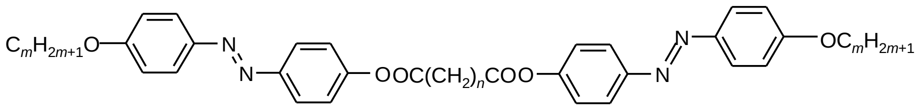
Chapter 7

Synthesis and characterization of symmetric mesogenic dimers composed of bent-core molecules connected by an alkylene spacer

Introduction

Liquid crystal dimers, which consist of two mesogenic units connected by a flexible spacer, have attracted much interest since they exhibit complex and novel phase behaviour different from that of the corresponding monomers [1]. The first liquid crystal dimer was synthesized by Vorlander long ago [2], which consists of alkoxy azobenzenes linked by a flexible alkylene spacer *via* an ester linkage (structure **7.1**).



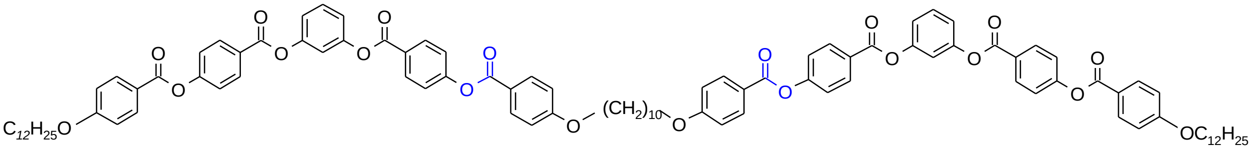
Structure 7.1 [2]

A second report of the liquid crystal dimers was given by Rauch *et al*. in 1975 [3]. However, much interest in this field was rekindled, when Griffin and Britt [4] described the transitional properties of a series of diesters and proposed that liquid crystal dimers could be considered as model compounds for technologically important main-chain liquid crystal polymers owing to their similarity in behaviour to that of the liquid crystal polymers. Since then, a number of liquid crystalline dimers have been prepared using two rod-like mesogenic units as well as disc-like units and investigated for their mesomorphic behaviour [5]. On the basis of these studies, it was found that, the transition temperatures and phase behaviour of dimers depend on,

1. the length and parity of the flexible spacer
2. chemical nature of the spacer
3. molecular structure of the mesogenic group and
4. the nature of terminal groups.

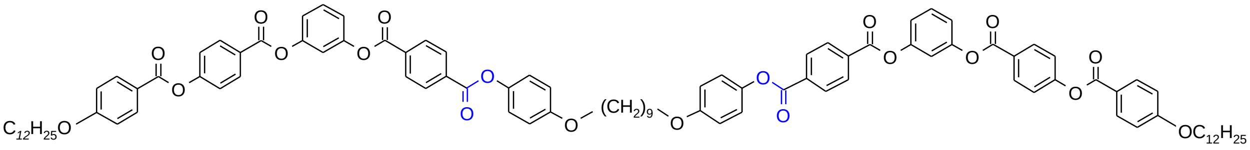
A systematic study on a series of symmetric dimers composed of two rod-like mesogenic units by Date *et al*. [6] has revealed interesting behaviour regarding the dependence of mesomorphic behaviour on the length of the spacer unit and the terminal groups. A pronounced alternation (odd-even effect) in the transition temperatures on varying the spacer length was observed and it was found that even numbers of the series exhibit higher values. They also found that lower members of the series exhibit only smectic mesophase but on increasing the spacer length nematic phase appeared while for longer spacer only nematic phase was observed. This is in complete contradiction to the observation in monomeric mesogenic units in which increasing the length of the alkyl chain stabilizes the smectic phase relative to the nematic phase. Further, they noticed that, increase in the length of the terminal chain causes a fall in clearing temperatures and also an increase in the smectic phase stability, which is in accord with those observed for conventional low molar mass mesogens. The authors propose that the symmetric dimers with an even-numbered spacer form a linear shape whereas with an odd-numbered spacer adopt a bent shape.

Although there are a number of reports on dimers composed of two rod-like units, there are a few reports of mesogenic dimers composed of disc-like units. The mesomorphic behaviour of all these dimers has formed the basis of an excellent review article [5]. In this thesis, the mesomorphic properties of dimers composed of BC molecules are discussed. The first dimesogen in which two bent-core units are connected by a flexible dimethylsiloxane unit was reported [7] only a few years ago. Interestingly, an odd-even effect of the type of mesophase was observed in these dimers. For example, for an odd-spacer, a ferroelectric switching behaviour was observed, whereas for an even spacer, antiferroelectric switching behaviour was observed. This behaviour was explained in terms of conformation of the spacer units. For odd numbered siloxane units, a bent shape is preferred which is compatible with the ferroelectric order. However, for an even numbered siloxane units linear shape is preferred which disturbs the anticlinic interlayer correlation and hence gives rise to antiferroelectricity. Very recently, Kosata *et al*. have reported [8] symmetric dimeric liquid crystals where several bent-core mesogenic units are terminally linked with different flexible spacers. In a dimer with an alkylene spacer (structure **7.2**) mesophase could not be observed. By reversing the orientation of the –COO- group between the inner rings (structure **7.3**), a columnar phase was observed. Interestingly, we were able to show that using the same basic structure **7.2**, but with suitable fluoro substitution, mesophase could be stabilized. Also, a systematic study of the properties of mesogenic dimers composed of bent-core molecules linked by a flexible alkylene spacer was undertaken.



Cr 165˚C I

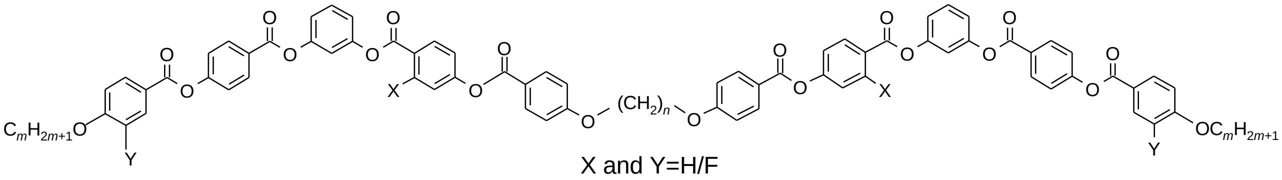
Structure 7.2 [10]



Cr 151˚C Col 163˚C I

Structure 7.3 [10]

In this chapter, the synthesis and mesomorphic properties of several novel symmetric dimers composed of bent-core molecules connected by a flexible alkylene spacer and belonging to three series (series **7.D.I**, **7.D.II** and **7.D.III**) have been described. In the first part, the influence of fluorine as a lateral substituent in such a dimer with fixed terminal chains and containing either an odd or an even spacer is examined. Later, the effect of varying the length of terminal chains with a fixed odd or even spacer and the effect of spacer length on the mesomorphic properties of these dimers are also examined. The dimers investigated have the general molecular structure (**7.4**) shown below.



X and Y=H/F

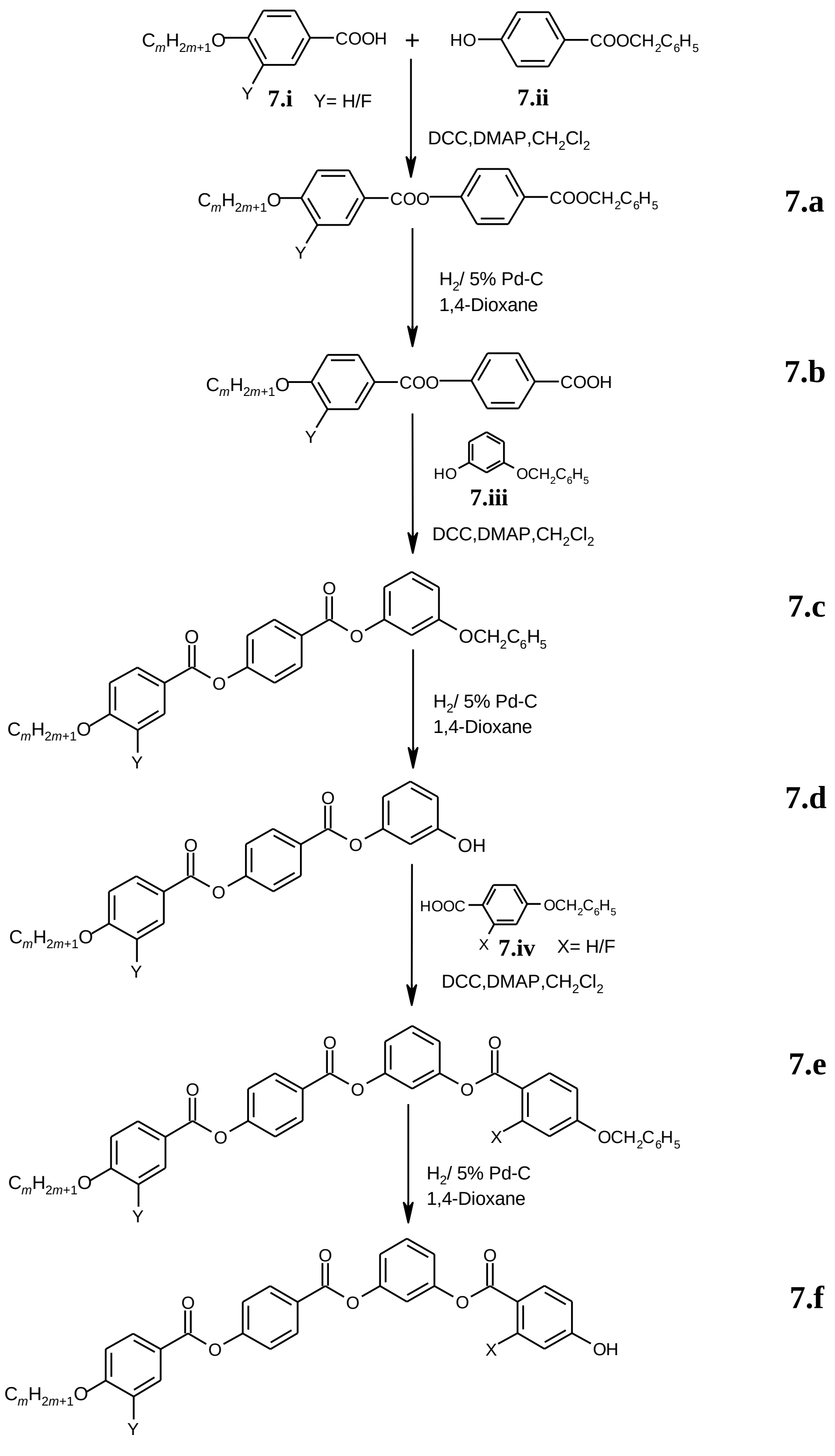
7.D

Structure 7.4

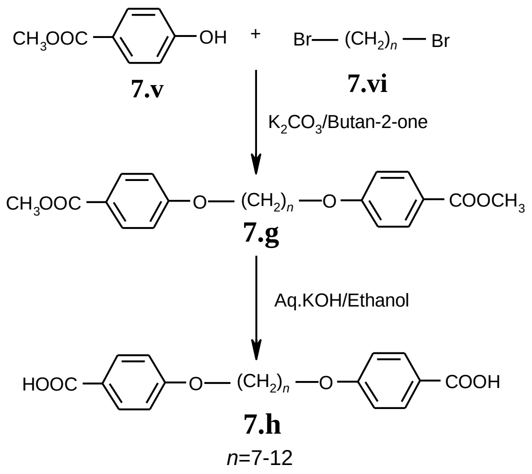
Synthesis

The preparation of phenolic monomeric compounds **7.f** was carried out by employing a series of esterification reactions and catalytic hydrogenolyses as shown in scheme **7.1**. The dicarboxylic acids **7.h** were prepared by the alkylation of two equivalents of methyl 4-hydroxybenzoate with appropriate dibromoalkanes followed by hydrolysis of the ester group as depicted in scheme **7.2**. The symmetrical dimers were prepared by reacting two equivalents of an appropriate phenol **7.f** with one equivalent of dicarboxylic acid **7.h** using *N*, *N′*-dicyclohexylcarbodiimide (DCC) and 4-(*N*, *N*-dimethylamino)pyridine (DMAP) in dry dichloromethane at room temperature as shown in scheme **7.3**.

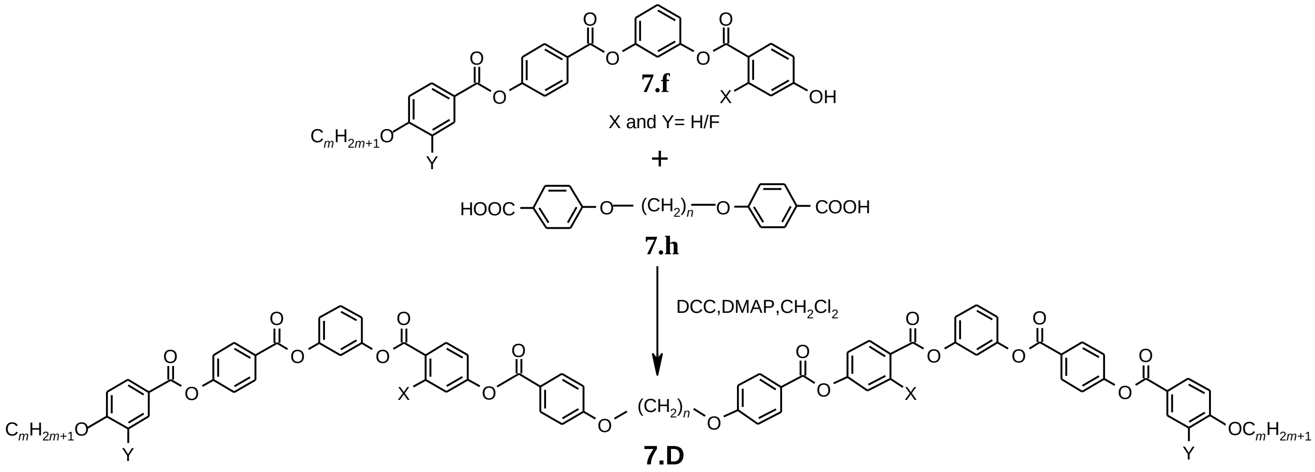
Benzyl 4-hydroxybenzoate, methyl 4-hydroxybenzoate and dibromoalkanes were commercial compounds and used without further purification. 3-Benzyloxyphenol [9], 4-benzyloxybenzoic acid [10] and 4-*n*-alkoxybenzoic acids [11] were prepared following procedures described earlier. 2-Fluoro-4-benzyloxybenzoic acid and 3-fluoro-4-benzyloxybenzoic acid [10, 12, 13], 2-fluoro-4-*n*-alkoxybenzoic acids and 3-fluoro-4-*n*-alkoxybenzoic acids [13, 14] were prepared according to procedures described in the literature.



Scheme 7.1: Synthetic pathway employed for the preparation of intermediate phenolic compounds, 7.f.



Scheme 7.2: Synthetic route followed to prepare the dicarboxylic acids, 7.h.



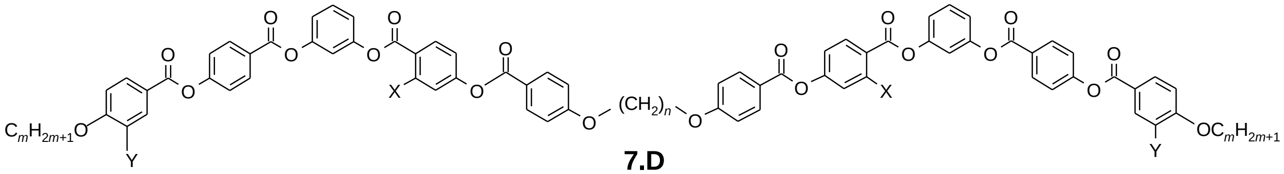
X=H, Y=H, *n*=9, *m*=14	Dimer **7.D.1**
X=H, Y=H, *n*=12, *m*=14	Dimer **7.D.2**
X=F, Y=H, *n*=9, *m*=14	Dimer **7.D.3**
X=F, Y=H, *n*=12, *m*=14	Dimer **7.D.4**
X=H, Y=F, *n*=9, *m*=14	Dimer **7.D.5**
X=H, Y=F, *n*=12, *m*=14	Dimer **7.D.6**
X=F, Y=F, *n*=9, *m*=14	Dimer **7.D.7**
X=F, Y=F, *n*=12, *m*=14	Dimer **7.D.8**
X=F, Y=F, *n*=9, *m*=8-12, 14, 16, 18	Series **7.D.I**
X=F, Y=F, *n*=12, *m*=8-12, 14, 16, 18	Series **7.D.II**
X=F, Y=F, *n*=7-12, *m*=14	Series **7.D.III**

Scheme 7.3: Synthetic route used to obtain the dimers.

Results and discussion

To assess the probability of obtaining a mesophase in such symmetric dimers connected by a flexible alkylene spacer, eight dimers (**7.D.1-8**) were synthesized. All these dimers have fixed terminal chains (*m*=14) and contain either an odd spacer (*n*=9) or an even spacer (*n*=12). The phase behaviour of the eight dimers **7.D.1-8** investigated together with the transition enthalpy values are summarized in table **7.1**.

Table 7.1: Transition temperatures (˚C) and the associated enthalpy values (kJ mol^{-1}, in italics) for dimers 7.D.1-8.



7.D

Compound	*n*	*m*	X	Y	Cr		$\text{Col}_{\text{ob}}\text{P}_{\text{F}}$		I
7.D.1	9	14	H	H	.	171.5 *80.5*	(.	167.5) ‡	.
7.D.2	12	14	H	H	.	156.5 *62.0*	(.	153.5) ‡	.
7.D.3	9	14	F	H	.	148.0 *52.5*	.	162.0 *26.0*	.
7.D.4	12	14	F	H	.	133.0 *58.5*	.	147.0 *26.0*	.
7.D.5	9	14	H	F	.	161.0 *106.5*	.	172.0 *26.0*	.
7.D.6	12	14	H	F	.	158.0 *55.0*	.	159.0 *26.5*	.
7.D.7	9	14	F	F	.	136.0 *49.5*	·	164.5 *26.5*	.
7.B.8	12	14	F	F	.	138.5 *45.5*	·	149.0 *25.5*	.

Abbreviations: Cr-Crystalline phase; $\text{Col}_{\text{ob}}\text{P}_{\text{F}}$-Columnar polar phase with an oblique lattice showing ferroelectric characteristics; I-Isotropic liquid; () Monotropic transition; ‡ Enthalpy could not be determined from DSC measurements as the sample crystallizes rapidly.

Dimers **7.D.1** and **7.D.2** are parent compounds, which do not contain any substituent in the bent-core, and they exhibit a highly metastable mesophase. It is well known [15-18] that melting points and phase transition temperatures can be modified in bent-core compounds, using lateral fluoro substituent. Using this methodology, initially a fluoro substituent was introduced *ortho* to the ester carbonyl group connected to the central phenyl unit to obtain dimmers, **7.D.3** and **7.D.4**. As expected, melting points are reduced and the mesophase becomes enantiotropic. A DSC thermogram obtained for dimer **7.D.3** is shown in figure **7.1**. In dimers **7.D.5** and **7.D.6** fluoro substituent was introduced *ortho* to the terminal *n*-alkoxy chain. These compounds also exhibit an enantiotropic mesophase but the melting and clearing temperatures are higher than the corresponding isomers, **7.D.3** and **7.D.4**. For example, the melting point of dimer **7.D.6** is increased by 25˚C and clearing temperature by 12˚C. In dimers **7.D.7** and **7.D.8** lateral fluoro substituents are incorporated *ortho* to the ester carbonyl group connected to the central phenyl ring as well as on the end phenyl ring *ortho* to the terminal *n*-alkoxy chain. It can be seen from the table that these two dimers have not only lower melting points but also a wider thermal range of the mesophase. For example, dimer **7.D.7** has a mesophase range of 28.5˚C while the analogous compounds **7.D.3** and **7.D.5** (with same spacer length but contain only two fluoro substituents) have a mesophase range of 14˚C and 11˚C respectively. These observations clearly demonstrate the influence of fluoro lateral substituent on the mesomorphic behaviour of dimeric bent-core compounds as reported earlier for monomeric systems [15-18].

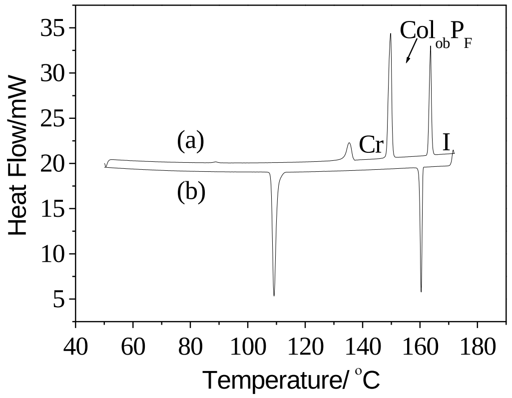
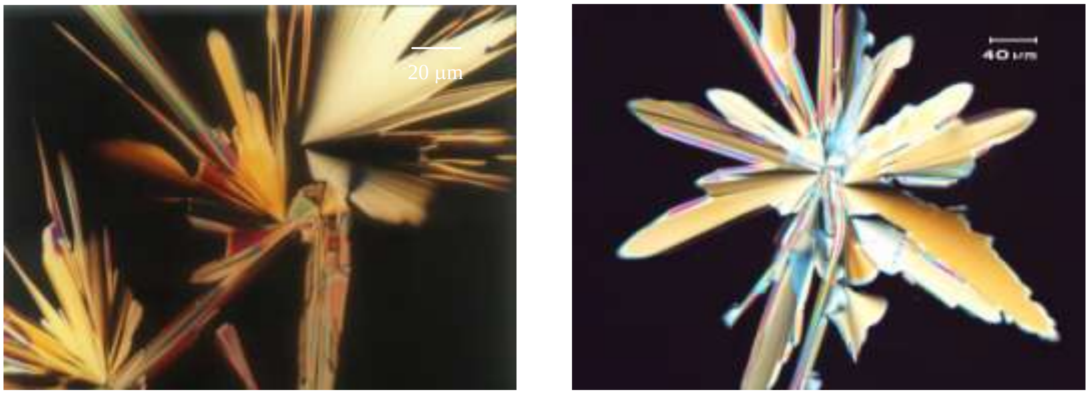


Figure 7.1: A DSC thermogram obtained for dimer 7.D.3. (a) Heating cycle; (b) cooling cycle; rate: 5˚C min^{-1}.

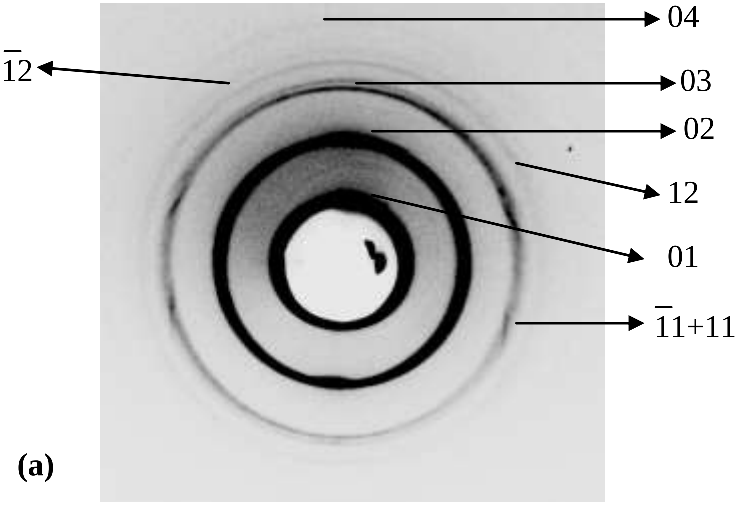
It can also be noted that in these dimers the enthalpy value for clearing transition is higher than that normally obtained for a smectic phase of monomeric BC compounds. It is interesting to point out here that, the transition temperatures are higher for dimers with an odd-number spacer than those with an even spacer. This is in contrast to the observation made in symmetric calamitic dimers in which compounds with even number of methylene units in the spacer have higher transition temperatures compared to the odd ones [5, 19, 20]. All the eight dimers exhibit similar textures when their isotropic liquids are cooled. A sample of dimer **7.D.3** sandwiched between a glass slide and a coverslip was cooled slowly from the isotropic state to give a texture as shown in figure **7.2a**. Similarly, a texture obtained for dimer **7.D.8** on slow cooling form the isotropic state is shown in figure **7.2b**. This type of textures is generally obtained for a mesophase with a two-dimensional lattice. The mesophase exhibited by dimers **7.D.1-8** has been characterized as $\mathrm{Col_{ob}P_F}$ on the basis of XRD and electro-optical investigations as described below.



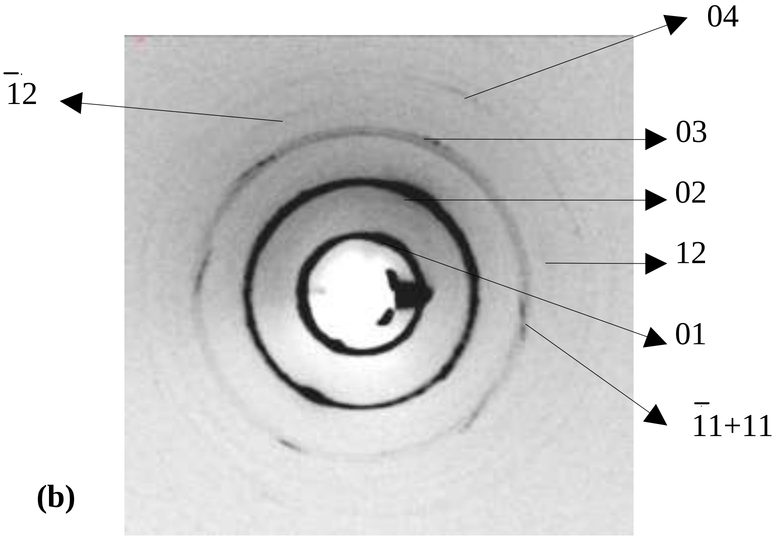
(a) **(b)**

Figure 7.2: Photomicrographs of the textures of the mesophase of dimers developing on slow cooling of the respective isotropic liquids. (a) 7.D.3, T=161.3˚C; (b) 7.D.8, T=148.4˚C.

XRD measurements were carried out on dimers **7.D.1-8** on powder samples as well as oriented samples. The powder patterns obtained for all the dimers were similar with a number of reflections in the small angle region, which ruled out the possibility of a simple layer structure. However, a partially oriented pattern was obtained by slow cooling of a drop of the sample on a glass plate from the isotropic state and XRD pattern obtained in this manner for dimer **7.D.3** is shown in figure **7.3a**. The data obtained from this partially aligned sample could be indexed to an oblique lattice with lattice parameters a = 19.9Å, b = 53.5Å and oblique angle β = 86.8˚.



a=19.9Å, b=53.5Å, β=86.8˚



a=21.6Å, b=56.1Å, β=86.7˚

Figure 7.3: X-Ray diffraction pattern in the small angle region obtained for dimers. (a) 7.D.3, 150˚C; (b) 7.D.8, 135˚C.

A diffuse peak was observed in the wide-angle region, which is located out of the equatorial plane indicating a liquid-like in-plane order and tilt of the molecules in the clusters. A similar partially oriented pattern obtained for dimer **7.D.8** is shown in figure **7.3b**. The measured *d*-spacings and their Miller indices for these two dimers are given in table **7.2**. The value of the lattice parameter *b* is almost half the measured length of the mesogenic unit (*l*=111Å for **7.D.8**) assuming an *all-trans* conformation of the chains and a bend angle of 120˚, which clearly indicates a strong intercalation of the molecules in the lattice. The total number of molecules estimated is about 2 per unit cell. Considering these facts into account a structural model for the mesophase has been proposed which is shown in figure **7.4**. In constructing the model it was assumed that two bent-core units of a dimer are located at the opposite corners of the lattice. The possible overlap of the flexible spacer of a dimer with the terminal chains of the adjacent dimers is also shown.

Table 7.2: The layer spacings (Å) and their Miller indices (in parantheses) observed in the small angle region of X-ray diffraction pattern.

Compound	*d*-Spacings (Å)	β
7.D.3	53.5 ± 0.82 (01), 26.8 (02), 18.9 (11+ $\bar{1}$1), 18.0 (03), 16.5 (12), 15.6 ($\bar{1}$2), 13.8 (04) Calc: 53.5 (01), 26.7 (02), 19.0 (11), 18.3 ($\bar{1}$1), 17.8 (03), 16.4 (12), 15.5 ($\bar{1}$2), 13.4 (04)	86.8˚
7.D.8	56.0 (01), 28.2 (02), 19.9 (11+ $\bar{1}$1**),** 19.0 (03), 17.6 (12), 16.7 ($\bar{1}$2), 14.4 (04). Cacl: 56.0 (01), 28.0 (02), 20.5 (11), 19.8 ($\bar{1}$1), 18.7 (03), 17.6 (12), 16.7 ($\bar{1}$2), 14.0 (04)	86.7˚

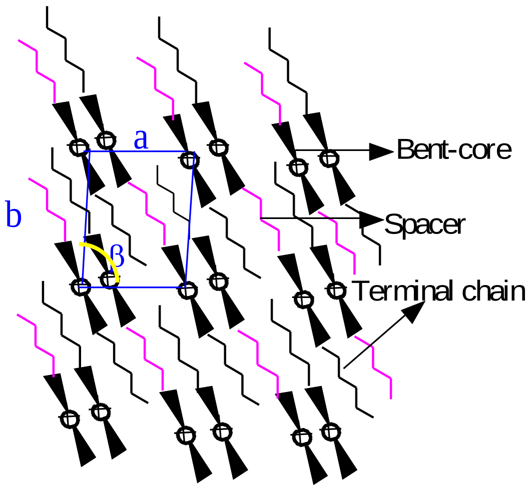
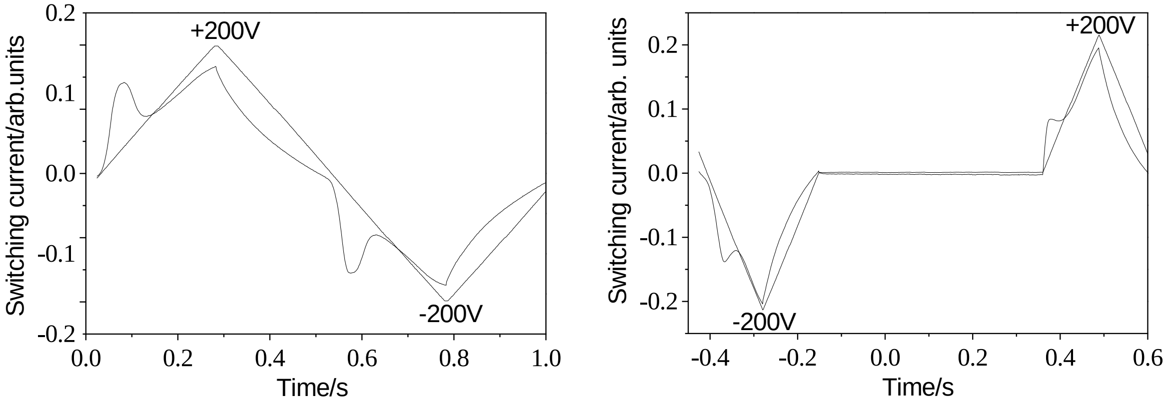


Figure 7.4: Proposed model for the $Col_{ob}P_F$ phase.

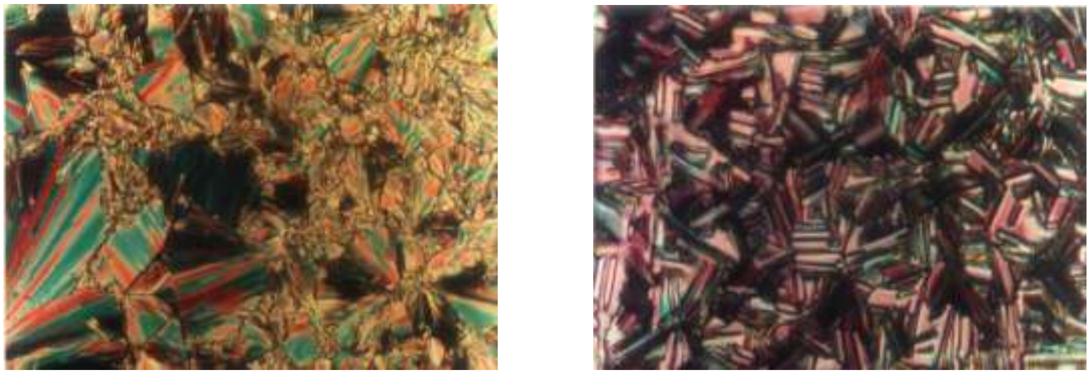
Electro-optical behaviour of the mesophase was investigated in a ITO coated cell with a gap of 9 μm and treated for planar alignment. A sample of dimer **7.D.3** in the isotropic state was filled into the cell by capillary action. After cooling the sample to the mesophase (138.5˚C) and applying a very high triangular voltage of $400V_{pp}$ and at a frequency of 20 Hz, a single current peak per half period of the applied voltage was observed which indicated the polar nature of the phase. The single peak persisted even at a low frequency of 0.1 Hz and did not split when a modified triangular wave with a plateau at zero voltage was applied indicating ferroelectric nature of the mesophase. The current response traces obtained under these two conditions are shown in figure **7.5a** and **7.5b** respectively. The polarization value was found to be 1280 nC cm^{-2}, which is quite high as compared to a number of monomeric systems which is usually in the range of 300-800 nC cm^{-2}. It should be mentioned here that the single peak obtained in the mesophase disappeared on going to the isotropic phase clearly indicating that the response is not due to ionic impurities.

It is interesting to point out here that, as the voltage is applied the current response trace appears initially as a small hump that grows with time. Correspondingly, a change in the optical texture could also be clearly observed. This slow response can be attributed to the intercalated structure coupled with the high viscosity of the phase. The natural texture of the mesophase before application of the voltage and the texture obtained on cooling from the isotropic state under the field are quite different as shown as shown in figure **7.6a** and **b**. The texture obtained under



(a) **(b)**

Figure 7.5: Switching current response traces obtained for the mesophase of dimer 7.D.3 by applying (a) triangular-wave voltage and (b) modified triangular-wave voltage; T=138.5˚C; 400V$_{pp}$; 1 Hz; cell thickness: 9 μm; P$_s$ ~1280 nC cm^{-2}.



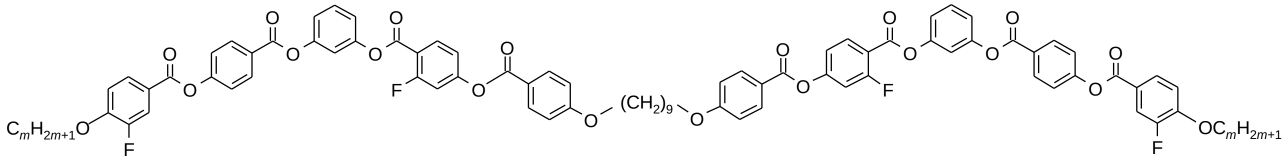
(a) **(b)**

Figure 7.6: Photomicrographs of the textures obtained for the mesophase of dimer 7.D.3 in a a cell treated for homogeneous alignment, cell thickness: 9 μm, T=138.5˚C; (a) before application of the field; (b) on cooling from the isotropic state under triangular-wave field; 400V$_{pp}$; 1Hz.

the field (figure **7.6b**) does not change on reversing the polarity of the field as well as after switching off the field. This indicates that the polar switching takes place along the long molecular axis without any change in the phase structure. However, it has been reported [23] that in some ferroelectric switching oblique columnar mesophases, the switching takes place around the cone axis, and this does not disturb the columnar structure as all the ribbons will have identical polar direction and rotation around the cone can take place uniformly. However, in the present case of dimeric system, where a possibility of two bent-core units situated at the opposite corners (see model) of the lattice is considered, switching around a cone would require complete reorganization of the phase structure. This may be the reason for no optical switching and this suggests that the rotation must take place along the long molecular axis. There is also a possibility of change of phase structure under the field [24] and again these points have been reviewed [23]. However, the XRD of the phase under the field could not be carried out. Similar behaviour was observed for dimers **7.D.4-8**. These observations clearly suggest that the parity of the spacer does not have any influence on the type of mesophase obtained.

Since the dimers **7.D.7** and **7.D.8** exhibit wide thermal range of the mesophase, this system was selected to investigate the effect of varying the terminal chain length (*m*) and varying the spacer length (*n*), on the mesomorphic behaviour and hence three series of dimers were synthesized. In series **7.D.I**, for a fixed odd-number spacer (*n*=9), effect of varying the length of the terminal chain (*m*=8-12,14, 16, 18) was studied. The transition temperatures and the associated enthalpy values obtained for this series of dimers are given in table **7.3**. All the homologues are enantiotropic mesomorphic and exhibit the same type of mesophase. This mesophase has been characterized as $\mathrm{Col_{ob}P_F}$. A plot of dependence of the transition temperature on the length of the terminal chain for this series is shown in figure **7.7**. It is evident from this plot that as the terminal chain length is increased, melting points are lowered and the clearing temperatures increase, as a result of which the thermal range for the mesophase is increased. Dimer **7.D.9** exhibits a dendritic-pattern on slow cooling from the isotopic phase. In addition, spherulitic patterns could also be observed. These dendritic-patterns obtained for dimer **7.D.9** are shown in figure **7.8a** and **7.8b**. These textural features are reminiscent of a rectangular columnar phase. However the XRD pattern of this phase is similar to that described for dimer **7.D.3** and the reflections could be indexed to an oblique lattice with lattice parameters a= 22.3Å, b=45.5Å and β=81.4° and the electro-optical behaviour indicates a ferroelectric behaviour. Hence this mesophase is designated as $\mathrm{Col_{ob}P_F}$. All the remaining homologues exhibit textures consisting of spherulitic domains and such textures obtained for dimer **7.D.7** are shown in figure **7.8c** and **d**.

Table 7.3: Transition temperatures (˚C) and the associated enthalpy values (kJ mol^{-1}, in italics) for the dimers of series 7.D.I.



Compound	*m*	Cr		$Col_{ob}P_F$		I
7.D.9	8	.	142.0	.	156.0	.
			49.5		*24.5*	
7.D.10	9	.	140.5	.	155.0	.
			47.0		*25.0*	
7.D.11	10	.	140.0	.	155.0	.
			39.0		*24.5*	
7.D.12	11	.	140.0	.	157.5	.
			47.5		*25.5*	
7.D.13	12	.	139.0	.	159.5	.
			48.0		*26.0*	
7.D.7	14	.	136.0	.	164.5	.
			49.5		*26.5*	
7.D.14	16	.	135.5	·	169.5	.
			57.5		*26.5*	
7.D.15	18	.	134.0	·	172.5	.
			60.0		*26.0*	

Abbreviations: See table **7.1**.

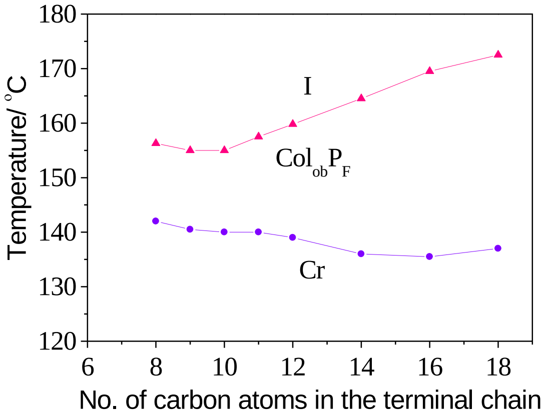
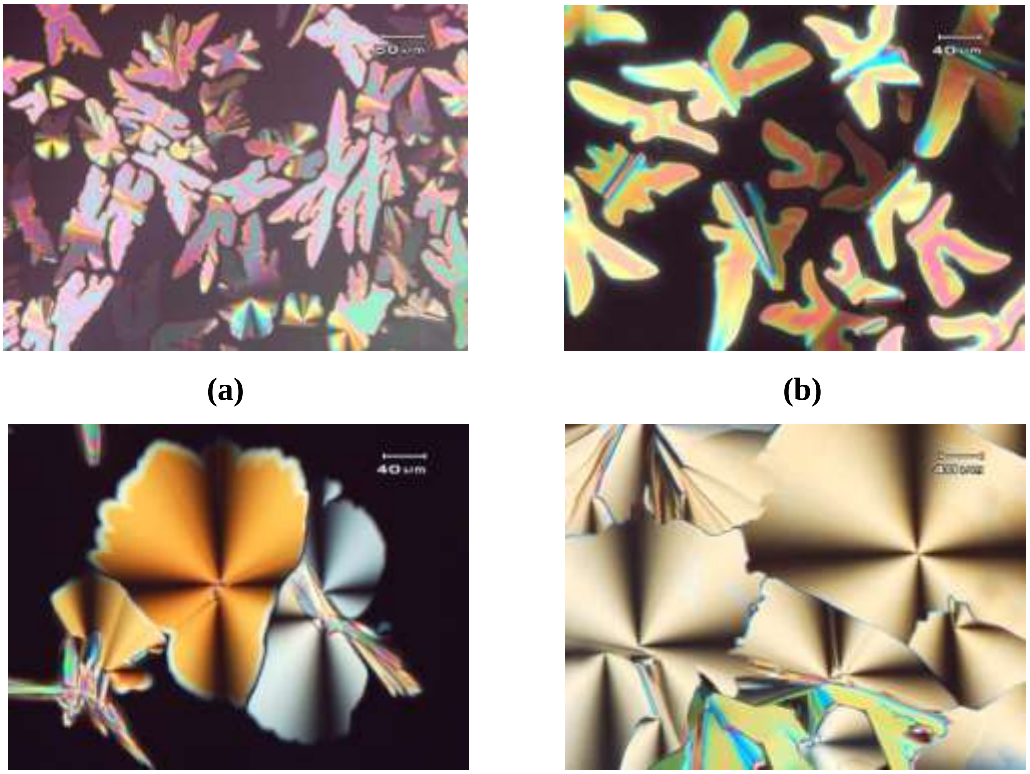


Figure 7.7: The dependence of transition temperature on the length of terminal chain for the dimers of series 7.D.I.



(a) **(b)**

(c) **(d)**

Figure 7.8: (a) and (b), Photomicrographs obtained for the mesophase of dimer 7.D.9 at different cooling rates, T=153˚C. (c) and (d), Photomicrographs obtained for the mesophase of dimer 7.D.7 at T=164˚C and T=163˚C respectively.

The XRD patterns of all the dimers were similar and the reflections obtained could be indexed to an oblique lattice. The electro-optical investigations indicate a ferroelectric behaviour for the mesophase. For example, on application of a triangular-wave electric field, the mesophase of compound **7.D.7** showed a single peak. The single peak did not split even on reducing the frequency down to 0.1 Hz. The current response trace obtained for the mesophase of compound **7.D.7** under a triangular-wave is shown in figure **7.9**. The polarization value calculated from the trace is about 770 nC cm^{-2}.

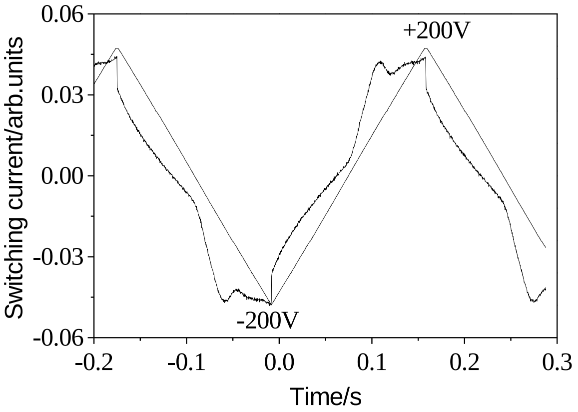
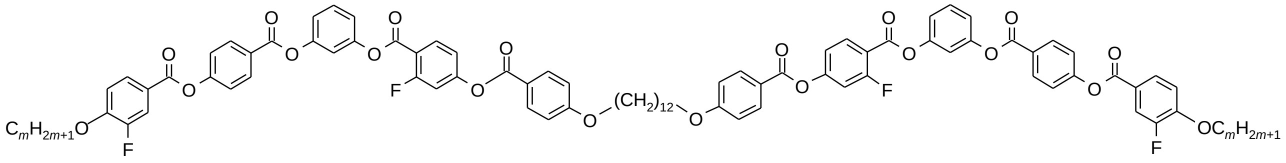


Figure 7.9: Current response trace obtained for the mesophase of dimer 7.D.7, T=150˚C, 400 V_{PP}, 3 Hz, cell thickness: 8.68 μm, P_S~770 nC cm^{-2}.

In series **7.D.II**, for a fixed even spacer (*n*=12), the dependence of transition temperature on the terminal chain is examined. The transition temperatures and the associated enthalpy values obtained for this series of dimers is presented in table **7.4**. It can be seen from the table that the clearing temperatures of these dimers are lower than the corresponding dimers with an odd-number spacer, *n*=9. All the homologues exhibit the same type of mesophase, which is characterized as $Col_{ob}P_F$. However, dimer **7.D.16**, exhibits an additional monotropic transition at 127.5˚C with a low enthalpy of 0.3 kJ mol^{-1}. The mesophase of this compound appears from the isotropic phase in the form of dendrites, which coalesce to give a mosaic texture. On further cooling, at 127.5˚C a clear textural change could be observed as shown in figure **7.10**. XRD studies could not be carried out on this lower temperature mesophase as the sample crystallizes quite rapidly. The electro-optical studies indicate a ferroelectric behaviour for this mesophase also (described later).

Interestingly, on increasing the length of the terminal chain, the mesophase becomes monotropic for dimers **7.D.17-19** and again becomes enantiotropic for dimers **7.D.20**, **7.D.8**, **7.D.21** and **7.D.22**. All these homologues exhibit spherulitic texture and other patterns that are obtained for non-layered mesophases.

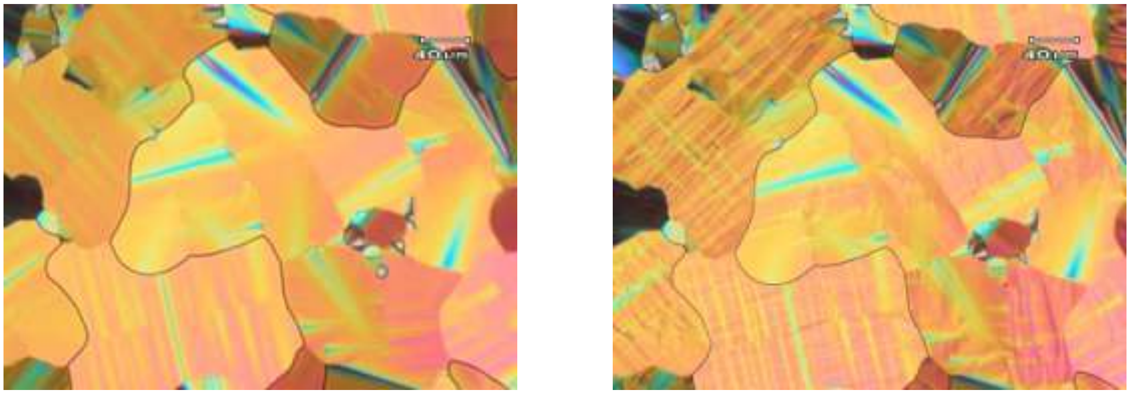
Table 7.4: Transition temperatures (˚C) and the associated enthalpy values (kJ mol^{-1}, in italics) for the dimers of series 7.D.II.



Compound	*m*	Cr		Col$_{ob}$P$_F$		I
7.D.16[#]	8	.	137.0	.	*145.5*	.
			50.0		*21.0*	
7.D.17	9	.	142.0	(.	138.0)	.
			70.0		*23.5*	
7.D.18	10	.	142.5	(.	138.0)	.
			65.0		*22.0*	
7.D.19	11	.	143.0	(.	140.5)	.
			63.5		*24.5*	
7.D.20	12	.	142.0	.	145.0	.
			43.7		*26.0*	
7.D.8	14	.	138.5	.	149.0	.
			45.5		*25.5*	
7.D.21	16	.	138.5	.	154.0	.
			82.0		*26.0*	
7.D.22	18	.	137.0	.	157.5	.
			94.0		*26.5*	

Abbreviations: See table **7.1**, [#] Compound exhibits a monotropic transition at 127.5˚C, and the mesophase could not be characterized as the sample crystallizes rapidly.

A plot of dependence of transition temperature on the length of terminal chain for the series **7.D.II** is shown in figure **7.11** and again as *m* increases, temperature of the mesophase increases as observed in series **7.D.I**. A comparison of dependence of clearing temperature on the length of terminal chain of series **7.D.I** and **7.D.II** is shown in figure **7.12**.



(a) **(b)**

Figure 7.10: Textures observed on cooling the isotropic liquid of a sample of dimer 7.D.16 sandwiched between a glass slide and a coverslip. (a) T=138˚C, (b) T=122˚C.

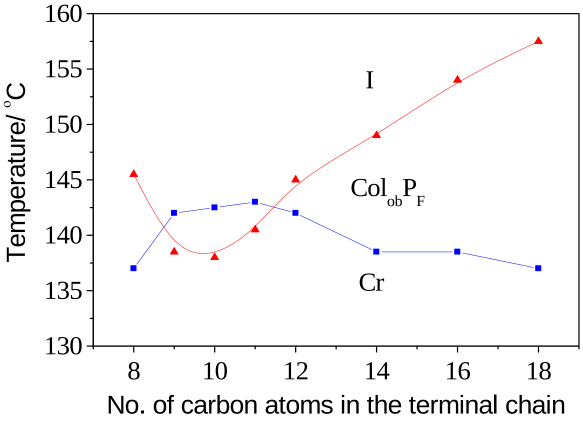


Figure 7.11: The dependence of transition temperature on the length of terminal chains for series 7.D.II.

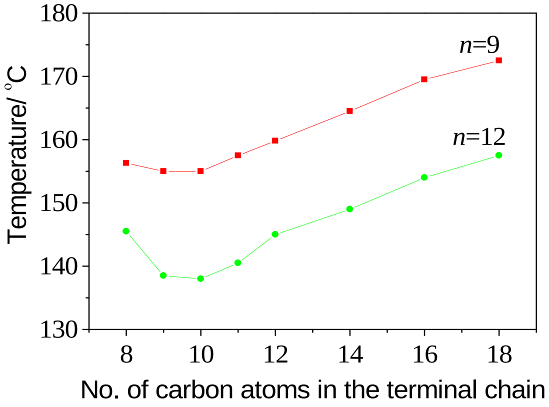
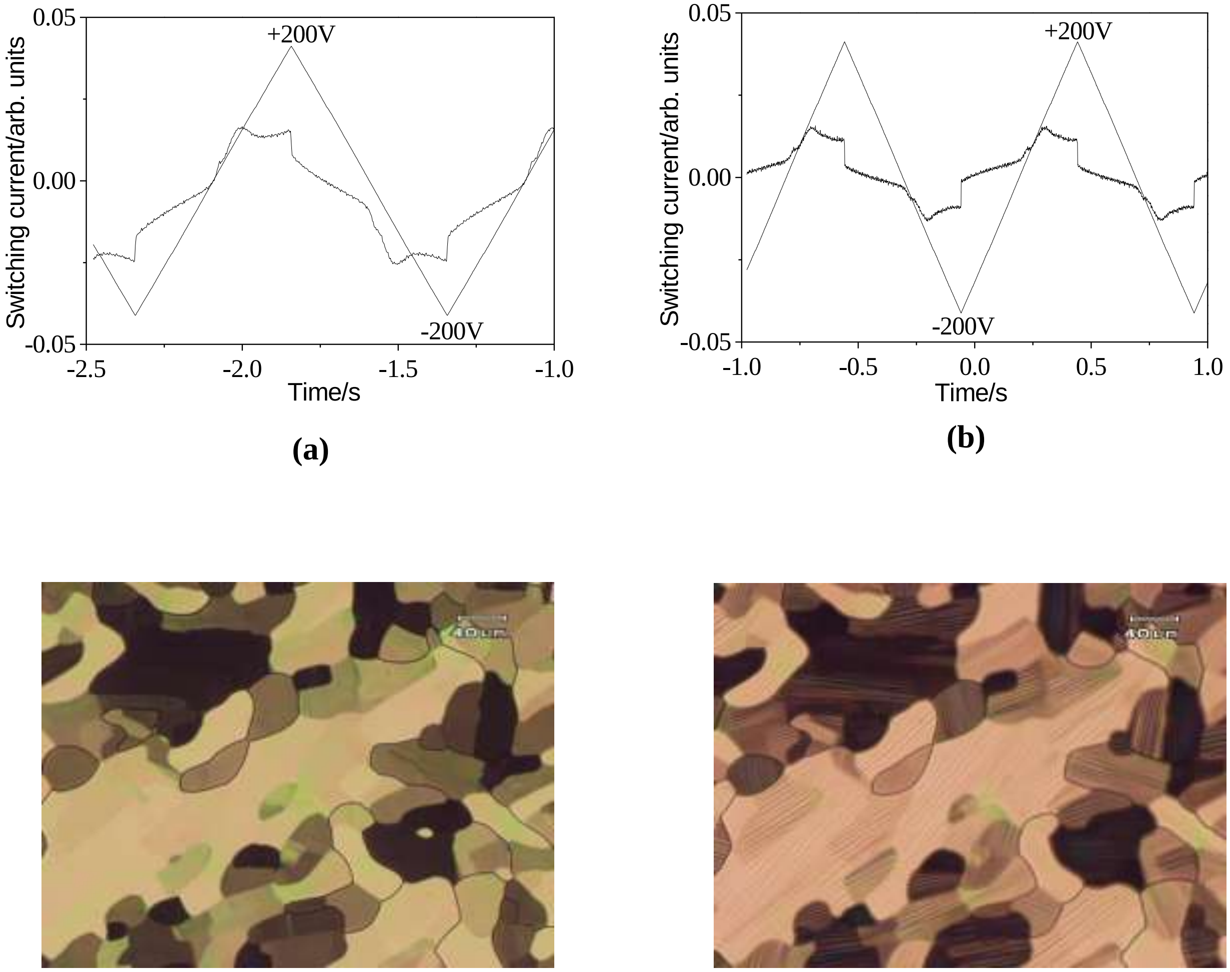


Figure 7.12: The dependence of clearing temperature on the length of terminal chains for series 7.D.I (*n*=9) and 7.D.II (*n*=12).

The XRD patterns of all the dimers were similar and could be indexed to an oblique lattice of a columnar phase. A partially oriented pattern obtained for the mesophase of dimer **7.D.8** is shown in figure **7.3b**.

Electro-optical studies of the mesophase of all the dimers indicate a ferroelectric behaviour. For example, a sample of dimer **7.D.16** was cooled from the isotopic phase to the mesophase and a triangular-wave electric field was applied and the strength slowly increased. A single current peak per half period of the applied voltage was observed indicating a ferroelectric switching. On further cooling under the field, although the single peak persists, a clear textural change could be observed at 125˚C. This clearly indicates a phase transition and this is reversible. The current response traces obtained for dimer **7.D.16** at 136˚C and 118˚C are shown in figure **7.13a** and **b** respectively. The corresponding optical photomicrographs obtained are shown in **7.13c** and **d**.

In series **7.D.III**, for a fixed terminal chain length (*m*=14), the spacer length (*n*=7-12) is varied. The transition temperatures and the associated enthalpy values obtained for this series of dimers is shown in table **7.5**. All the dimers are enantiotropic mesomorphic except for **7.D.24,** which is metastable. The mesophase behaviour is similar to that exhibited by compounds of series **7.D.I** and **7.D.II** and hence identified as $Col_{ob}P_F$ phase. Some textural patterns obtained on slow cooling the isotropic liquid of dimer **7.D.25** are shown in figure **7.14**.



(a)

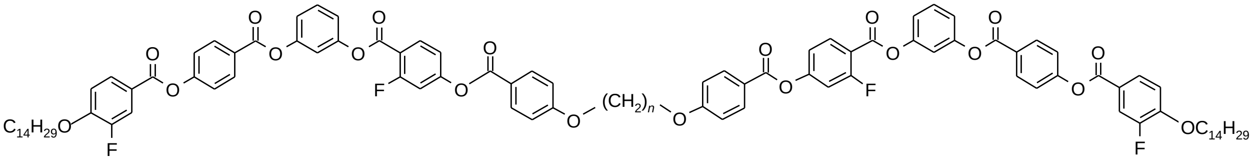
(b)

(c)

(d)

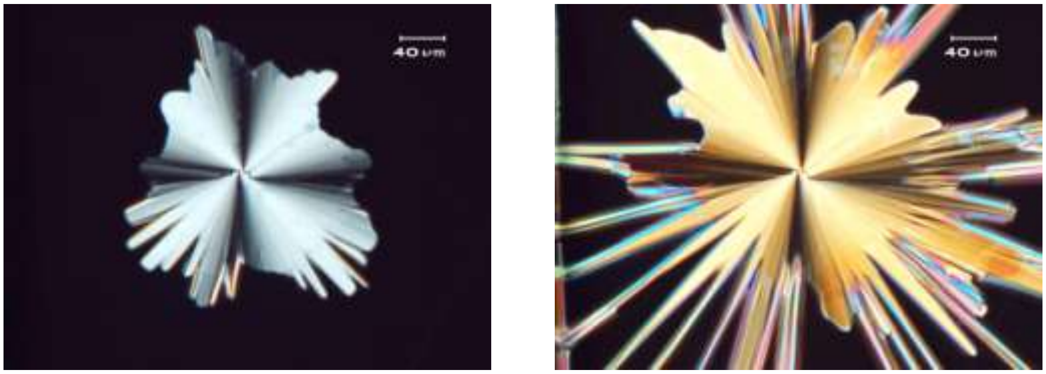
Figure7.13: Current response traces obtained for the mesophase of dimer 7.D.16 in a ITO coated cell of thickness 8 μm (a) T=136˚C, 400V_{pp}, 1 Hz, P_S ~ 180 nC cm^{-2}; (b) T=118˚C, 400V_{pp}, 1 Hz, P_S ~ 123 nC cm^{-2}. (c) and (d) Corresponding optical textures obtained under the field.

Table 7.5: Transition temperatures (°C) and the associated enthalpy values (kJ mol^{-1}, in italics) for the dimers of series 7.D.III.



Compound	*n*	Cr		$\mathrm{Col_{ob}P_F}$		I
7.D.23	7	.	171.0 *80.5*	.	172.5 *25.0*	.
7.D.24	8	.	170.0 *81.5*	(.	161.0) *21.0*	.
7.D.7	9	.	136.0 *49.5*	.	164.5 *26.5*	.
7.D.25	10	.	137.0 *65.0*	.	156.7 *24.5*	.
7.D.26	11	.	142.0 *45.0*	.	157.8 *27.0*	.
7.D.8	12	.	138.5 *45.5*	.	149.0 *25.5*	.

Abbreviations: See table **7.1**.



(a) **(b)**

Figure 7.14: Photomicrographs of textures obtained for the mesophase of dimer 7.D.25 on slow cooling from the isotropic liquid. (a) and (b) represent different regions of the same sample, T=156.2°C.

A plot of dependence of transition temperature on the length of the spacer is shown in figure **7.15**. A fairly pronounced odd-even effect of the clearing points can be seen from the graph. Interestingly, the phase type is not affected as the spacer length is varied. It can also be noticed from this plot that the homologues containing odd-number spacers exhibit higher isotropization temperature compared to those containing even-spacers. This is the first example of a series of symmetric dimers containing BC units where such an odd-even effect for the parity of the spacers is observed. Remarkably, this is in complete contrast to those dimers formed using rod-like mesogenic units, where odd-even effects are observed but the parity has a strong influence on the type of mesophase obtained.

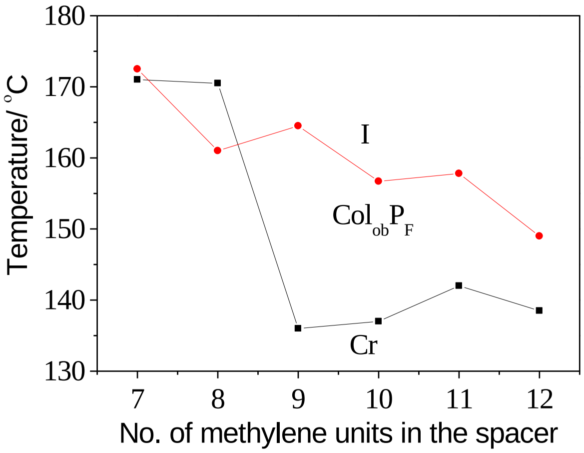


Figure 7.15: The dependence of transition temperature on the length of the flexible spacer for the dimers of series 7.D.III.

Conclusions

The first polar symmetric mesogenic dimers composed of bent-core molecules and linked by an alkylene spacer were synthesized and their mesomorphic behaviour investigated. All the dimers investigated show a same type of mesophase. From partially oriented XRD patterns and electro-optical investigations this mesophase has been characterized as a columnar phase with an oblique lattice that exhibits ferroelectric characteristics. Hence, this phase has been designated as a Col$_{ob}$P$_F$ phase. In order to study the structure-property relationships, three series of dimers were synthesized in which the length of the terminal chain as well as the length of the alkylene spacer are varied. These studies reveal that in such dimers for a fixed spacer, the thermal range of the mesophase increases with increase in terminal chain length. This is the first example of a BC dimer, where an odd-even effect is observed when the length of the flexible spacer is increased and it is observed that the dimers with even-number of methylene units in the spacer have higher clearing temperatures than those with odd-number. The results also suggest that the parity of the alkylene spacer has no effect on the nature of the mesophase at least in the compounds investigated.

Synthesis

Benzyl 4-(4-*n*-tetradecyloxybenzoyloxy)benzoate, 7.a (Y=H, *n*=14)

A mixture of 4-*n*-tetradecyloxybenzoic acid, **7.i** (Y=H), (4g, 11.9 mmol), benzyl 4-hydroxybenzoate, **7.ii** (2.73g, 11.9 mmol) and a catalytic amount of DMAP in dry dichloromethane (50 ml) was stirred for 15 minutes. To this stirred mixture, DCC (2.7g, 13.2 mmol) was added and stirring continued for a further 4 hours at room temperature. The precipitated *N, N'*–dicyclohexylurea was filtered off and washed thoroughly with chloroform. The solvent from the filtrate was evaporated and the residue obtained was chromatographed on silica gel using a mixture of chloroform and hexane in the ratio 1:1 as an eluant. Removal of solvent from the eluate provided a white material, which was crystallized from hexane. Yield 5.5g (84%), m. p. 68-69˚C. ν_{max}: 2920, 2850, 1730, 1716, 1469, 1379, 1292 cm^{-1}; δ_H: 8.16-8.12 (m, 4H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.64 Hz, 2H, Ar-H), 6.97 (d, ^3J 8.8 Hz, 2H, Ar-H), 5.38 (s, 2H, -COO-CH_2-Ar), 4.03 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.85-1.78 (quin, ^3J 6.5 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.26 (m, 22H, $(-CH_2-)_{11}$), 0.88 (t, 3H, ^3J 6.32 Hz, -CH_3); $C_{35}H_{44}O_5$ requires C 77.17, H 8.14; found C 76.82, H 8.28 %.

Benzyl 4-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound **7.a** (Y=H, *n*=14). Quantities: 4-*n*-tetradecyloxybenzoic acid, **7.i** (Y=H), (4g, 11.3 mmol), benzyl 4-hydroxybenzoate, **7.ii** (2.6g, 11.3 mmol), DCC (2.6g, 12.5 mmol), DMAP (cat. amount) and dry dichloromethane (30 ml). Yield 5.5g (86%), m. p. 88-89˚C. ν_{max}: 2922, 2850, 1726, 1618, 1467, 1377, 1303, 1292, 1193 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH_2-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.48-1.26 (m, 22H, $(-CH_2-)_{11}$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH_3); $C_{35}H_{43}FO_5$ requires C 74.70, H 7.63; found C 74.58, H 7.44 %.

4-*n*-Tetradecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=H, *n*=14)

To compound **7.a** (Y=H, *n*=14), (5g, 9.1mmol) in 1,4-dioxane (30 ml), 5% Pd-C catalyst (1g) was added. The mixture was stirred in an atmosphere of hydrogen at 60˚C until the absorption of hydrogen ceased. The solution was filtered hot and the filtrate was allowed to cool slowly. The crystallized product was filtered and dried. Yield 3.6g (86%), transition temperature: Cr 120°C SmC 214°C N 217.5°C I. ν_{max}: 3070, 2972, 2851, 2548, 1732, 1688, 1603, 1261, 1161 cm^{-1}; δ_H (CD_3COCD_3): 8.20 (d, ${}^3J$ 8.68 Hz, 2H, Ar-H), 8.14 (d, ${}^3J$ 8.88 Hz, 2H, Ar-H), 7.40 (d, ${}^3J$ 8.68 Hz, 2H, Ar-H), 7.12 (d, ${}^3J$ 8.88 Hz, 2H, Ar-H), 4.05 (t, ${}^3J$ 6.48 Hz, 2H, Ar-OCH_2-), 1.86-1.79 (quin, ${}^3J$ 6.8 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.28 (m, 22H, $(-CH_2-)_{11}$), 0.88 (t, ${}^3J$ 6.48 Hz, 3H, $-CH_3$); $C_{28}H_{38}O_5$ requires C 73.98, H 8.48; found C 73.71, H 8.55 %.

3-Fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound **7.b** (Y=H, *n*=14). Quantities: compound **7.a** (Y=F, *n*=14), (5g, 8.9 mmol), 5% Pd-C (1g) and 1, 4-dioxane (30 ml). Yield 3.8g (90%), m. p. 142-143°C. ν_{max}: 2952, 2920, 2850, 2717, 2682, 2557, 1728, 1697, 1687, 1616, 1604, 1523, 1469, 1436, 1377, 1303 cm^{-1}; δ_H (CD_3COCD_3): 8.15 (d, ${}^3J$ 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ${}^3J$ 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ${}^3J$ 11.72 Hz, ${}^4J$ 2.12 Hz, 1H, Ar-H), 7.44 (d, ${}^3J$ 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ${}^3J$ 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ${}^3J$ 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.29 (m, 22H, $(-CH_2-)_{11}$), 0.87 (t, ${}^3J$ 6.92 Hz, 3H, $-CH_3$); $C_{28}H_{37}FO_5$ requires C 71.16, H 7.89; found C 70.9, H 8.05 %.

1-Benzyloxyphenylene-3-(4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.c (Y=H, *n*=14)

This compound was prepared following a procedure described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.b** (Y=H, *n*=14), (3.5g, 7.7 mmol), 3-(benzyloxy)phenol, **7.iii** (1.54g, 7.7 mmol), DCC (2.0g, 8.5 mmol), DMAP (cat. amount) and dry dichloromethane (30 ml). Yield 4g (82%), m. p. 96-97.5°C. ν_{max}: 2922, 2852, 1733, 1608, 1463, 1377, 1062 cm^{-1}; δ_H: 8.30 (d, ${}^3J$ 8.68 Hz, 2H, Ar-H), 8.27 (d, ${}^3J$ 8.68 Hz, 2H, Ar-H), 8.15 (d, ${}^3J$ 8.8 Hz, 2H, Ar-H), 7.45-7.32 (m, 8H, Ar-H,), 6.99 (d, ${}^3J$ 8.8 Hz, 2H, Ar-H), 6.92-6.84 (m, 3H, Ar-H), 5.08 (s, 2H, $-OCH_2$-Ar), 4.05 (t, ${}^3J$ 6.55 Hz, 2H, Ar-OCH_2-), 1.86-1.80 (quin, ${}^3J$ 7.1 Hz, 2H, Ar-OCH_2-$C\underline{H_2}$-), 1.51-1.33 (m, 22H, $(-CH_2-)_{11}$), 0.88 (t, ${}^3J$ 6.4 Hz, 3H, $-CH_3$); $C_{41}H_{48}O_6$ requires C 77.33, H 7.59; found C 76.74, H 7.87 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.b** (Y=F, *n*=14), (3.5g, 7.4 mmol), 3-(benzyloxy)phenol,

7.iii (1.48g, 7.4 mmol), DCC (1.68g, 8.2 mmol), DMAP (cat. amount) and dry dichloromethane (30 ml). Yield 4g (82%), m. p. 86-87˚C. ν_{max}: 2923, 2852, 1732, 1730, 1610, 1600, 1465, 1288, 1186 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, $-OCH_2-Ar$), 4.13 (t, ^3J 6.56 Hz, 2H, $Ar-OCH_2-$), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, $Ar-OCH_2-\underline{CH_2}-$), 1.51-1.27 (m, 22H, $(-CH_2-)_{11}$), 0.88 (t, ^3J 6.52 Hz, 3H, $-CH_3$); $C_{41}H_{47}FO_6$ requires C 75.2, H 7.23; found C 75.06, H 7.52 %.

1-(3-Hydroxy)phenylene-4-*n*-tetradecyloxybenzoyloxy-4-benzoate, 7.d (Y=H, *n*=14)

This compound was prepared following a procedure similar to the one described for compound **7.b** (Y=H, *n*=14). Quantities: compound **7.c** (Y=H, *n*=14), (3.5g, 5.5 mmol), 5% Pd-C (0.7g) and 1, 4-dioxane (35 ml). Yield 2.8g (93%), m. p. 125-126˚C. ν_{max}: 3375, 3300, 2922, 2852, 1733, 1714, 1604, 1463, 1272, 1251, 1604 cm^{-1}; δ_H (CD_3COCD_3): 8.66 (s, 1H, Ar-OH, exchangeable with D_2O), 8.25 (d, ^3J 8.7 Hz, 2H, Ar-H), 8.15 (d, ^3J 8.9 Hz, 2H, Ar-H), 7.49 (d, ^3J 8.7 Hz, 2H,Ar-H), 7.27 (t, ^3J 7.45 Hz, 1H, Ar-H), 7.13 (d, ^3J 8.9 Hz, 2H, Ar-H), 6.80-6.75 (m, 3H, Ar-H), 4.14 (t, ^3J 6.48 Hz, 2H, $Ar-OCH_2-$), 1.86-1.81 (quin, ^3J 6.6 Hz, 2H, $Ar-OCH_2-C\underline{H_2}-$), 1.50-1.27 (m, 22H, $(-CH_2-)_{11}$), 0.87 (t, ^3J 6.5 Hz, 3H, $-CH_3$); $C_{34}H_{42}O_6$ requires C 74.69, H 7.74; found C 74.42, H 7.73 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound **7.b** (Y=H, *n*=14). Quantities: compound **7.c** (Y=F, *n*=14), (3.5g, 5.3 mmol), 5% Pd-C (0.7g) and 1, 4-dioxane (35 ml). Yield 2.8g (93%), m. p. 132-133˚C. ν_{max}: 3377, 3336, 2922, 2852, 1728, 1618, 1600, 1463, 1377, 1305, 1288, 1139 cm^{-1}; δ_H (CD_3COCD_3): 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, $Ar-OCH_2-$), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, $Ar-OCH_2-\underline{CH_2}-$), 1.54-1.28 (m, 22H, $(-CH_2-)_{11}$), 0.86 (t, ^3J 6.88 Hz, 3H, $-CH_3$); $C_{34}H_{41}FO_6$ requires C 72.32, H 7.32; found C 72.17, H 7.62 %.

1-(4-Benzyloxybenzoyloxy)phenylene-3-(4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.e (X=H, Y=H, *n*=14)

This compound was prepared using the same procedure as described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.d** (Y=H, *n*=14), (2.5g, 4.58 mmol), 4-benzyloxybenzoic acid, **7.iv** (X=H), (1g, 4.58 mmol), DCC (1g, 5 mmol), DMAP (cat. amount) and dry dichloromethane (25 ml). Yield 3g (80%), m. p. 124.5-125.5˚C. ν_{max}: 2923, 2852, 1735, 1728, 1606, 1465, 1377, 1267, 1163 cm^{-1}; δ_H: 8.28 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.15 (d, ^3J 8.4 Hz, 2H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.51 (d, ^3J 8.4 Hz, 2H, Ar-H), 7.43-7.24 (m, 10H, Ar-H), 7.20 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.12 (d, ^3J 8.84 Hz, 2H, Ar-H), 5.27 (s, 2H, -OCH$_2$-Ar), 4.14 (t, ^3J 6.44 Hz, 2H, Ar-OCH$_2$-), 1.84-1.80 (m, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 22H, (-CH$_2$-)$_{11}$), 0.86 (t, 3H, ^3J 6.9 Hz, -CH$_3$); $C_{48}H_{52}O_8$ requires C 76.17, H 6.92; found C 75.85, H 6.65 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=H, *n*=14)

This compound was prepared using the same procedure as described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.d** (Y=H, *n*=14), (2.5g, 4.58 mmol), 2-fluoro-4-benzyloxybenzoic acid, **7.iv** (X=F), (1.1g, 4.58 mmol), DCC (1g, 5 mmol), DMAP (cat. amount) and dry dichloromethane (25 ml). Yield 3g (86%), m. p. 105-106˚C. ν_{max}: 2922, 2852, 1728, 1718, 1616, 1583, 1508, 1463, 1377, 1303, 1251, 1103 cm^{-1}; δ_H: 8.27 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.15 (d, ^3J 8.88 Hz, 2H, Ar-H), 8.05-7.89 (m, 1H, Ar-H), 7.49-7.36 (m, 7H, Ar-H), 7.18-7.16 (m, 4H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 2H, Ar-H), 6.88-6.85 (dd, ^3J 8.84 Hz, ^4J 2.36 Hz, 1H, Ar-H), 6.80-6.76 (dd, ^3J 12.48 Hz, ^4J 2.28 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.06 (t, ^3J 6.52 Hz, 2H, Ar-OCH$_2$-), 1.86-1.80 (quin, ^3J 6.92 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.27 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, 3H, ^3J 6.52 Hz, -CH$_3$); $C_{48}H_{51}FO_8$ requires C 74.39, H 6.63; found C 74.02, H 6.55 %.

1-(4-Benzyloxybenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.e (X=H, Y=F, *n*=14)

This compound was prepared using the same procedure as described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.d** (Y=F, *n*=14), (2.5g, 4.4 mmol), 4-benzyloxybenzoic acid, **7.iv** (X=H), (1g, 4.44 mmol), DCC (1g, 4.9 mmol), DMAP (cat. amount) and dry dichloromethane (25 ml). Yield 2.8g (80%), m. p. 124-125˚C. ν_{max}: 2939, 2852, 1728, 1739, 1602, 1463, 1377, 1265, 1130 cm^{-1}; δ_H: 8.27 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.15 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.4 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.49-7.39 (m, 6H, Ar-H), 7.36 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.17-7.15 (m, 3H, Ar-H), 7.08-7.03 (m, 3H, Ar-H), 5.16 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.52 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.52 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, ^3J 6.48 Hz, 3H, -CH$_3$); $C_{48}H_{51}FO_8$ requires C 74.39, H 6.63; found C 73.99, H 6.36 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=14)

This compound was prepared using the same procedure as described for compound **7.a** (Y=H, *n*=14). Quantities: compound **7.d** (Y=F, *n*=14), (2.5g, 4.4 mmol), 2-fluoro-4-benzyloxybenzoic acid, **7.iv** (X=F), (1.09g, 4.44 mmol), DCC (1g, 4.9 mmol), DMAP (cat. amount) and dry dichloromethane (25 ml). Yield 2.9g (83%), m. p. 101-102˚C. ν_{max}: 2922, 2852, 1739, 1726, 1724, 1620, 1600, 1463, 1438, 1377,1288, 1267, 1130 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{48}H_{50}F_2O_8$ requires C 72.7, H 6.35; found C 72.3, H 6.33 %.

1-(4-Hydroxybenzoyloxy)phenylene-3-(4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.f (X=H, Y=H, *n*=14)

This compound was prepared following a procedure similar to the one described for compound, **7.b** (Y=H, *n*=14). Quantities: compound **7.e** (X=H, Y=H, *n*=14), (2.5g, 3.3 mmol), 5% Pd-C (0.5g) and 1, 4-dioxane (25 ml). Yield 1.9g (86%), m. p. 182-183˚C. ν_{max}: 3371, 2922, 2852, 2617, 1741, 1728, 1705, 1595, 1461, 1377, 1242 cm^{-1}; δ_H (CD$_3$COCD$_3$): 9.35 (s, 1H, Ar-OH, exchangeable with D$_2$O), 8.29 (d, ^3J 8.72 Hz, 2H, Ar-H), 8.14 (d, ^3J 8.88 Hz, 2H, Ar-H), 8.07 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.56-7.54 (m, 1H, Ar-H), 7.51 (d, ^3J 8.72 Hz, 2H, Ar-H), 7.35-7.22 (m, 3H, Ar-H), 7.12 (d, ^3J 8.88 Hz, 2H, Ar-H), 7.0 (d, ^3J 8.76 Hz, 2H, Ar-H), 4.14 (t, ^3J 6.48 Hz, 2H, Ar-

OCH_2-), 1.84-1.80 (m, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.28 (m, 22H, (-CH_2-)$_{11}$), 0.86 (t, ^3J 6.48 Hz, 3H, -CH_3); $C_{41}H_{46}O_8$ requires C 73.85, H 6.95; found C 73.45, H 6.58 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=H, *n*=14)

This compound was prepared following a procedure similar to the one described for compound, **7.b** (Y=H, *n*=14). Quantities: compound **7.e** (X=F, Y=H, *n*=14), (2.5g, 3.2 mmol), 5% Pd-C (0.5g) and 1, 4-dioxane (25 ml). Yield 2g (90%), m. p. 181-182˚C. ν_{max}: 3342, 2922, 2852, 2713, 1743, 1728, 1714, 1616, 1600, 1508, 1460, 1377, 1276, 1055 cm^{-1}; δ_H (CD_3COCD_3): 9.94 (s, 1H, Ar-OH, exchangeable with D_2O), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.14 (d, ^3J 8.8 Hz, 2H, Ar-H), 8.05-8.01 (m, 1H, Ar-H), 7.99-7.54 (m, 1H, Ar-H), 7.51 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.31-7.23 (m, 3H, Ar-H), 7.12 (d, ^3J 8.8 Hz, 2H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.2 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.14 (t, ^3J 6.4 Hz, 2H, Ar-OCH_2-), 1.89-1.79 (m, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.56-1.27 (m, 22H, (-CH_2-)$_{11}$), 0.86 (t, ^3J 6.5 Hz, 3H, -CH_3); $C_{41}H_{45}FO_8$ requires C 71.91, H 6.62; found C 71.85, H 6.48 %.

1-(4-Hydroxybenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.f (X=H, Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound, **7.b** (Y=H, *n*=14). Quantities: compound **7.e** (X=H, Y=F, *n*=14), (2.5g, 3.2 mmol), 5% Pd-C (0.5g) and 1, 4-dioxane (25 ml). Yield 2.1g (95%), m. p. 181-182˚C. ν_{max}: 3352, 3070, 2923, 2852, 2731, 2615, 1739, 1730, 1714, 1712, 1614, 1600, 1461, 1330, 1282, 1182, 1120, 1055 cm^{-1}; δ_H: 9.35 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.07 (d, ^3J 8.72 Hz, 2H, Ar-H), 8.02-7.99 (dd, ^3J 8.6 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.57-7.55 (m, 1H, Ar-H), 7.52 (d, ^3J 8.56 Hz, 2H, Ar-H), 7.36-7.32 (m, 1H, Ar-H), 7.31-7.22 (m, 3H, Ar-H), 7.01 (d, ^3J 8.72 Hz, 2H, Ar-H), 4.23 (t, ^3J 6.44 Hz, 2H, Ar-OCH_2-), 1.88-1.84 (m, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.53-1.28 (m, 22H, (-CH_2-)$_{11}$), 0.86 (t, ^3J 6.32 Hz, 3H, -CH_3); $C_{41}H_{45}FO_8$ requires C 71.91, H 6.62; found C 71.55, H 6.40 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=14)

This compound was prepared following a procedure similar to the one described for compound, **7.b** (Y=H, *n*=14). Quantities: compound **7.e** (X=F, Y=F, *n*=14), (2.5g, 3.2 mmol), 5% Pd-C (0.5g) and 1, 4-dioxane (25 ml). Yield 2g (90%), m. p. 181-182˚C. ν_{max}: 3352, 3070, 2923, 2852, 2731, 2615, 1739, 1730, 1714, 1712, 1614, 1600, 1461, 1330, 1282, 1182, 1120, 1055 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 22H, (-CH$_2$-)$_{11}$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH$_3$); $C_{41}H_{44}F_2O_8$ requires C 70.07, H 6.31; found C 70.05, H 6.52 %.

The physical data for cognate preparations are given below

Benzyl 4-(3-fluoro-4-*n*-octyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=8)

Yield 84%, m. p. 70-71˚C. ν_{max}: 2954, 2922, 2852, 1730, 1726, 1716, 1616, 1469, 1454, 1434, 1290 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH$_2$-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.48-1.26 (m, 10H, (-CH$_2$-)$_5$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH$_3$); $C_{29}H_{31}FO_5$ requires C 72.78, H 6.53; found C 72.33, H 6.90 %.

3-Fluoro-4-*n*-octyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=8)

Yield 92%, m. p. 152-153˚C. ν_{max}: 2954, 2922, 2852, 2673, 2555, 1732, 1689, 1604, 1465, 1434, 1294 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.29 (m, 10H, (-CH$_2$-)$_5$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH$_3$); $C_{22}H_{25}FO_5$ requires C 68.03, H 6.49; found C 67.78, H 6.72 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-octyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=8)

Yield 80%, m. p. 82-83.5˚C. ν_{max}: 2923, 2852, 1743, 1732, 1730, 1614, 1600, 1589, 1519, 1465, 1328, 1286 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, Ar-OCH$_2$-$\underline{\mathrm{CH}_2}$-), 1.51-1.27 (m, 10H, (-CH$_2$-)$_5$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH$_3$); $C_{35}H_{35}FO_6$ requires C 73.66, H 6.18; found C 73.35, H 5.98 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-octyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=8)

Yield 89%, m. p. 133-134˚C. ν_{max}: 3381, 3300, 2923, 2854, 1730, 1712, 1616, 1604, 1461, 1377, 1286 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{\mathrm{CH}_2}$-), 1.54-1.28 (m, 10H, (-CH$_2$-)$_5$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH$_3$); $C_{28}H_{29}FO_6$ requires C 69.99, H 6.08; found C 69.8, H 5.81 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-octyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=8)

Yield 76%, 100.5-101.5˚C. ν_{max}: 2923, 2852, 1741, 1724, 1620, 1461, 1454, 1288, 1130 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{\mathrm{CH}_2}$-), 1.53-1.27 (m, 10H, (-CH$_2$-)$_5$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{42}H_{38}F_2O_8$ requires C 71.17, H 5.40; found C 70.70, H 5.64 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-octyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=8)

This compound was prepared following a procedure described for the synthesis of compound **7.b**, (Y=F, *n*=8). Quantities: compound **7.e**, (X=F, Y=F, *n*=8), (2.5g), 5% Pd-C (0.5g) and 1, 4-dioxane

(15ml). Yield 2g (91%), m. p. 189-190.5˚C. ν_{max}: 3344, 2923, 2854, 2723, 2619, 1743, 1728, 1712, 1697, 1616, 1598, 1461, 1328, 1282 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.52-1.28 (m, 10H, (-CH_2-$)_5$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH_3); $C_{35}H_{32}F_2O_8$ requires C 67.95, H 5.20; found C 67.96, H 5.39 %.

Benzyl 4-(3-fluoro-4-*n*-nonyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=9)

Yield 83%, m. p. 84-85.5˚C. ν_{max}: 2922, 2850, 1730, 1728, 1716, 1616, 1523, 1469, 1434, 1380, 1290 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH_2-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.48-1.26 (m, 12H, (-CH_2-$)_6$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH_3); $C_{30}H_{33}FO_5$ requires C 73.15, H 6.75; found C 72.91, H 6.83 %.

3-Fluoro-4-*n*-nonyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=9)

Yield 90%, m. p. 150-150.5˚C. ν_{max}: 2922, 2852, 2684, 1730, 1728, 1697, 1687, 1465, 1436, 1299 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.29 (m, 12H, (-CH_2-$)_6$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH_3); $C_{23}H_{27}FO_5$ requires C 68.64, H 6.75; found C 68.17, H 6.72 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-nonyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=9)

Yield 79%, m. p. 82.5-83.5˚C. ν_{max}: 2923, 2854, 1743, 1732, 1612, 1600, 1589, 1519, 1286, 1247, 1203 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH_2-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.91-1.84 (quin, ^3J

6.44 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.27 (m, 12H, (-CH_2-$)_6$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH_3); $C_{36}H_{37}FO_6$ requires C 73.95, H 6.37; found C 73.12, H 7.05 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-nonyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=9)

Yield 91%, m. p. 132-133.5˚C. ν_{max}: 3382, 3325, 2922, 2852, 1728, 1618, 1463, 1377cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.28 (m, 12H, (-CH_2-$)_6$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH_3); $C_{29}H_{31}FO_6$ requires C 70.43, H 6.31; found C 70.25, H 6.01 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-nonyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=9)

Yield 78%, m. p. 97-98˚C. ν_{max}: 2923, 2852, 1741, 1733, 1732, 1456, 1271 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH_2-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.53-1.27 (m, 12H, (-CH_2-$)_6$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH_3); $C_{43}H_{40}F_2O_8$ requires C 71.45, H 5.57; found C 71.21, H 5.56 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-nonyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=9)

Yield 90%, m. p. 191-192˚C. ν_{max}: 3346, 2923, 2852, 2613, 1739, 1730, 1714, 1712, 1614, 1461, 1282, 1120, 1055 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.52-1.28 (m, 12H, (-CH_2-$)_6$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH_3); $C_{36}H_{34}F_2O_8$ requires C 68.35, H 5.42; found C 68.55, H 5.29 %.

Benzyl 4-(3-fluoro-4-*n*-decyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=10)

Yield 86%, m. p. 78.5-79.5˚C. ν_{max}: 2954, 2920, 2850, 1728, 1616, 1469, 1290 cm^{-1}; δ_H: 8.15 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^{3}J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^{3}J 11.52 Hz, ^{4}J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH_2-Ar), 4.12 (t, ^{3}J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^{3}J 6.84 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.48-1.26 (m, 14H, $(-CH_2-)_7$), 0.88 (t, ^{3}J 6.44 Hz, 3H, -CH_3); $C_{31}H_{35}FO_5$ requires C 73.50, H 6.95; found C 73.35, H 7.38 %.

3-Fluoro-4-*n*-decyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=10)

Yield 89%, m. p. 147-148˚C. ν_{max}: 2922, 2852, 1732, 1672, 1643, 1521, 1463, 1377, 1282 cm^{-1}; δ_H: 8.15 (d, ^{3}J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^{3}J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^{3}J 11.72 Hz, ^{4}J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^{3}J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^{3}J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.29 (m, 14H, $(-CH_2-)_7$), 0.87 (t, ^{3}J 6.92 Hz, 3H, -CH_3); $C_{24}H_{29}FO_5$ requires C 69.21, H 7.02; found C 69.01, H 6.85 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-decyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=10)

Yield 78%, m. p. 84-85˚C. ν_{max}: 2923, 2852, 1732, 1614, 1589, 1465, 1436, 1286, 1186 cm^{-1}; δ_H: 8.27 (d, ^{3}J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^{3}J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^{3}J 11.44 Hz, ^{4}J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH_2-Ar), 4.13 (t, ^{3}J 6.56 Hz, 2H, Ar-OCH_2-), 1.91-1.84 (quin, ^{3}J 6.44 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.27 (m, 14H, $(-CH_2-)_7$), 0.88 (t, ^{3}J 6.52 Hz, 3H, -CH_3); $C_{37}H_{39}FO_6$ requires C 74.23, H 6.57; found C 73.98, H 6.86 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-decyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=10)

Yield 90%, m. p. 129-131.5˚C. ν_{max}: 3381, 3325, 2920, 2852, 1728, 1618, 1600, 1463, 1377, 1305 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^{3}J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^{3}J 11.64 Hz, ^{4}J 1.92 Hz, 1H, Ar-H), 7.51(d, ^{3}J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^{3}J 6.6 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.28 (m, 14H, $(-CH_2-)_7$), 0.86 (t, ^{3}J 6.88 Hz, 3H, -CH_3); $C_{30}H_{33}FO_6$ requires C 70.85, H 6.53; found C 70.46, H 6.43 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-decyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=10)

Yield 77%, m. p. 89-90˚C. ν_{max}: 2923, 2852, 1741, 1724, 1620, 1461, 1454, 1288, 1130 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 14H, (-CH$_2$-)$_7$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{44}H_{42}F_2O_8$ requires C 71.73, H 5.75; found C 71.98, H 5.90 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-decyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=10)

Yield 89%, m. p. 177-179˚C. ν_{max}: 3350, 2923, 2852, 1739, 1732, 1714, 1697, 1614, 1598,1461, 1377, 1265 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D$_2$O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 14H, (-CH$_2$-)$_7$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH$_3$); $C_{37}H_{36}F_2O_8$ requires C 68.72, H 5.60; found C 68.98, H 5.85 %.

Benzyl 4-(3-fluoro-4-*n*-undecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=11)

Yield 83%, m. p. 90-91˚C. ν_{max}: 2920, 2852, 1726, 1618, 1467, 1377, 1301, 1193 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH$_2$-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.48-1.26 (m, 16H, (-CH$_2$-)$_8$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH$_3$); $C_{32}H_{37}FO_5$ requires C 73.82, H 7.16; found C 73.4, H 6.85 %.

3-Fluoro-4-*n*-undecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=11)

Yield 92%, m. p. 147.5-148.5˚C. ν_{max}: 3058, 2922, 2852, 2682, 2557, 1728, 1697, 1687, 1463, 1436, 1377, 1301 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.29 (m, 16H, (-CH$_2$-)$_8$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH$_3$); $C_{25}H_{31}FO_5$ requires C 69.75, H 7.25; found C 69.53, H 7.36 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-undecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=11)

Yield 85%, m. p. 83-84˚C. ν_{max}: 2922, 2852, 1732, 1614, 1456, 1286, 1124 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.27 (m, 16H, (-CH$_2$-)$_8$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH$_3$); $C_{38}H_{41}FO_6$ requires C 74.49, H 6.73; found C 74.21, H 7.01 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-undecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=11)

Yield 90%, m. p. 127-128˚C. ν_{max}: 3377, 3336, 2920, 2852, 2723, 2611,1728, 1616, 1600, 1463, 1377, 1303, 1288 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D$_2$O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.28 (m, 16H, (-CH$_2$-)$_8$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH$_3$); $C_{31}H_{35}FO_6$ requires C 71.25, H 6.75; found C 71.0, H 6.45 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-undecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=11)

Yield 79%, m. p. 98-99˚C. ν_{max}: 2923, 2852, 1741, 1724, 1620, 1456, 1377, 1269, 1132 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J

12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 16H, (-CH$_2$-)$_8$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{45}H_{44}F_2O_8$ requires C 71.98, H 5.90; found C 71.63, H 5.94 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-undecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=11)

Yield 89%, m. p. 174-175˚C. ν_{max}: 3344, 3064,2922, 2852, 2615, 2453, 1741, 1730, 1719, 1616, 1600, 1515, 1463, 1377, 1276, 1182, 1120, 1053 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D$_2$O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 16H, (-CH$_2$-)$_8$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH$_3$); $C_{38}H_{38}F_2O_8$ requires C 69.08, H 5.79; found C 68.8, H 5.99 %.

Benzyl 4-(3-fluoro-4-*n*-dodecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=12)

Yield 87%, m. p. 85-86˚C. ν_{max}: 2922, 2852, 1726, 1465, 1377, 1303, 1163 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH$_2$-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.48-1.26 (m, 18H, (-CH$_2$-)$_9$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH$_3$); $C_{33}H_{39}FO_5$ requires C 74.13, H 7.35; found C 73.75, H 7.63 %.

3-Fluoro-4-*n*-dodecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=12)

Yield 93%, m. p. 154-155˚C. ν_{max}: 2922, 2852, 2671, 2559, 1730, 1685, 1463, 1436, 1377, 1292,1217 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.29 (m, 18H, (-CH$_2$-)$_9$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH$_3$); $C_{26}H_{33}FO_5$ requires C 70.25, H 7.47; found C 69.99, H 7.39 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-dodecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=12)

Yield 82%, m. p. 84-85.5˚C. ν_{max}: 2923, 2852, 1732, 1614, 1600, 1589, 1519, 1465, 1454, 1436, 1286, 1186, 1124, 1080, 1010 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.27 (m, 18H, (-CH$_2$-)$_9$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH$_3$); $C_{39}H_{43}FO_6$ requires C 74.74, H 6.91; found C 74.56, H 7.29 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-dodecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=12)

Yield 90%, m. p. 132.5-134˚C. ν_{max}: 3398, 2925, 2854, 1735, 1708, 1608, 1515, 1436, 1328, 1284, 1236, 1128, 1062 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D$_2$O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.28 (m, 18H, (-CH$_2$-)$_9$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH$_3$); $C_{32}H_{37}FO_6$ requires C 71.63, H 6.94; found C 71.29, H 6.55 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-dodecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=12)

Yield 79%, m. p. 102-103.5˚C. ν_{max}: 2923, 2852, 1737, 1722, 1622, 1456, 1436, 1271, 1126, 1064 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 18H, (-CH$_2$-)$_9$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{46}H_{46}F_2O_8$ requires C 72.23, H 6.06; found C 72.59, H 6.41 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-dodecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=12)

Yield 89%, m. p. 177.5-179.5˚C. ν_{max}: 3373, 3068, 2922, 2852, 2626, 1745, 1728, 1726, 1714, 1701, 1614, 1461, 1282, 1265 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D$_2$O exchangeable), 8.29 (d, ^3J 8.64

Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^{3}J 11.68 Hz, ^{4}J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^{3}J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^{3}J 8.72 Hz, ^{4}J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^{3}J 12.8 Hz, ^{4}J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^{3}J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 18H, (-CH$_2$-)$_9$), 0.85 (t, ^{3}J 6.84 Hz, 3H, -CH$_3$); $C_{39}H_{40}F_2O_8$ requires C 69.42, H 5.98; found C 69.41, H 6.08 %.

Benzyl 4-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=14)

Yield 86%, m. p. 88-89˚C. ν_{max}: 2922, 2850, 1726, 1618, 1467, 1377, 1303, 1292, 1193 cm^{-1}; δ_H: 8.15 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^{3}J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^{3}J 11.52 Hz, ^{4}J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH$_2$-Ar), 4.12 (t, ^{3}J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^{3}J 6.84 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.48-1.26 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, ^{3}J 6.44 Hz, 3H, -CH$_3$); $C_{35}H_{43}FO_5$ requires C 74.70, H 7.63; found C 74.49, H 7.92 %.

3-Fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=14)

Yield 90%, m. p. 142-143˚C. ν_{max}: 2952, 2920, 2850, 2717, 2682, 2557, 1728, 1697, 1687, 1616, 1604, 1523, 1469, 1436, 1377, 1303 cm^{-1}; δ_H: 8.15 (d, ^{3}J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^{3}J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^{3}J 11.72 Hz, ^{4}J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^{3}J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^{3}J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.29 (m, 22H, (-CH$_2$-)$_{11}$), 0.87 (t, ^{3}J 6.92 Hz, 3H, -CH$_3$); $C_{28}H_{37}FO_5$ requires C 71.16, H 7.89; found C 70.9, H 8.05 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=14)

Yield 82%, m. p. 86-87˚C. ν_{max}: 2923, 2852, 1732, 1730, 1610, 1600, 1465, 1288, 1186 cm^{-1}; δ_H: 8.27 (d, ^{3}J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^{3}J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^{3}J 11.44 Hz, ^{4}J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^{3}J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.91-1.84 (quin, ^{3}J 6.44 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.27 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, ^{3}J 6.52 Hz, 3H, -CH$_3$); $C_{41}H_{47}FO_6$ requires C 75.2, H 7.23; found C 75.06, H 7.52 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=14)

Yield 95%, m. p. 132-133˚C. ν_{max}: 3377, 3336, 2922, 2852, 1728, 1618, 1600, 1463, 1377, 1305, 1288, 1139 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^{3}J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^{3}J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^{3}J 11.64 Hz, ^{4}J 1.92 Hz, 1H, Ar-H), 7.51(d, ^{3}J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^{3}J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.28 (m, 22H, (-CH$_2$-)$_{11}$), 0.86 (t, ^{3}J 6.88 Hz, 3H, -CH$_3$); $C_{34}H_{41}FO_6$ requires C 72.32, H 7.32; found C 72.17, H 7.62 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=14)

Yield 80%, m. p. 101-102˚C. ν_{max}: 2922, 2852, 1739, 1726, 1724, 1620, 1600, 1463, 1438, 1377,1288, 1267, 1130 cm^{-1}; δ_H: 8.27 (d, ^{3}J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^{3}J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^{3}J 11.36 Hz, ^{4}J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^{3}J 8.8 Hz, ^{4}J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^{3}J 12.52 Hz, ^{4}J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^{3}J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^{3}J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 22H, (-CH$_2$-)$_{11}$), 0.88 (t, ^{3}J 6.56 Hz, 3H, -CH$_3$); $C_{48}H_{50}F_2O_8$ requires C 72.7, H 6.35; found C 72.52, H 6.32 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-tetradecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=14)

Yield 93%, m. p. 181-182˚C. ν_{max}: 3352, 3070, 2923, 2852, 2731, 2615, 1739, 1730, 1714, 1712, 1614, 1600, 1461, 1330, 1282, 1182, 1120, 1055 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^{3}J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^{3}J 11.68 Hz, ^{4}J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^{3}J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^{3}J 8.72 Hz, ^{4}J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^{3}J 12.8 Hz, ^{4}J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^{3}J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^{3}J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 22H, (-CH$_2$-)$_{11}$), 0.85 (t, ^{3}J 6.84 Hz, 3H, -CH$_3$); $C_{41}H_{44}F_2O_8$ requires C 70.07, H 6.31; found C 70.05, H 6.52 %.

Benzyl 4-(3-fluoro-4-*n*-hexadecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=16)

Yield 84%, m. p. 91-92˚C. ν_{max}: 2954, 2922, 2852, 1730, 1726, 1716, 1616, 1469, 1454, 1434, 1290 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH_2-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.48-1.26 (m, 26H, $(-CH_2-)_{13}$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH_3); $C_{37}H_{47}FO_5$ requires C 75.22, H 8.02; found C 74.95, H 8.48 %.

3-Fluoro-4-*n*-hexadecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=16)

Yield 92%, m. p. 139-140˚C. ν_{max}: 2922, 2850, 2684, 1728, 1687, 1699, 1467, 1377, 1303, 1292 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.54-1.29 (m, 26H, $(-CH_2-)_{13}$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH_3); $C_{30}H_{41}FO_5$ requires C 71.97, H 8.2; found C 71.99, H 7.73 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-hexadecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=16)

Yield 80%, m. p. 87-88˚C. ν_{max}: 2923, 2852, 1743, 1732, 1730, 1614, 1600, 1589, 1519, 1465, 1328, 1286 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH_2-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.27 (m, 26H, $(-CH_2-)_{13}$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH_3); $C_{43}H_{51}FO_6$ requires C 75.63, H 7.52; found C 75.44, H 7.98 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-hexadecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=16)

Yield 93%, m. p. 132-133˚C. ν_{max}: 3381, 3300, 2923, 2854, 1730, 1712, 1616, 1604, 1461, 1377, 1286 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t,

^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.28 (m, 26H, (-CH$_2$-)$_{13}$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH$_3$); $C_{36}H_{45}FO_6$ requires C 72.95, H 7.64; found C 72.58, H 7.84 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-hexadecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=16)

Yield 81%, m. p. 105.5-107˚C. ν_{max}: 2922, 2852, 1737,1722, 1620, 1577, 1463, 1436, 1288, 1261, 1130 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 (m, 26H, (-CH$_2$-)$_{13}$), 0.88 (t, ^3J 6.56 Hz, 3H, -CH$_3$); $C_{50}H_{54}F_2O_8$ requires C 73.15, H 6.62; found C 72.66, H 7.12 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-hexadecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=16)

Yield 92%, m. p. 180.5-181.5˚C. ν_{max}: 3344, 2923, 2852, 1741, 1732, 1712, 1697, 1616, 1600, 1461, 1377, 1276, 1120 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.52-1.28 (m, 26H, (-CH$_2$-)$_{13}$), 0.85 (t, ^3J 6.84 Hz, 3H, -CH$_3$); $C_{43}H_{48}F_2O_8$ requires C 70.67, H 6.62; found C 70.41, H 6.42 %.

Benzyl 4-(3-fluoro-4-*n*-octadecyloxybenzoyloxy)benzoate, 7.a (Y=F, *n*=18)

Yield 83%, m. p. 93-94˚C. ν_{max}: 2954, 2922, 2852, 1730, 1726, 1716, 1616, 1469, 1454, 1434, 1290 cm^{-1}; δ_H: 8.15 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.96-7.94 (dd, ^3J 8.24 Hz, 1H, Ar-H), 7.90-7.87 (dd, ^3J 11.52 Hz, ^4J 1.96 Hz, 1H, Ar-H), 7.46-7.35 (m, 5H, Ar-H), 7.28 (d, ^3J 8.68 Hz, 2H, Ar-H), 7.05-7.01 (m, 1H, Ar-H), 5.37 (s, 2H, -COO-CH$_2$-Ar), 4.12 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.90-

1.83 (quin, ^3J 6.84 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.48-1.26 (m, 10H, (-CH$_2$-)$_5$), 0.88 (t, ^3J 6.44 Hz, 3H, -CH$_3$); $C_{39}H_{51}FO_5$ requires C 75.70, H 8.31; found C 75.31, H 8.15 %.

3-Fluoro-4-*n*-octadecyloxybenzoyloxy-4-benzoic acid, 7.b (Y=F, *n*=18)

Yield 90%, m. p. 130-131.5˚C. ν_{max}: 2920, 2850, 2682, 2557, 1728, 1697, 1687, 1685, 1469, 1438, 1377, 1305, 1290 cm^{-1}; δ_H: 8.15 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.01-7.99 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.91-7.88 (dd, ^3J 11.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 7.44 (d, ^3J 8.76 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.29 (m, 10H, (-CH$_2$-)$_5$), 0.87 (t, ^3J 6.92 Hz, 3H, -CH$_3$); $C_{32}H_{45}FO_5$ requires C 72.71, H 8.57; found C 72.3, H 8.29 %.

1-Benzyloxyphenylene-3-(3-fluoro-4-*n*-octadecyloxybenzoyloxy-4-benzoate), 7.c (Y=F, *n*=18)

Yield 79%, m. p. 90-91˚C. ν_{max}: 2922, 2852, 1730, 1612, 1587, 1463, 1377, 1247 cm^{-1}; δ_H: 8.27 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.98-7.96 (dd, ^3J 8.8 Hz, 1H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.45-7.32 (m, 8H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.92-6.83 (m, 3H, Ar-H), 5.08 (s, 2H, -OCH$_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH$_2$-), 1.91-1.84 (quin, ^3J 6.44 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.27 (m, 10H, (-CH$_2$-)$_5$), 0.88 (t, ^3J 6.52 Hz, 3H, -CH$_3$); $C_{45}H_{55}FO_6$ requires C 76.03, H 7.79; found C 75.94, H 7.89 %.

1-(3-Hydroxy)phenylene-3-fluoro-4-*n*-octadecyloxybenzoyloxy-4-benzoate, 7.d (Y=F, *n*=18)

Yield 92%, m. p. 133-134˚C. ν_{max}: 3334, 2954, 2918, 2850, 2673, 1728, 1616, 1606, 1458, 1288 cm^{-1}; δ_H: 8.68 (s, 1H, Ar-OH, D_2O exchangeable), 8.26 (d, ^3J 8.68 Hz, 2H, Ar-H), 8.02-8.00 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.92-7.88 (dd, ^3J 11.64 Hz, ^4J 1.92 Hz, 1H, Ar-H), 7.51(d, ^3J 8.64 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.29-7.25 (m, 1H, Ar-H), 6.79-6.76 (m, 3H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH$_2$-), 1.90-1.83 (quin, ^3J 6.6 Hz, 2H, Ar-OCH$_2$-$\underline{CH_2}$-), 1.54-1.28 (m, 10H, (-CH$_2$-)$_5$), 0.86 (t, ^3J 6.88 Hz, 3H, -CH$_3$); $C_{38}H_{49}FO_6$ requires C 73.52, H 7.96; found C 73.34, H 7.87 %.

1-(4-Benzyloxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-octadecyloxybenzoyloxy-4-benzoate), 7.e (X=F, Y=F, *n*=18)

Yield 78%, m. p. 107-108˚C. ν_{max}: 2920, 2850, 1739, 1728, 1726, 1622, 1465, 1286, 1186 cm^{-1}; δ_H: 8.27 (d, ^3J 8.76 Hz, 2H, Ar-H), 8.08-8.04 (m, 1H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 1H, Ar-H), 7.93-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 1H, Ar-H), 7.49-7.36 (m, 8H, Ar-H), 7.18-7.15 (m, 3H, Ar-H), 7.07-7.03 (m, 1H, Ar-H), 6.88-6.85 (dd, ^3J 8.8 Hz, ^4J 2.3 Hz, 1H, Ar-H), 6.79-6.76 (dd, ^3J 12.52 Hz, ^4J 2.32 Hz, 1H, Ar-H), 5.14 (s, 2H, $-OCH_2$-Ar), 4.13 (t, ^3J 6.56 Hz, 2H, Ar-OCH_2-), 1.90-1.84 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.53-1.27 (m, 10H, $(-CH_2-)_5$), 0.88 (t, ^3J 6.56 Hz, 3H, $-CH_3$); $C_{52}H_{58}F_2O_8$ requires C 73.56, H 6.88; found C 73.22, H 6.9 %.

1-(4-Hydroxy-2-fluorobenzoyloxy)phenylene-3-(3-fluoro-4-*n*-octadecyloxybenzoyloxy-4-benzoate), 7.f (X=F, Y=F, *n*=18)

Yield 90%, m. p. 181-182˚C. ν_{max}: 3346, 3070, 2922, 2852, 1732, 1714, 1697, 1616, 1600, 1506, 1463, 1377, 1276, 1120 cm^{-1}; δ_H: 9.80 (s, 1H, Ar-OH, D_2O exchangeable), 8.29 (d, ^3J 8.64 Hz, 2H, Ar-H), 8.05-8.00 (m, 2H, Ar-H), 7.92-7.88 (dd, ^3J 11.68 Hz, ^4J 2.0 Hz, 1H, Ar-H), 7.58-7.54 (m, 1H, Ar-H), 7.53 (d, ^3J 8.8 Hz, 2H, Ar-H), 7.37-7.33 (m, 1H, Ar-H), 7.30-7.23 (m, 3H, Ar-H), 6.86-6.83 (dd, ^3J 8.72 Hz, ^4J 2.12 Hz, 1H, Ar-H), 6.76-6.72 (dd, ^3J 12.8 Hz, ^4J 2.2 Hz, 1H, Ar-H), 4.24 (t, ^3J 6.48 Hz, 2H, Ar-OCH_2-), 1.90-1.83 (quin, ^3J 6.64 Hz, 2H, Ar-OCH_2-$\underline{CH_2}$-), 1.52-1.28 (m, 10H, $(-CH_2-)_5$), 0.85 (t, ^3J 6.84 Hz, 3H, $-CH_3$); $C_{45}H_{52}F_2O_8$ requires C 71.22, H 6.99; found C 70.91, H 6.96 %.

Methyl 4-{3-[4-(methoxycarbonyl)phenoxy]-*n*-heptyloxy}benzoate, 7.g (*n*=7)

To a mixture of methyl 4-hydroxybenzoate, **7.v** (7.7g, 0.05 mol) and 1,7-dibromoheptane (6.5g, 0.025 mol) in butan-2-one (150ml), anhydrous potassium carbonate (21g, 0.15 mol) was added and the resulting solution was refluxed for 24 hours. Excess solvent was distilled off, the reaction mixture was cooled and poured into ice-cold water. The resulting solution was extracted using chloroform (2×100 ml). The organic solution was washed with aqueous 5% NaOH solution (2 × 100 ml) followed by excess of water and dried over anhydrous sodium sulphate. The solvent was removed to obtain a material, which was crystallized using methanol. Yield 9g (90%), m. p. 87-88˚C. ν_{max}: 2923, 2852, 1722, 1608, 1510, 1461, 1510, 1433, 1317, 1249, 1110 cm^{-1}; δ_H: 7.97 (d, ^3J 8.6 Hz, 4H, Ar-H), 7.89 (d, ^3J 8.68 Hz, 4H, Ar-H), 4.00 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 3.88

(s, 6H, 2×Ar-COOCH_3), 1.83-1.76 (quin, 4H, 2× Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.37 (m, 6H, (-CH_2-)$_3$); $C_{23}H_{28}O_6$ requires C 68.98, H 7.05; found C 68.55, H 7.19 %.

4-[3-(4-Carboxyphenoxy)-*n*-heptyloxy]benzoic acid, 7.h (*n*=7)

A mixture of compound **7.g.1**, (8.5g, 0.02 mol), 10% ethanolic KOH was refluxed for 5 hours. Excess of ethanol was distilled off, the reaction mixture was cooled and poured into ice-cold water. The resulting solution was acidified with conc. HCl, heated on a water-bath for an hour and cooled. The white precipitate obtained was filtered off, washed several times with ice-cold water until the washings were neutral to litmus and dried. The material so obtained was crystallized using aqueous dimethyl acetamide. Yield 6g (82%), m. p. 267-269˚C (reported 268-270˚C) [23]. ν_{max}: 2923, 2852, 2669, 2557, 1679, 1674, 1670, 1463, 1296, 1255, 1168 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 1.82-1.78 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.39 (m, 6H, (-CH_2-)$_3$); $C_{21}H_{24}O_6$ requires C 67.73, H 6.49; found C 67.24, H 6.17 %.

Methyl 4-{3-[4-(methoxycarbonyl)phenoxy]-*n*-octyloxy}benzoate, 7.g (*n*=8)

Yield 85%, m. p. 131-132˚C. ν_{max}: 2923, 2854, 2752, 1722, 1608, 1463, 1377, 1280, 1257, 1170 cm^{-1}; δ_H: 7.97 (d, ^3J 8.6 Hz, 4H, Ar-H), 7.89 (d, ^3J 8.68 Hz, 4H, Ar-H), 4.00 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 3.88 (s, 6H, 2× Ar-COOCH_3), 1.83-1.76 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.37 (m, 8H, (-CH_2-)$_4$); $C_{24}H_{30}O_6$ requires C 69.55, H 7.30; found C 69.75, H 7.10 %.

4-[3-(4-Carboxyphenoxy)-*n*-octyloxy]benzoic acid, 7.h (*n*=8)

Yield 88%, m. p. 292-294˚C (reported 288-290˚C) [23]. ν_{max}: 2922, 2857, 2667, 2555, 1683, 1670, 1604, 1456, 1377, 1257 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 1.82-1.78 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.39 (m, 8H, (-CH_2-)$_4$); $C_{22}H_{26}O_6$ requires C 68.38, H 6.78; found C 68.73, H 6.99 %.

Methyl 4-{3-[4-(methoxycarbonyl)phenoxy]-*n*-nonyloxy}benzoate, 7.g (*n*=9)

Yield 80%, m. p. 85-86˚C. ν_{max}: 2922, 2852, 2628, 1722, 1608, 1463, 1434, 1377, 1282, 1257, 1172, 1110 cm^{-1}; δ_H: 7.97 (d, ^3J 8.6 Hz, 4H, Ar-H), 7.89 (d, ^3J 8.68 Hz, 4H, Ar-H), 4.00 (t, ^3J 6.48

Hz, 4H, 2×Ar-OCH_2-), 3.88 (s, 6H, 2×Ar-$COOCH_3$), 1.83-1.76 (quin, 4H, 2× Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.37 (m, 10H, $(-CH_2-)_5$); $C_{25}H_{32}O_6$ requires C 70.07, H 7.53; found C 69.87, H 7.25 %.

4-[3-(4-Carboxyphenoxy)-*n*-nonyloxy]benzoic acid, 7.h (*n*=9)

Yield 83%, m. p. 261-262˚C (reported 260-262˚C) [23]. ν_{max}: 2922, 2852, 2669, 2557, 1681, 1674, 1604, 1558, 1456, 1282, 1257, 1168 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 1.82-1.78 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.39 (m, 10H, $(-CH_2-)_5$); $C_{23}H_{28}O_6$ requires C 68.98, H 7.05; found C 68.75, H 7.30 %.

Methyl 4-{3-[4-(methoxycarbonyl)phenoxy]-*n*-decyloxy}benzoate, 7.g (*n*=10)

Yield 87%, m. p. 126-128˚C. ν_{max}: 2922, 2852, 2717, 2619, 2545, 1722, 1608, 1508, 1463, 1434, 1282, 1253, 1170, 1107 cm^{-1}; δ_H: 7.97 (d, ^3J 8.6 Hz, 4H, Ar-H), 7.89 (d, ^3J 8.68 Hz, 4H, Ar-H), 4.00 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 3.88 (s, 6H, 2×Ar-$COOCH_3$), 1.83-1.76 (quin, 4H, 2× Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.37 (m, 12H, $(-CH_2-)_6$); $C_{26}H_{34}O_6$ requires C 70.56, H 7.73; found C 70.29, H 7.58 %.

4-[3-(4-Carboxyphenoxy)-*n*-decyloxy]benzoic acid, 7.h (*n*=10)

Yield 85%, m. p. 275-276˚C (reported 280˚C) [23]. ν_{max}: 2922, 2852, 2665, 2536, 1681, 1668, 1602, 1573, 1558, 1508, 1461, 1377, 1294, 1259 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 1.82-1.78 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.39 (m, 12H, $(-CH_2-)_6$); $C_{24}H_{30}O_6$ requires C 69.55, H 7.29; found C 69.20, H 7.15 %.

Methyl 4-{3-[4-(methoxycarbonyl)phenoxy]-*n*-undecyloxy}benzoate, 7.g (*n*=11)

Yield 89%, m. p. 96-97˚C. ν_{max}: 2922, 2852, 1716, 1608, 1456, 1280, 1269, 1170 cm^{-1}; δ_H: 7.97 (d, ^3J 8.6 Hz, 4H, Ar-H), 7.89 (d, ^3J 8.68 Hz, 4H, Ar-H), 4.00 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 3.88 (s, 6H, 2× Ar-$COOCH_3$), 1.83-1.76 (quin, 4H, 2×Ar-OCH_2-$\underline{CH_2}$-), 1.47-1.37 (m, 14H, $(-CH_2-)_7$); $C_{27}H_{36}O_6$ requires C 71.03, H 7.95; found C 70.84, H 7.76 %.

4-[3-(4-Carboxyphenoxy)-*n*-undecyloxy]benzoic acid, 7.h (*n*=11)

Yield 90%, m. p. 250-252˚C. ν_{max}: 2922, 2857, 2661, 2555, 1683, 1652, 1604, 1508, 1255 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH$_2$-), 1.82-1.78 (quin, 4H, 2×Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.39 (m, 14H, (-CH$_2$-)$_7$); $C_{25}H_{32}O_6$ requires C 70.08, H 7.52; found C 69.75, H 7.32 %.

Benzyl 4-{3-[4-(benzyloxycarbonyl)phenoxy]-*n*-dodecyloxy}benzoate, 7.g (*n*=12)

This compound was prepared following a procedure similar to that described for compound **7.g.1**, using benzyl 4-hydroxybenzoate. Quantities: benzyl 4-hydroxybenzoate (8g, 35 mmol), 1,12-dibromododecane (5.7g, 17.5 mmol), K_2CO_3 (14.3g, 10.5 mmol), butan-2-one (150 ml). Yield 9.5g (87%), m. p.127-128.5˚C. ν_{max}: 2922, 2852, 1726, 1606, 1508, 1463, 1377, 1267, 1163 cm^{-1}; δ_H: 8.15 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.49-7.36 (m, 10H, Ar-H), 7.06 (d, ^3J 8.8 Hz, 4H, Ar-H), 5.16 (s, 4H, 2×-OCH$_2$-Ar), 4.05 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 1.84-1.79 (m, 4H, 2×Ar-OCH$_2$-$\underline{CH_2}$-), 1.49-1.26 (m, 16H, (-CH$_2$-)$_8$); $C_{40}H_{46}O_6$ requires C 77.14, H 7.44; found C 76.84, H 7.20 %.

4-[3-(4-Carboxyphenoxy)-*n*-dodecyloxy]benzoic acid, 7.h (*n*=12)

This compound was prepared by hydrogenolysis of compound **7.g**, (*n*=12) with 5% palladium on charcoal (5% Pd-C). Quantities: compound **7.g**, (*n*=12), (9g, 14.6 mmol), 5% Pd-C (1.8g) and 1, 4-dioxane (50 ml). Yield 5.8g (90%), m. p. 258-260˚C (reported 262-265˚C) [25]. ν_{max}: 2922, 2852, 2669, 2555, 1919, 1693, 1687, 1681, 1674, 1668, 1575, 1514, 1465, 1249, 1164 cm^{-1}; δ_H: 7.96 (d, ^3J 8.8 Hz, 4H, Ar-H), 7.00 (d, ^3J 8.8 Hz, 4H, Ar-H), 4.08 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH$_2$-), 1.82-1.78 (quin, 4H, 2× Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.39 (m, 16H, (-CH$_2$-)$_8$); $C_{26}H_{34}O_6$ requires C 70.56, H 7.75; found C 70.19, H 8.12 %.

Dimer 7.D.1

A mixture of of phenol **7.f** (X=H, Y=H; 0.33g, 5×10^{-4} mol), dicarboxylic acid **7.h** (*n*=9; 0.1g, 2.5×10^{-4} mol), DCC (0.1g, 5.5×10^{-4} mol) and a catalytic amount of DMAP in dry dichloromethane was stirred at room temperature for 24 hours. The precipitated *N*, *N'*-dicyclohexylurea was filtered off. The residue was washed thoroughly with excess of dichloromethane. The filtrate was concentrated to obtain a residue, which was chromatographed on silica gel using chloroform as an eluant. Evaporation of the solvent from the eluate provided a white product which was crystallized several times using butan-2-one. Yield: 0.35g (83%), m. p. 171.5˚C. ν_{max}: 2920, 2850, 1735, 1733, 1604, 1510, 1473, 1255 cm^{-1}; δ_H: 8.29-8.27 (dd, ^3J 8.72 Hz, ^4J 1.8 Hz, 8H, Ar-H), 8.17-8.14 (d, ^3J 8.8 Hz, ^4J 1.6 Hz, 8H, Ar-H), 7.50 (t, ^3J 8.48 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 8H, Ar-H), 7.20-7.17 (m, 6H, Ar-H), 7.00-6.97 (dd, ^3J 8.8 Hz, ^4J 1.68 Hz, 8H, Ar-H), 4.08-4.04 (m, 8H, 4×Ar-OCH_2-), 1.87-1.8 (quin, ^3J 6.24 Hz, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.26 [m, 54H, 2×(-CH_2-)$_{11}$+ (-CH_2-)$_5$], 0.87 (t, ^3J 6.24 Hz, 6H, 2×-CH_3); $C_{105}H_{116}O_{20}$ requires C 74.28, H 6.88; found C 74.06, H 6.67 %.

Dimer 7.D.2

Yield 85%, m. p. 156.5˚C. ν_{max}: 2918, 2850, 1732, 1735, 1730, 1604, 1510, 1473 cm^{-1}; δ_H: 8.27 (d, ^3J 8.72 Hz, 8H, Ar-H), 8.15 (d, ^3J 8.52 Hz, 8H, Ar-H), 7.50 (t, ^3J 8.36 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 8H, Ar-H), 7.20-7.17 (m, 6H, Ar-H), 6.98 (d, ^3J 8.6 Hz, 8H, Ar-H), 4.07-4.04 (m, 8H, 4×Ar-OCH_2-), 1.84-1.77 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.26 [m, 54H, 2×(-CH_2-)$_{11}$+(-CH_2-)$_5$], 0.88 (t, ^3J 6.6 Hz, 6H, 2×-CH_3); $C_{108}H_{122}O_{20}$ requires C 74.55, H 7.06; found C 74.42, H 6.87 %.

Dimer 7.D.3

Yield 80%, m. p. 148˚C. ν_{max}: 2922, 2850, 1735, 1726, 1604, 1510, 1475, 1238, 1166, 1136, 1049 cm^{-1}; δ_H: 8.27 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.18 (d, ^3J 8.72 Hz, 8H, Ar-H), 8.16-8.12 (m, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 6.98 (d, ^3J 8.84 Hz, 8H, Ar-H), 4.08-4.04 (m, 8H, 4×Ar-OCH_2-), 1.85-1.79 (quin, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.26 [m, 54H, 2×(-CH_2-)$_{11}$+(-CH_2-)$_5$], 0.87 (t, ^3J 6.48 Hz, 6H, 2×-CH_3); δ_C: 164.0, 151.5, 151.2, 133.5, 132.5, 131.8, 129.8, 126.7, 122.0, 121.0, 120.6, 119.5, 119.2, 118.0, 115.7, 114.5, 111.2, 68.5, 31.9, 29.6, 29.3, 29.1, 26.0, 22.7, 14.0; $C_{105}H_{114}F_2O_{20}$ requires C 72.73, H 6.62; found C 72.56, H 6.47 %.

Dimer 7.D.4

Yield 82%, m. p. 133˚C. ν_{max}: 2920, 2852, 1733, 1732, 1604, 1510, 1473, 1240 cm^{-1}; δ_H: 8.27 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.19-8.12 (m, 10H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72

Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 6.98 (d, ^{3}J 8.84 Hz, 8H, Ar-H), 4.08-4.04 (m, 8H, 4×Ar-OCH$_2$-), 1.84-1.81 (quin, 8H, 4×Ar-OCH$_2$-$\underline{\mathrm{CH_2}}$-), 1.50-1.26 [m, 60H, 2×(-CH$_2$-)$_{11}$+ (-CH$_2$-)$_8$], 0.87 (t, ^{3}J 6.44 Hz, 6H, 2×-CH$_3$); $C_{108}H_{120}F_2O_{20}$ requires C 73.03, H 6.8; found C 73.15, H 6.76 %.

Dimer 7.D.5

Yield 79%, m. p. 161.0˚C. ν_{max}: 2922, 2852, 1735, 1733, 1610, 1461 cm^{-1}; δ_H: 8.29-8.27 (dd, ^{3}J 8.8 Hz, ^{4}J 2.08 Hz, 8H, Ar-H), 8.16 (d, ^{3}J 8.76 Hz, 4H, Ar-H), 7.98-7.96 (m, 2H, Ar-H), 7.93-7.90 (m, 2H, Ar-H), 7.50 (t, ^{3}J 8.08 Hz, 2H, Ar-H), 7.37 (d, ^{3}J 8.36 Hz, 4H, Ar-H), 7.24-7.18 (m, 6H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^{3}J 8.84 Hz, 4H, Ar-H), 4.13 (t, 4H, ^{3}J 6.48 Hz, 2×Ar-OCH$_2$-), 4.06 (t, 4H, ^{3}J 6.32 Hz, 2×Ar-OCH$_2$-), 1.91-1.81 (m, 8H, 4×Ar-OCH$_2$-$\underline{\mathrm{CH_2}}$-), 1.51-1.26 [m, 54H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_5$], 0.88 (t, ^{3}J 6.44 Hz, 6H, 2×-CH$_3$); $C_{105}H_{114}F_2O_{20}$ requires C 72.73, H 6.62; found C 72.46, H 6.44 %.

Dimer 7.D.6

Yield 81%, m. p. 158.0˚C. ν_{max}: 2922, 2852, 1735, 1730, 1602, 1461, 1377 cm^{-1}; δ_H: 8.29-8.26 (dd, ^{3}J 8.8 Hz, ^{4}J 2.32 Hz, 8H, Ar-H), 8.16 (d, ^{3}J 8.84 Hz, 4H, Ar-H), 7.98-7.96 (m, 2H, Ar-H), 7.93-7.89 (dd, ^{3}J 11.5 Hz, ^{4}J 2.08 Hz, 2H, Ar-H), 7.50 (t, ^{3}J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^{3}J 8.52 Hz, 4H, Ar-H), 7.22-7.17 (m, 6H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^{3}J 8.84 Hz, 4H, Ar-H), 4.13 (t, 4H, ^{3}J 6.52 Hz, 2×Ar-OCH$_2$-), 4.06 (t, 4H, ^{3}J 6.4 Hz, 2×Ar-OCH$_2$-), 1.91-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{\mathrm{CH_2}}$-), 1.51-1.26 [m, 60H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_8$], 0.88 (t, ^{3}J 6.28 Hz, 6H, 2×-CH$_3$); $C_{108}H_{120}$ F_2O_{20} requires C 73.03, H 6.81; found C 72.96, H 6.82 %.

Dimer 7.D.7

Yield 89%, m. p. 136.0˚C. ν_{max}: 2916, 2850, 1745, 1735, 1726, 1714, 1604, 1512, 1436, 1284 cm^{-1}; δ_H: 8.28 (d, ^{3}J 8.72 Hz, 4H, Ar-H), 8.18 (m, 2H, Ar-H), 8.13 (d, ^{3}J 8.88 Hz, 4H, Ar-H), 7.97 (d, ^{3}J 8.52 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^{3}J 11.2 Hz, ^{4}J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^{3}J 8.0 Hz, 2H, Ar-H), 7.37 (d, ^{3}J 8.76 Hz, 4H, Ar-H), 7.24-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^{3}J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^{3}J 6.56 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^{3}J 6.52 Hz, 4H, 2×Ar-

OCH$_2$-), 1.90-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.53-1.27 [m, 54H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_5$], 0.88 (t, ^3J 6.44 Hz, 6H, 2×-CH$_3$); $C_{105}H_{112}F_4O_{20}$ requires C 71.25, H 6.37; found C 71.59, H 6.39 %.

Dimer 7.D.8

Yield 84%, m. p. 138.5˚C. ν_{max}: 2920, 2850, 1739, 1735, 1730, 1604, 1510, 1467, 1433, 1286, 1240, 1124 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88 Hz, 4H, Ar-H), 7.97 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 1.97 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.0 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.24-7.16 (m, 10H, Ar-H), 7.07-7.02 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.6 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.79 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.18 [m, 60H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_8$], 0.88 (t, ^3J 6.48 Hz, 6H, 2×-CH$_3$); $C_{108}H_{118}F_4O_{20}$ requires C 71.59, H 6.56; found C 71.63, H 6.75 %.

Dimer 7.D.9

Yield 82%, m. p. 142˚C. ν_{max}: 2923, 2854, 1739, 1728, 1604, 1614, 1512, 1473, 1282, 1240 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.84 Hz, 4H, Ar-H), 7.97 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 1.92 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.6 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.31 [m, 30H, 2×(-CH$_2$-)$_5$+(-CH$_2$-)$_5$], 0.88 (t, ^3J 6.88 Hz, 6H, 2×-CH$_3$); $C_{93}H_{88}F_4O_{20}$ requires C 69.74, H 5.50; found C 69.56, H 5.25 %.

Dimer 7.D.10

Yield 83%, m. p. 140.5˚C. ν_{max}: 2920, 2852, 1745, 1735, 1726, 1604, 1510, 1436, 1282, 1238, 1124, 1047 cm^{-1}; δ_H: 8.28 (d, ^3J 8.6 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.76, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.72 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 1.88 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.2 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.64 Hz, 4H, Ar-H), 7.21-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.30 [m, 34H, 2×(-CH$_2$-)$_6$+

$(-CH_2-)_5]$, 0.89 (t, ^3J 6.36 Hz, 6H, 2×$-CH_3$); $C_{95}H_{92}F_4O_{20}$ requires C 70.01, H 5.68; found C 70.16, H 5.81 %.

Dimer 7.D.11

Yield 87%, m. p. 140˚C. ν_{max}: 2923, 2852, 1739, 1733, 1730, 1724, 1616, 1606, 1512, 1436, 1249 cm^{-1}; δ_H: 8.28 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.92 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.08 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.64 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.40 Hz, 4H, 2×Ar-OCH_2-), 1.91-1.80 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.28 [m, 38H, 2×$(-CH_2-)_7$+$(-CH_2-)_5$], 0.89 (t, ^3J 6.36 Hz, 6H, 2×$-CH_3$); $C_{97}H_{96}F_4O_{20}$ requires C 70.28, H 5.83; found C 69.95, H 5.82 %.

Dimer 7.D.12

Yield 84%, m. p. 140˚C. ν_{max}: 2918, 2850, 1745, 1726, 1604, 1510, 1436, 1282, 1236 cm^{-1}; δ_H: 8.28 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 9.0 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.68 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.40 Hz, 4H, 2×Ar-OCH_2-), 1.91-1.82 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.27 [m, 42H, 2×$(-CH_2-)_8$+$(-CH_2-)_5$], 0.89 (t, ^3J 6.48 Hz, 6H, 2×$-CH_3$); $C_{99}H_{100}F_4O_{20}$ requires C 70.53, H 5.97; found C 70.11, H 5.89 %.

Dimer 7.D.13

Yield 80%, m. p. 139˚C. ν_{max}: 2922, 2852, 1745, 1724, 1604, 1463, 1377, 1249 cm^{-1}; δ_H: 8.28 (d, ^3J 8.76 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.87, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.92 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 2.0 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.76 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.24-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.87 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.51 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.42 Hz, 4H, 2×Ar-OCH_2-), 1.91-1.82 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.45-1.27 [m, 46H, 2×$(-CH_2-)_9$+$(-CH_2-)_5$], 0.89 (t, ^3J 6.88 Hz, 6H, 2×$-CH_3$); $C_{101}H_{104}F_4O_{20}$ requires C 70.78, H 6.11; found C 70.42, H 6.13 %.

Dimer 7.D.14

Yield 81%, m. p. 135.5°C. ν_{max}: 2922, 2850, 1745, 1724, 1604, 1510, 1463, 1377, 1284, 1251, 1236 cm^{-1}; δ_H: 8.28 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.14 (d, ^3J 8.84, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.6 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.5 Hz, ^4J 1.92 Hz, 2H, Ar-H), 7.5 (t, ^3J 8.32 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 4H, Ar-H), 7.21-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.36 Hz, 4H, 2×Ar-OCH_2-), 1.89-1.81 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.51-1.26 [m, 62H, 2×$(-CH_2-)_{13}$+ $(-CH_2-)_5$], 0.89 (t, ^3J 6.52 Hz, 6H, 2×-CH_3). $C_{109}H_{120}F_4O_{20}$ requires C 71.69, H 6.62; found C 71.3, H 6.47 %.

Dimer 7.D.15

Yield 89%, m. p. 134°C. ν_{max}: 2920, 2850, 1745, 1726, 1724, 1714, 1465, 1286, 1251 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.52 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.4 Hz, ^4J 2.0 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.56 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.44 Hz, 4H, 2×Ar-OCH_2-), 1.89-1.81 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.50-1.27 [m, 70H, 2×$(-CH_2-)_{15}$+$(-CH_2-)_5$], 0.89 (t, ^3J 6.48 Hz, 6H, 2×-CH_3); $C_{113}H_{128}F_4O_{20}$ requires C 72.11, H 6.84; found C 72.23, H 6.99 %.

Dimer 7.D.16

Yield 84%, m. p. 137°C. ν_{max}: 2922, 2854, 1739, 1735, 1730, 1604, 1510, 1473, 1284 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.72 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.36 Hz, ^4J 1.96 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH_2-), 4.06 (t, ^3J 6.44 Hz, 4H, 2×Ar-OCH_2-), 1.89-1.82 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.52-1.30 [m, 36H, 2×$(-CH_2-)_5$+$(-CH_2-)_8$], 0.89 (t, ^3J 6.92 Hz, 6H, 2×-CH_3); $C_{96}H_{94}F_4O_{20}$ requires C 70.18, H 5.76; found C 69.82, H 5.35 %.

Dimer 7.D.17

Yield 87%, m. p. 142°C. ν_{max}: 2922, 2854, 1739, 1735, 1733, 1604, 1510, 1475, 1431, 1203 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.64 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.48 Hz, ^4J 1.96 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.56 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.77 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.49-1.30 [m, 40H, 2×(-CH$_2$-)$_6$+(-CH$_2$-)$_8$], 0.89 (t, ^3J 6.92 Hz, 6H, 2×-CH$_3$); $C_{98}H_{98}F_4O_{20}$ requires C 70.40, H 5.90; found C 70.34, H 5.73 %.

Dimer 7.D.18

Yield 85%, m. p. 142.5°C. ν_{max}: 2923, 2852, 1735, 1732, 1724, 1616, 1606, 1514, 1436, 1272, 1240 cm^{-1}; δ_H: 8.28 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.84, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.52 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.96 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.44 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.82 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.49-1.28 [m, 44H, 2×(-CH$_2$-)$_7$+ (-CH$_2$-)$_8$], 0.89 (t, ^3J 6.92 Hz, 6H, 2×-CH$_3$); $C_{100}H_{102}F_4O_{20}$ requires C 70.66, H 6.04; found C 70.24, H 6.10 %.

Dimer 7.D.19

Yield 80%, m. p. 143°C. ν_{max}: 2922, 2852, 1735, 1732, 1604, 1512, 1473, 1434, 1240 cm^{-1}; δ_H: 8.28 (d, ^3J 8.76 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.52 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.44 Hz, ^4J 1.96 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.76 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.56 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.44 Hz, 4H, 2×Ar-OCH$_2$-), 1.91-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.49-1.28 [m, 48H, 2×(-CH$_2$-)$_8$+(-CH$_2$-)$_8$], 0.89 (t, ^3J 6.92 Hz, 6H, 2×-CH$_3$); $C_{102}H_{106}F_4O_{20}$ requires C 70.9, H 6.17; found C 70.42, H 6.19 %.

Dimer 7.D.20

Yield 87%, m. p. 142˚C. ν_{max}: 2923, 2852, 1743, 1735, 1732, 1604, 1461, 1377, 1240, 1122 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.52 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.52 Hz, ^4J 2 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 1.90-1.82 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.50-1.27 [m, 52H, 2×(-CH$_2$-)$_9$+(-CH$_2$-)$_8$], 0.89 (t, ^3J 6.4 Hz, 6H, 2×-CH$_3$); $C_{104}H_{110}F_4O_{20}$ requires C 71.13, H 6.31; found C 70.72, H 6.12 %.

Dimer 7.D.21

Yield 88%, m. p. 138.5˚C. ν_{max}: 2922, 2852, 1737, 1732, 1604, 1510, 1465, 1434, 1377, 1282, 1240, 1122, 1047 cm^{-1}; δ_H: 8.28 (d, ^3J 8.76 Hz, 4H, Ar-H), 8.18-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.48 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.2 Hz, ^4J 2.08 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.24 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.76 Hz, 4H, Ar-H), 7.21-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.88 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.44 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 1.89-1.82 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.23 [m, 68H, 2×(-CH$_2$-)$_{13}$+(-CH$_2$-)$_8$], 0.89 (t, ^3J 6.4 Hz, 6H, 2×-CH$_3$); $C_{112}H_{126}F_4O_{20}$ requires C 72.0, H 6.79; found C 71.73, H 6.54 %.

Dimer 7.D.22

Yield 84%, m. p. 137˚C. ν_{max}: 2922, 2852, 1743, 1737, 1732, 1606, 1510, 1465, 1377, 1282, 1240 cm^{-1}; δ_H: 8.28 (d, ^3J 8.76 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.13 (d, ^3J 8.88, Hz, 4H, Ar-H), 7.97 (d, ^3J 8.84 Hz, 2H, Ar-H), 7.92-7.89 (dd, ^3J 11.36 Hz, ^4J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.76 Hz, 4H, Ar-H), 7.24-7.16 (m, 10H, Ar-H), 7.07-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.06 (t, ^3J 6.48 Hz, 4H, 2×Ar-OCH$_2$-), 1.89-1.82 (m, 8H, 4×Ar-OCH$_2$-$\underline{CH_2}$-), 1.51-1.23 [m, 76H, 2×(-CH$_2$-)$_{15}$+(-CH$_2$-)$_8$], 0.89 (t, ^3J 6.4 Hz, 6H, 2×-CH$_3$); $C_{116}H_{134}F_4O_{20}$ requires C 72.41, H 7.01; found C 72.06, H 7.06 %.

Dimer 7.D.23

Yield 87%, m. p. 171˚C. ν_{max}: 2916, 2850, 1745, 1743, 1726, 1614, 1604, 1510, 1436, 1284 cm^{-1}; δ_H: 8.28 (d, ^3J 8.64 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.14 (d, ^3J 8.88 Hz, 4H, Ar-H), 7.98-7.96 (dd, ^3J 8.64 Hz, 2H, Ar-H), 7.93-7.89 (dd, ^3J 11.4 Hz, ^4J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.12 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 4H, Ar-H), 7.22-7.17 (m, 10H, Ar-H), 7.06-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.56 Hz, 4H, 2×Ar-OCH$_2$-), 4.07 (t, ^3J 6.4 Hz, 4H, 2×Ar-OCH$_2$-), 1.89-1.86 (m, 8H, 4×Ar-OCH$_2$-$\underline{\text{CH}_2}$-), 1.52-1.26 [m, 50H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_3$], 0.88 (t, ^3J 6.48 Hz, 6H, 2×-CH$_3$); $C_{103}H_{108}F_4O_{20}$ requires C 71.02, H 6.25; found C 70.77, H 6.51 %.

Dimer 7.D.24

Yield 82%, m. p. 170˚C. ν_{max}: 2918, 2850, 1739, 1735, 1720, 1604, 1512, 1433, 1286 cm^{-1}; δ_H: 8.28 (d, ^3J 8.64 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.14 (d, ^3J 8.84 Hz, 4H, Ar-H), 7.98-7.96 (dd, ^3J 8.56 Hz, 2H, Ar-H), 7.93-7.89 (dd, ^3J 11.4 Hz, ^4J 2.04 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.17 (m, 10H, Ar-H), 7.06-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.92 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.07 (t, ^3J 6.4 Hz, 4H, 2×Ar-OCH$_2$-), 1.89-1.86 (m, 8H, 4×Ar-OCH$_2$-$\underline{\text{CH}_2}$-), 1.52-1.27 [m, 52H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_4$], 0.88 (t, ^3J 6.52 Hz, 6H, 2×-CH$_3$); $C_{104}H_{110}F_4O_{20}$ requires C 71.14, H 6.31; found C 70.91, H 6.54 %.

Dimer 7.D.25

Yield 86%, m. p. 137˚C. ν_{max}: 2914, 2848, 1735, 1728, 1608, 1436, 1421, 1278 cm^{-1}; δ_H: 8.28 (d, ^3J 8.68 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.14 (d, ^3J 8.88 Hz, 4H, Ar-H), 7.98-7.96 (dd, ^3J 8.32 Hz, 2H, Ar-H), 7.93-7.89 (dd, ^3J 11.4 Hz, ^4J 1.88 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.68 Hz, 4H, Ar-H), 7.22-7.17 (m, 10H, Ar-H), 7.06-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.84 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.52 Hz, 4H, 2×Ar-OCH$_2$-), 4.07 (t, ^3J 6.4 Hz, 4H, 2× Ar-OCH$_2$-), 1.90-1.80 (m, 8H, 4×Ar-OCH$_2$-$\underline{\text{CH}_2}$-), 1.53-1.27 [m, 56H, 2×(-CH$_2$-)$_{11}$+(-CH$_2$-)$_6$], 0.88 (t, ^3J 6.48 Hz, 6H, 2×-CH$_3$); $C_{106}H_{114}F_4O_{20}$ requires C 71.36, H 6.44; found C 71.23, H 6.37 %.

Dimer 7.D.26

Yield 83%, m. p. 142˚C. ν_{max}: 2918, 2850, 1743, 1735, 1726, 1604, 1510, 1471, 1436, 1190, 1205 cm^{-1}; δ_H: 8.28 (d, ^3J 8.72 Hz, 4H, Ar-H), 8.20-8.16 (m, 2H, Ar-H), 8.14 (d, ^3J 8.84 Hz, 4H, Ar-H), 7.98-7.96 (dd, ^3J 8.68 Hz, 2H, Ar-H), 7.93-7.89 (dd, ^3J 11.4 Hz, ^4J 2.0 Hz, 2H, Ar-H), 7.49 (t, ^3J 8.16 Hz, 2H, Ar-H), 7.37 (d, ^3J 8.72 Hz, 4H, Ar-H), 7.22-7.17 (m, 10H, Ar-H), 7.06-7.03 (m, 2H, Ar-H), 6.99 (d, ^3J 8.84 Hz, 4H, Ar-H), 4.13 (t, ^3J 6.56 Hz, 4H, 2×Ar-OCH_2-), 4.07 (t, ^3J 6.4 Hz, 4H, 2×Ar-OCH_2-), 1.91-1.80 (m, 8H, 4×Ar-OCH_2-$\underline{CH_2}$-), 1.49-1.27 [m, 58H, 2×$(-CH_2-)_{11}$+ $(-CH_2-)_7$], 0.88 (t, ^3J 6.52 Hz, 6H, 2×-CH_3); $C_{107}H_{116}F_4O_{20}$ requires C 71.47, H 6.50; found C 71.12, H 6.43 %.

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