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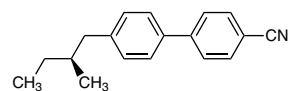
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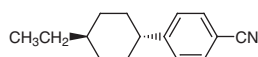
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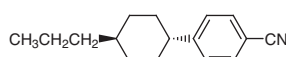
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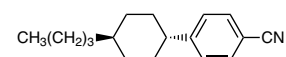
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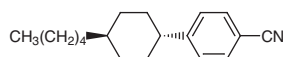
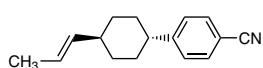
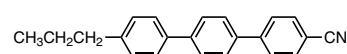
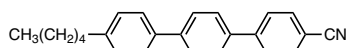
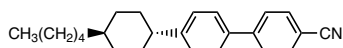
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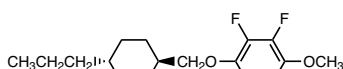
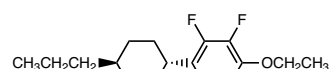
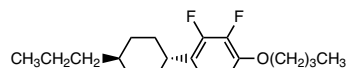
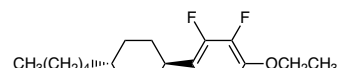
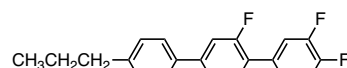
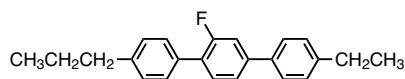
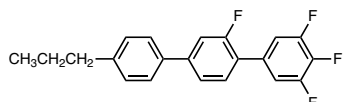
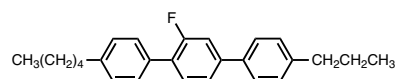
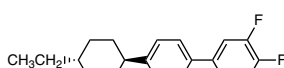
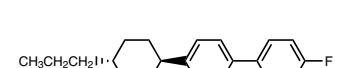
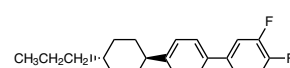
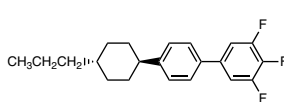
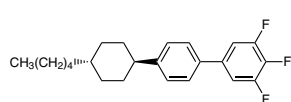
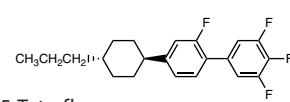
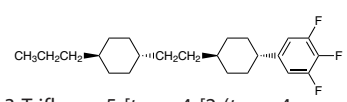
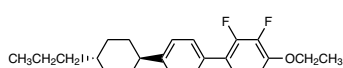
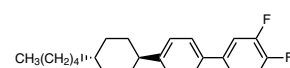
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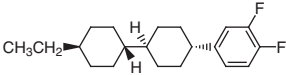
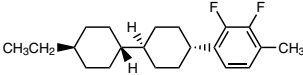
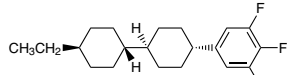
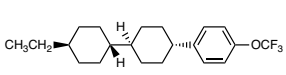
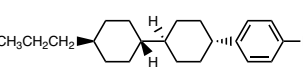
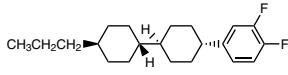
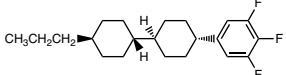
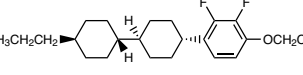
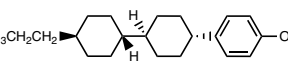
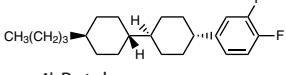
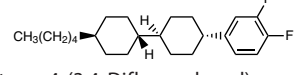
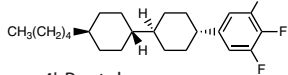
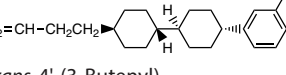
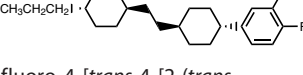
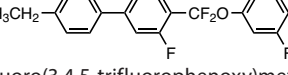
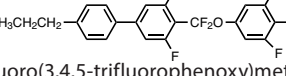
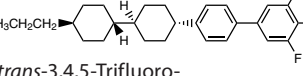
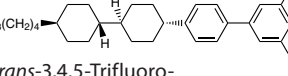
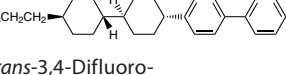
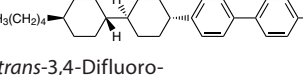
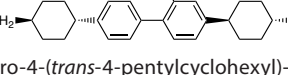
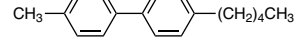
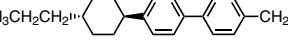
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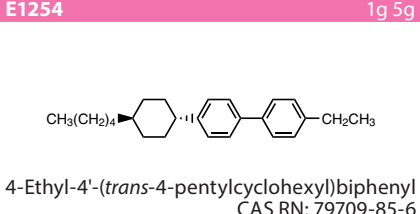
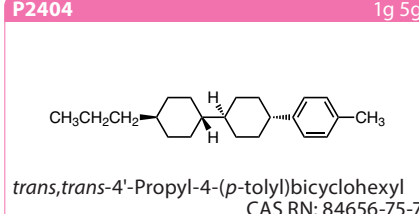
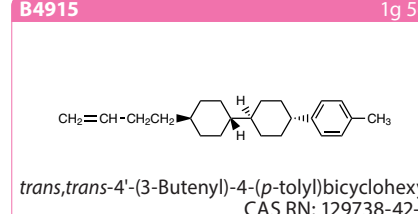
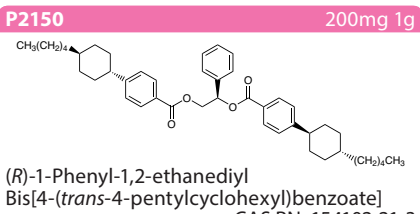
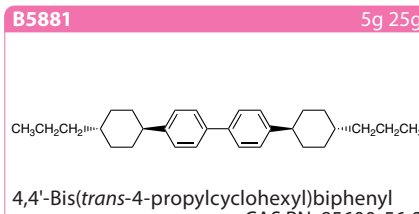
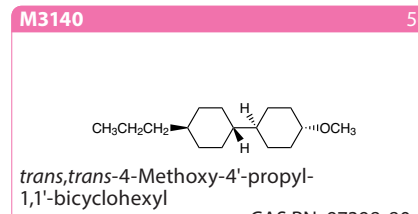
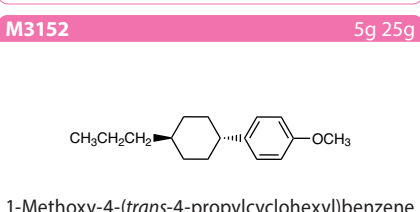
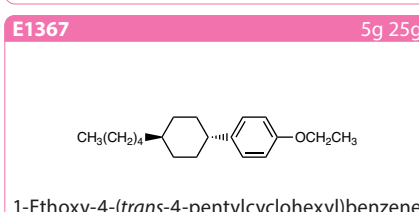
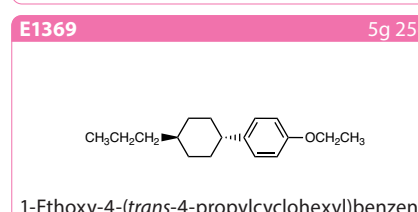
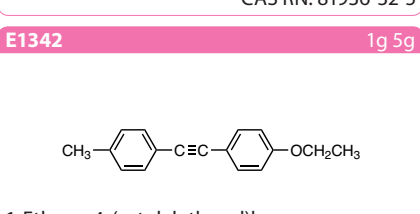
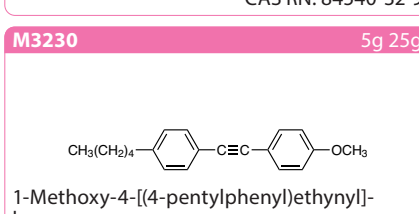
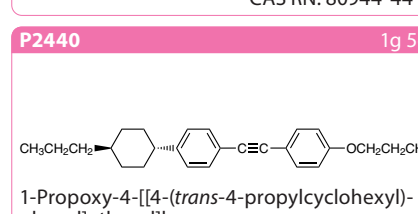
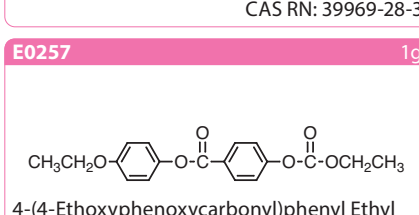
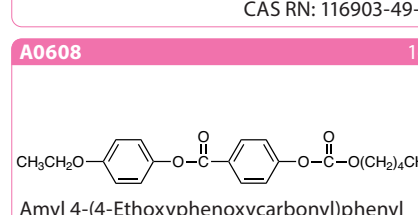
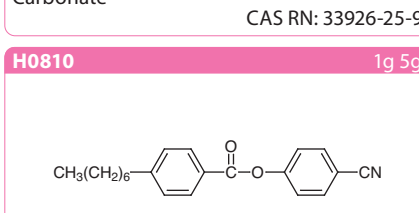
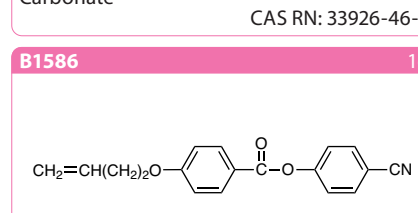
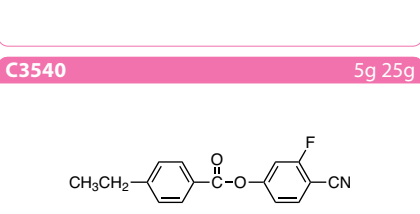
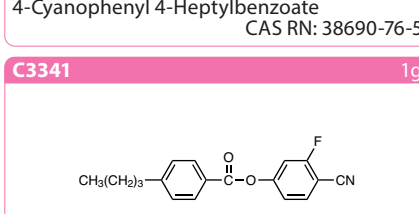
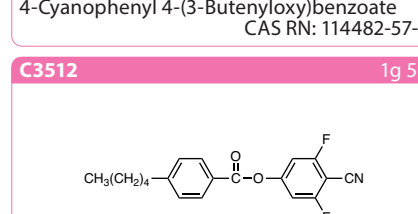
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CAS RN: 61204-00-0

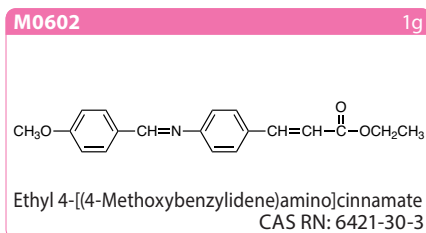
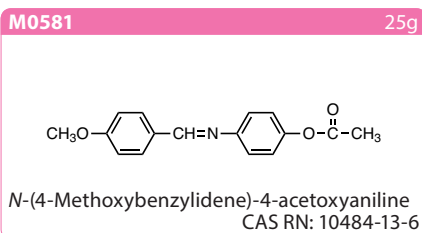
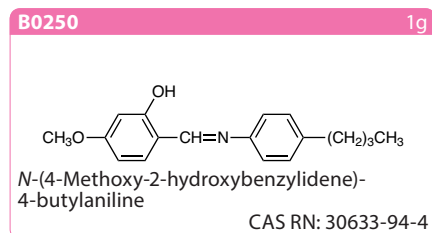
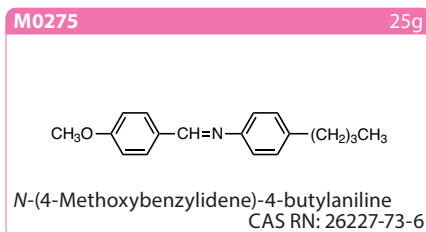
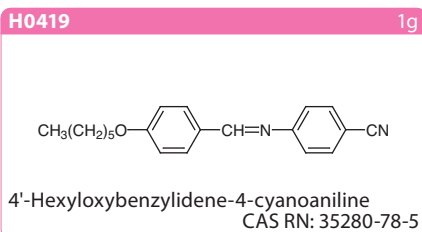
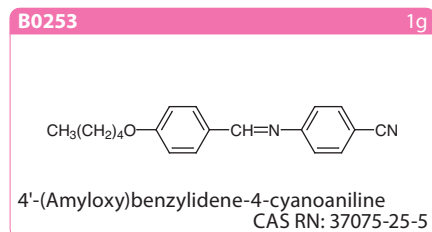
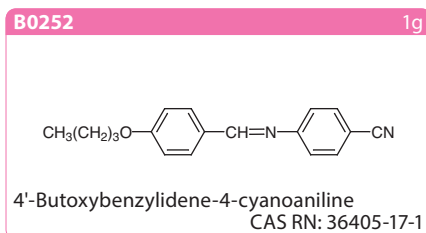
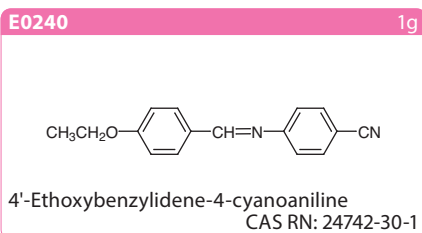
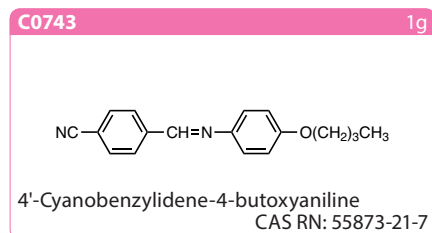
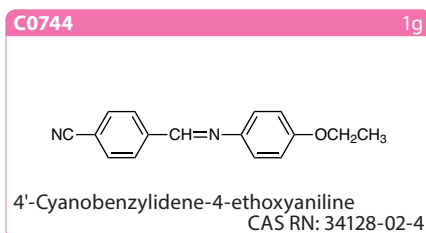
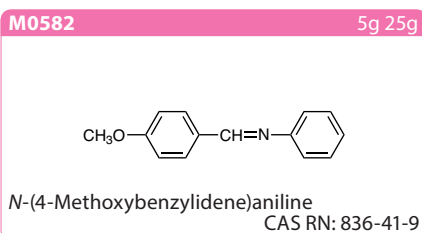
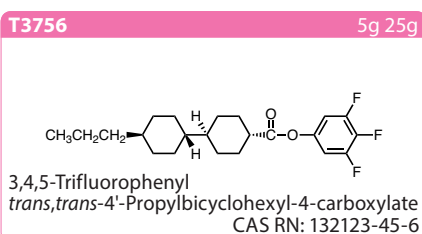
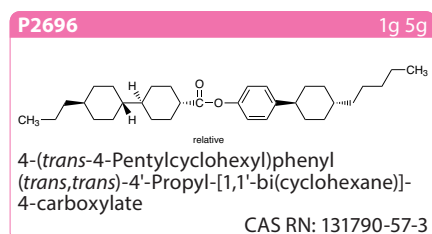
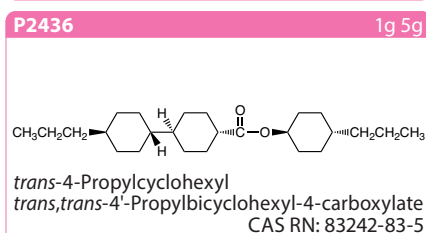
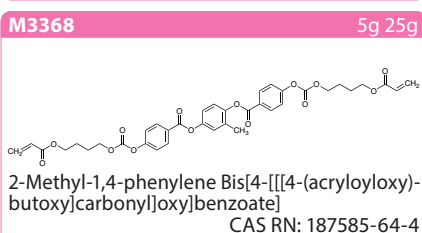
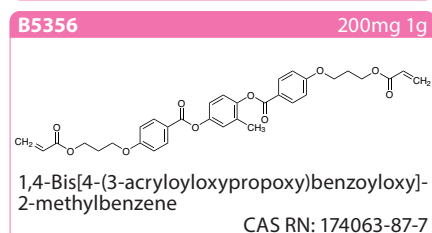
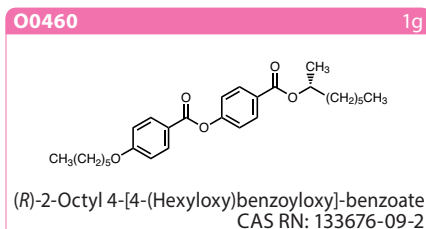
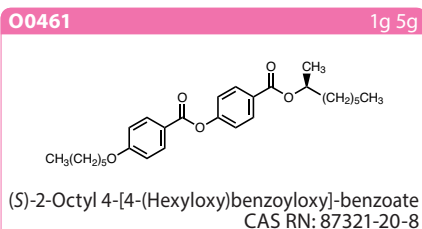
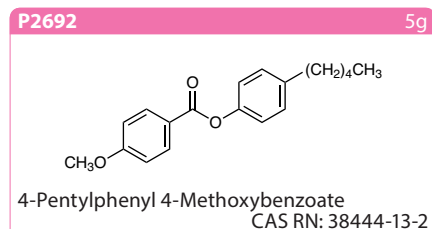
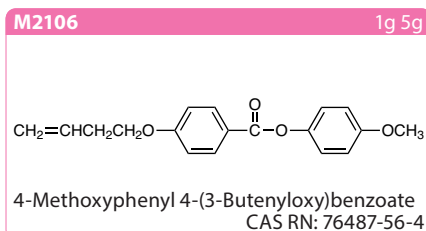
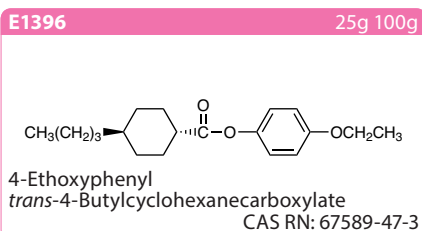
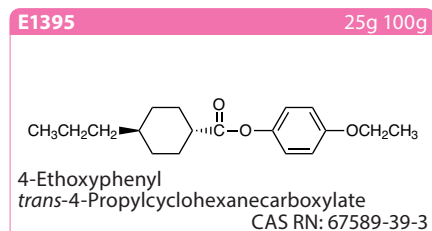
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CAS RN: 61204-01-1**P2378** 1g 5g4-[*trans*-4-[(*E*)-1-Propenyl]cyclohexyl]benzonitrile  
CAS RN: 96184-40-6**C3271** 1g4-Cyano-4''-propyl-*p*-terphenyl  
CAS RN: 54296-25-2**C2910** 1g 5g4-Cyano-4''-pentyl-*p*-terphenyl  
CAS RN: 54211-46-0**A2568** 1g 5g4'-(*trans*-4-Amylcyclohexyl)biphenyl-4-carbonitrile  
CAS RN: 68065-81-6

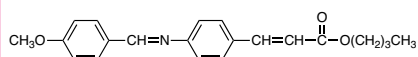
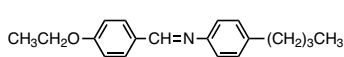
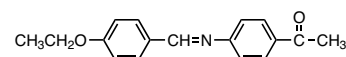
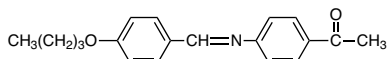
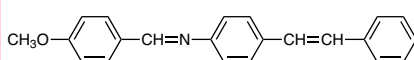
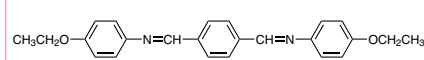
## Fluorinated Biphenyls & Analogs

**D4909** 1g 5g2,3-Difluoro-4-[(*trans*-4-propylcyclohexyl)-methoxy]anisole  
CAS RN: 1373116-00-7**E1230** 1g 5g1-Ethoxy-2,3-difluoro-4-(*trans*-4-propylcyclohexyl)benzene  
CAS RN: 174350-05-1**B5364** 1g 5g1-Butoxy-2,3-difluoro-4-(*trans*-4-propylcyclohexyl)benzene  
CAS RN: 208709-55-1**E1389** 1g 5g*trans*-1-Ethoxy-2,3-difluoro-4-(4-pentylcyclohexyl)benzene  
CAS RN: 124729-02-8**T3419** 1g 5g2',3,4-Trifluoro-4''-propyl-1,1':4',1''-terphenyl  
CAS RN: 248936-60-9**E1264** 1g 5g4''-Ethyl-2'-fluoro-4-propyl-1,1':4',1''-terphenyl  
CAS RN: 95759-44-7**T3318** 1g 5g2',3,4,5-Tetrafluoro-4''-propyl-1,1':4',1''-terphenyl  
CAS RN: 205806-87-7**F1046** 1g 5g2'-Fluoro-4-pentyl-4''-propyl-1,1':4',1''-terphenyl  
CAS RN: 95759-51-6**D4859** 5g 25g3,4-Difluoro-4'-(*trans*-4-ethylcyclohexyl)biphenyl  
CAS RN: 134412-18-3**F1103** 1g 5g4-Fluoro-4'-(*trans*-4-propylcyclohexyl)biphenyl  
CAS RN: 87260-24-0**D4535** 5g 25g3,4-Difluoro-4'-(*trans*-4-propylcyclohexyl)biphenyl  
CAS RN: 85312-59-0**T3260** 1g 5g3,4,5-Trifluoro-4'-(*trans*-4-propylcyclohexyl)biphenyl  
CAS RN: 132123-39-8**T3397** 1g 5g3,4,5-Trifluoro-4'-(*trans*-4-pentylcyclohexyl)biphenyl  
CAS RN: 137019-95-5**T3317** 1g 5g2',3,4,5-Tetrafluoro-4'-(*trans*-4-propylcyclohexyl)biphenyl  
CAS RN: 173837-35-9**T3466** 1g 5g1,2,3-Trifluoro-5-[*trans*-4-[2-(*trans*-4-propylcyclohexyl)ethyl]cyclohexyl]benzene  
CAS RN: 131819-24-4**E1158** 5g 25g4-Ethoxy-2,3-difluoro-4'-(*trans*-4-propylcyclohexyl)biphenyl  
CAS RN: 189750-98-9**D4534** 5g 25g3,4-Difluoro-4'-(*trans*-4-pentylcyclohexyl)biphenyl  
CAS RN: 134412-17-2

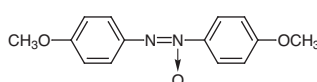
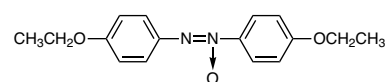
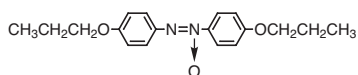
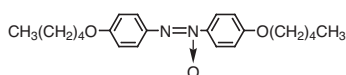
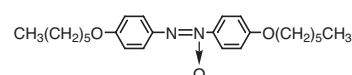
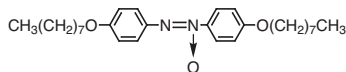
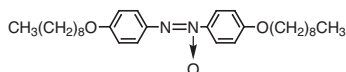
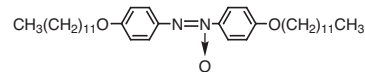
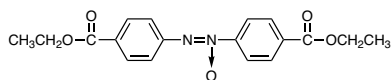
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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>D3856</b> 1g 5g<br><br><i>trans</i> -4-(3,4-Difluorophenyl)- <i>trans</i> -4'-ethylbicyclohexane<br>CAS RN: 118164-50-4   | <b>D5127</b> 1g 5g<br><br><i>trans,trans</i> -4-(2,3-Difluoro-4-methylphenyl)-4'-ethylbicyclohexyl<br>CAS RN: 174350-08-4                          | <b>E1156</b> 5g 25g<br><br><i>trans,trans</i> -4'-Ethyl-4-(3,4,5-trifluorophenyl)bicyclohexyl<br>CAS RN: 139215-80-8                             |
| <b>E1165</b> 5g<br><br><i>trans,trans</i> -4'-Ethyl-4-(4-trifluoromethoxyphenyl)bicyclohexyl<br>CAS RN: 135734-59-7          | <b>F1102</b> 1g 5g<br><br><i>trans,trans</i> -4-(4-Fluorophenyl)-4'-propylbicyclohexyl<br>CAS RN: 82832-27-7                                       | <b>D4797</b> 1g 5g<br><br><i>trans,trans</i> -4-(3,4-Difluorophenyl)-4'-propylbicyclohexyl<br>CAS RN: 82832-57-3                                 |
| <b>P2314</b> 5g 25g<br><br><i>trans,trans</i> -4'-Propyl-4-(3,4,5-trifluorophenyl)bicyclohexyl<br>CAS RN: 131819-23-3        | <b>E1157</b> 1g 5g<br><br><i>trans,trans</i> -4-(4-Ethoxy-2,3-difluorophenyl)-4'-propylbicyclohexyl<br>CAS RN: 123560-48-5                         | <b>P2464</b> 1g<br><br><i>trans,trans</i> -4'-Propyl-4-(4-trifluoromethoxyphenyl)bicyclohexyl<br>CAS RN: 133937-72-1                             |
| <b>B4925</b> 5g 25g<br><br><i>trans,trans</i> -4'-Butyl-4-(3,4-difluorophenyl)bicyclohexyl<br>CAS RN: 82832-58-4            | <b>D4798</b> 1g 5g<br><br><i>trans,trans</i> -4-(3,4-Difluorophenyl)-4'-pentylbicyclohexyl<br>CAS RN: 118164-51-5                                 | <b>P2319</b> 5g<br><br><i>trans,trans</i> -4'-Pentyl-4-(3,4,5-trifluorophenyl)bicyclohexyl<br>CAS RN: 137644-54-3                               |
| <b>B4916</b> 1g 5g<br><br><i>trans,trans</i> -4'-(3-Butenyl)-4-(3,4-difluorophenyl)bicyclohexyl<br>CAS RN: 155266-68-5     | <b>D5128</b> 1g 5g<br><br>1,2-Difluoro-4-[ <i>trans</i> -4-[2-( <i>trans</i> -4-propylcyclohexyl)ethyl]cyclohexyl]benzene<br>CAS RN: 117943-37-0 | <b>D5129</b> 1g 5g<br><br>4-[Difluoro(3,4,5-trifluorophenoxy)methyl]-4'-ethyl-3,5-difluorobiphenyl<br>CAS RN: 303186-19-8                      |
| <b>D5130</b> 1g 5g<br><br>4-[Difluoro(3,4,5-trifluorophenoxy)methyl]-3,5-difluoro-4'-propylbiphenyl<br>CAS RN: 303186-20-1 | <b>T3319</b> 1g 5g<br><br><i>trans,trans</i> -3,4,5-Trifluoro-4'-(4'-propylbicyclohexyl-4-yl)biphenyl<br>CAS RN: 137529-41-0                     | <b>T3482</b> 1g 5g<br><br><i>trans,trans</i> -3,4,5-Trifluoro-4'-(4'-pentylbicyclohexyl-4-yl)biphenyl<br>CAS RN: 137529-43-2                   |
| <b>D5650</b> 1g 5g<br><br><i>trans,trans</i> -3,4-Difluoro-4'-(4'-propylbicyclohexyl-4-yl)biphenyl<br>CAS RN: 119990-81-7  | <b>D5651</b> 1g 5g<br><br><i>trans,trans</i> -3,4-Difluoro-4'-(4'-pentylbicyclohexyl-4-yl)biphenyl<br>CAS RN: 136609-96-6                        | <b>F1122</b> 1g 5g<br><br>2-Fluoro-4-( <i>trans</i> -4-pentylcyclohexyl)-4'-( <i>trans</i> -4-propylcyclohexyl)biphenyl<br>CAS RN: 106349-49-9 |
| <b>Other Biphenyls &amp; Analogs</b>                                                                                                                                                                          |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                     |
| <b>M2885</b> 1g 5g<br><br>4'-Methyl-4-pentylbiphenyl<br>CAS RN: 64835-63-8                                                 |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                     |
| <b>E1162</b> 5g 25g<br><br>4-Ethyl-4'-( <i>trans</i> -4-propylcyclohexyl)biphenyl<br>CAS RN: 84540-37-4                  |                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                     |

|                                                                                                                                                                                                                                       |                                                                                                                                                                                                        |                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>E1254</b> 1g 5g</p>  <p>4-Ethyl-4'-(<i>trans</i>-4-pentylcyclohexyl)biphenyl<br/>CAS RN: 79709-85-6</p>                                        | <p><b>P2404</b> 1g 5g</p>  <p><i>trans,trans</i>-4'-Propyl-4-(<i>p</i>-tolyl)bicyclohexyl<br/>CAS RN: 84656-75-7</p> | <p><b>B4915</b> 1g 5g</p>  <p><i>trans,trans</i>-4'-(3-Butenyl)-4-(<i>p</i>-tolyl)bicyclohexyl<br/>CAS RN: 129738-42-7</p>               |
| <p><b>P2150</b> 200mg 1g</p>  <p>(<i>R</i>)-1-Phenyl-1,2-ethanediyl<br/>Bis[4-(<i>trans</i>-4-pentylcyclohexyl)benzoate]<br/>CAS RN: 154102-21-3</p> | <p><b>B5881</b> 5g 25g</p>  <p>4,4'-Bis(<i>trans</i>-4-propylcyclohexyl)biphenyl<br/>CAS RN: 85600-56-2</p>          | <p><b>M3140</b> 5g</p>  <p><i>trans,trans</i>-4-Methoxy-4'-propyl-<br/>1,1'-bicyclohexyl<br/>CAS RN: 97398-80-6</p>                      |
| <p><b>M3152</b> 5g 25g</p>  <p>1-Methoxy-4-(<i>trans</i>-4-propylcyclohexyl)benzene<br/>CAS RN: 81936-32-5</p>                                       | <p><b>E1367</b> 5g 25g</p>  <p>1-Ethoxy-4-(<i>trans</i>-4-pentylcyclohexyl)benzene<br/>CAS RN: 84540-32-9</p>        | <p><b>E1369</b> 5g 25g</p>  <p>1-Ethoxy-4-(<i>trans</i>-4-propylcyclohexyl)benzene<br/>CAS RN: 80944-44-1</p>                            |
| <p><b>E1342</b> 1g 5g</p>  <p>1-Ethoxy-4-(<i>p</i>-tolyethynyl)benzene<br/>CAS RN: 116903-46-9</p>                                                  | <p><b>M3230</b> 5g 25g</p>  <p>1-Methoxy-4-[(4-pentylphenyl)ethynyl]-<br/>benzene<br/>CAS RN: 39969-28-3</p>        | <p><b>P2440</b> 1g 5g</p>  <p>1-Propoxy-4-[[4-(<i>trans</i>-4-propylcyclohexyl)-<br/>phenyl]ethynyl]benzene<br/>CAS RN: 116903-49-2</p> |
| <p><b>Carbonates</b></p>                                                                                                                                                                                                              |                                                                                                                                                                                                        |                                                                                                                                                                                                                             |
| <p><b>Phenyl Esters</b></p>                                                                                                                                                                                                           |                                                                                                                                                                                                        |                                                                                                                                                                                                                             |
| <p><b>E0257</b> 1g</p>  <p>4-(4-Ethoxyphenoxy)phenyl Ethyl<br/>Carbonate<br/>CAS RN: 33926-25-9</p>                                                | <p><b>A0608</b> 1g</p>  <p>Amyl 4-(4-Ethoxyphenoxy)phenyl<br/>Carbonate<br/>CAS RN: 33926-46-4</p>                 | <p><b>H0810</b> 1g 5g</p>  <p>4-Cyanophenyl 4-Heptylbenzoate<br/>CAS RN: 38690-76-5</p>                                                |
| <p><b>C3540</b> 5g 25g</p>  <p>4-Cyano-3-fluorophenyl 4-Ethylbenzoate<br/>CAS RN: 86776-50-3</p>                                                   | <p><b>C3341</b> 1g</p>  <p>4-Cyano-3-fluorophenyl 4-Butylbenzoate<br/>CAS RN: 86776-52-5</p>                       | <p><b>C3512</b> 1g 5g</p>  <p>4-Cyano-3,5-difluorophenyl<br/>4-Pentylbenzoate<br/>CAS RN: 123843-69-6</p>                              |
| <p><b>B0375</b> 1g</p>  <p>4-Ethoxyphenyl 4-Butylbenzoate<br/>CAS RN: 62716-65-8</p>                                                               | <p><b>B1091</b> 1g</p>  <p>4-(Hexyloxy)phenyl 4-Butylbenzoate<br/>CAS RN: 38454-28-3</p>                           | <p><b>B1092</b> 1g</p>  <p>4-<i>n</i>-Octyloxyphenyl 4-Butylbenzoate<br/>CAS RN: 42815-59-8</p>                                        |



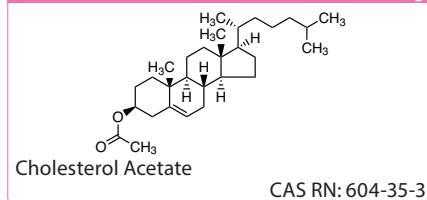
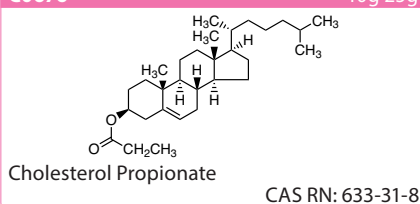
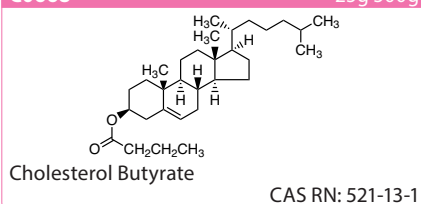
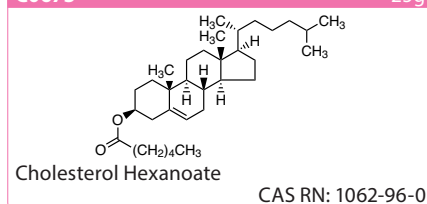
**B0255** 1gButyl 4-[(4-Methoxybenzylidene)amino]cinnamate  
CAS RN: 16833-17-3**E0262** 25g 500g4'-Ethoxybenzylidene-4-butylaniline  
CAS RN: 29743-08-6**E0254** 1gN-(4-Ethoxybenzylidene)-4-acetylaniline  
CAS RN: 17224-17-8**B0372** 1gN-(4-Butoxybenzylidene)-4-acetylaniline  
CAS RN: 17224-18-9**M0603** 1g4-[(Methoxybenzylidene)amino]stilbene  
CAS RN: 322413-12-7**B0871** 5g 25gTerephthalbis(*p*-phenetidine)  
CAS RN: 17696-60-5

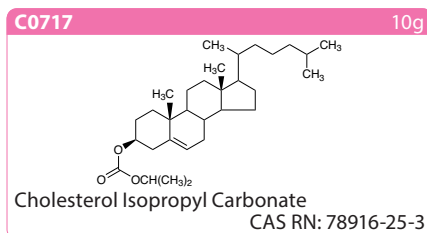
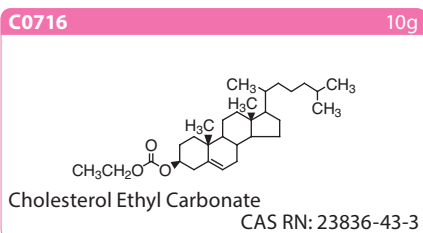
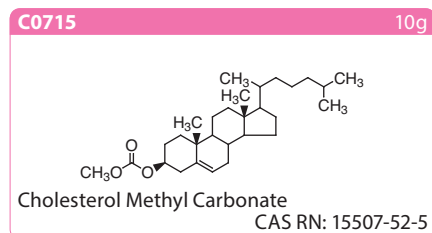
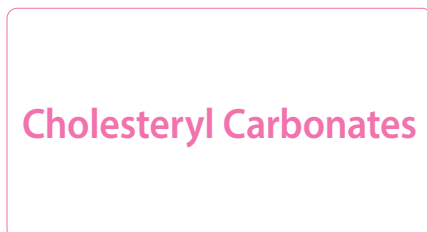
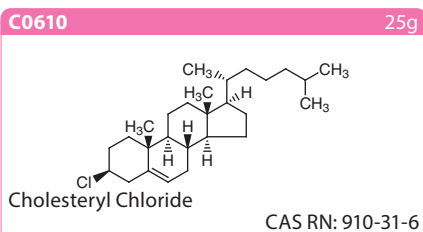
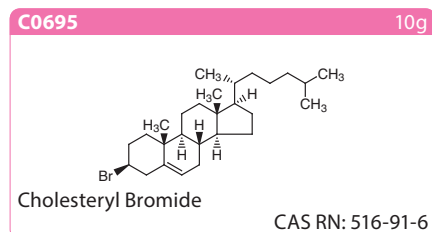
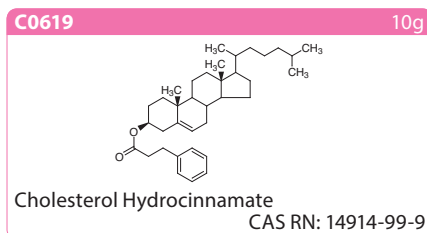
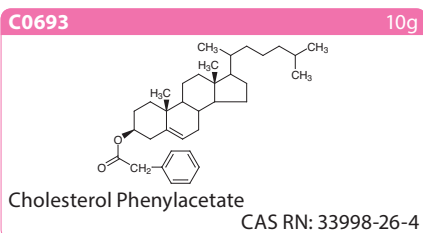
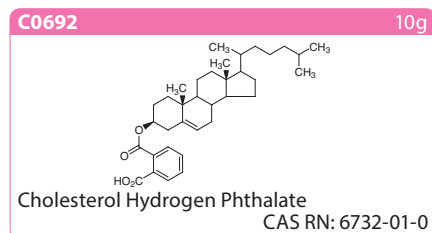
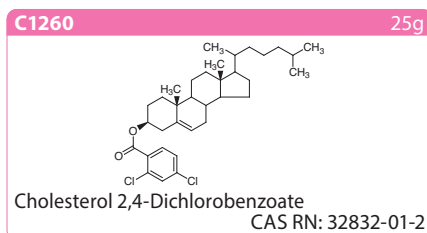
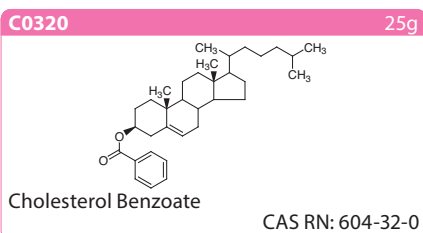
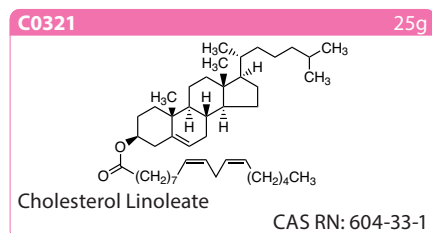
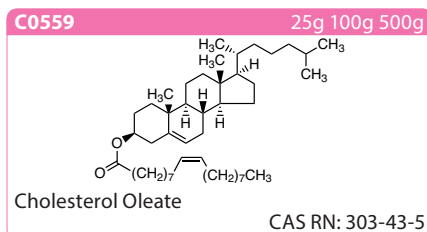
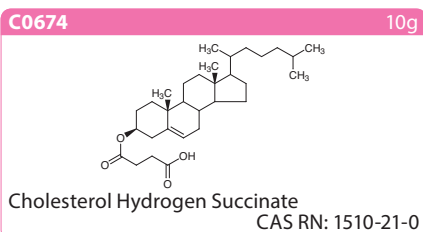
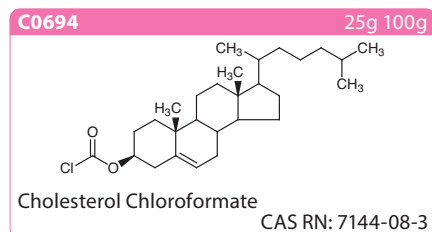
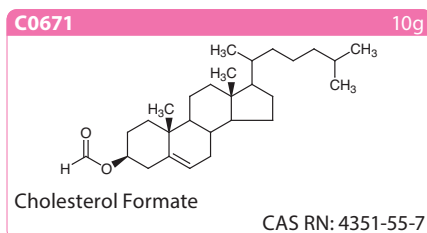
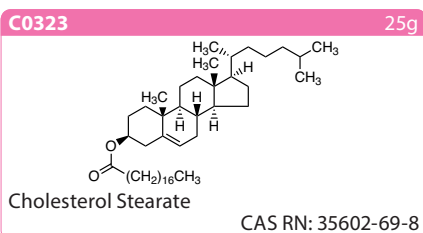
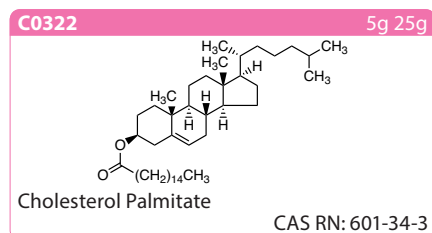
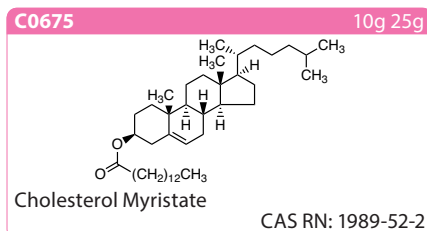
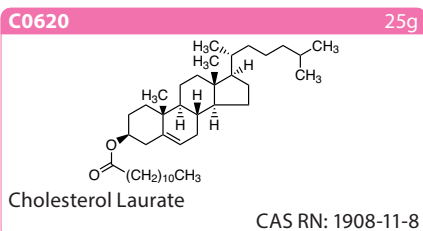
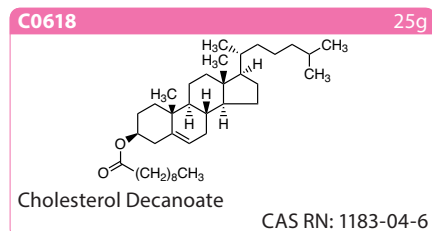
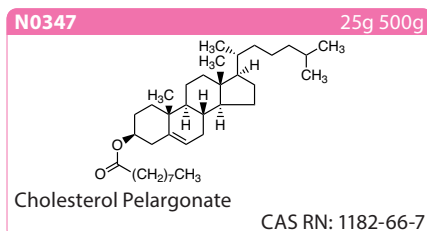
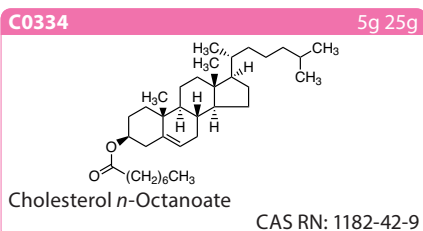
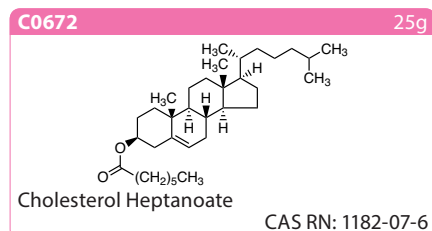
## Azoxybenzenes

**A0554** 5g 25g4,4'-Azoxydianisole  
CAS RN: 1562-94-3**A0683** 1g 5g4,4'-Azoxydiphenetole  
CAS RN: 4792-83-0**D1094** 5g4,4'-Dipropoxyazoxybenzene  
CAS RN: 23315-55-1**D1093** 1g4,4'-Diamyloxyazoxybenzene  
CAS RN: 19482-05-4**D1092** 1g4,4'-Dihexyloxyazoxybenzene  
CAS RN: 2587-42-0**D1123** 1g 5g4,4'-Di-*n*-octyloxyazoxybenzene  
CAS RN: 25729-12-8**D1518** 100mg4,4'-Dinonyloxyazoxybenzene  
CAS RN: 25729-13-9**D0553** 5g4,4'-Didodecyloxyazoxybenzene  
CAS RN: 2312-14-3**A1065** 1gDiethyl Azoxybenzene-4,4'-dicarboxylate  
CAS RN: 6421-04-1

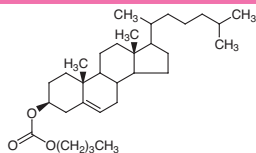
## Cholesteric Liquid Crystals

## Cholesteryl Compounds

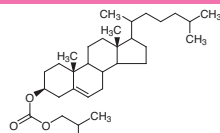
**C0319** 25g**C0676** 10g 25g**C0668** 25g 500g**C0673** 25g



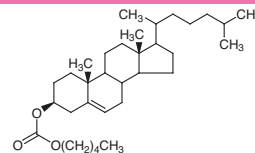
C0718 10g

Cholesterol Butyl Carbonate  
CAS RN: 41371-14-6

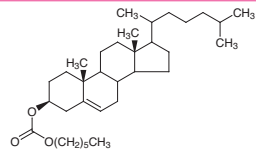
C0719 10g

Cholesterol Isobutyl Carbonate  
CAS RN: 77546-35-1

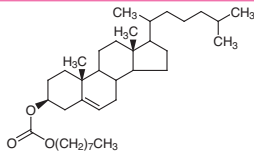
C0720 1g 10g

Cholesterol Amyl Carbonate  
CAS RN: 15455-79-5

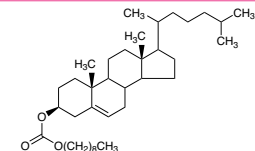
C0725 10g

Cholesterol Hexyl Carbonate  
CAS RN: 15455-80-8

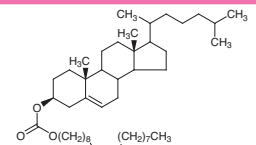
C0721 10g

Cholesterol *n*-Octyl Carbonate  
CAS RN: 15455-82-0

B0256 1g 10g

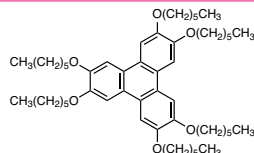
Cholesterol Nonyl Carbonate  
CAS RN: 15455-83-1

C0691 10g 25g

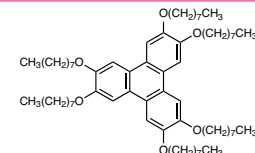
Cholesterol Oleyl Carbonate  
CAS RN: 17110-51-9

## Discotic Liquid Crystals

H1449 200mg 1g

2,3,6,7,10,11-Hexakis(hexyloxy)triphenylene  
CAS RN: 70351-86-9

H1450 200mg 1g

2,3,6,7,10,11-Hexakis[(*n*-octyl)oxy]triphenylene  
CAS RN: 70351-87-0

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