Mesomorphic Properties of Symmetric Hydrogen – Bonding Dimers Containing Chalcone Moiety

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Abstract
The work involves synthesis of a new homologous series of hydrogen bonding liquid crystal dimers containing chalcone moiety. All the prepared compounds were characterized by spectroscopic techniques such as FT – IR, ^{1}H-NMR, ^{13}C-NMR as well as elemental analysis. All the synthesized dimers exhibited nematic and smectic A phase. The mesophases behaviour and transitional temperatures were studied by polarized microscopy and differential scanning calorimetry, and are discussed the self- assemble of H-bonding donor and acceptor complexes.

Keywords: hydrogen bonding, complex, nematic, chalcone

صفات الاطوار الوسطية لدايمرات متماثلة ذات تاصر هيدروجيني و محتوية على مجموعة جالكون

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الخلاصة:
تضمن العمل تحضير سلسلة جديدة من الدايمرات البلورية السائلة ذات التاصر الهيدروجيني والمحتوية على المجموعة الجالكونية. شخصت جميع المركبات المحضرة بالتقنيات الطيفية مثل مطيافية الاشعة تحت الحمراء ومطيافية الرنين النووي المغناطيسي بالاضافة الى تحليل العناصر الدقيق. اظهرت الدايمرات المحضرة الاطوار الوسطية النيماتية والسمكتية. درست خصائص الاطوار الوسطية ودرجات الانتقال بجهازالمكروسكوب المستقطب وجهاز المسح الحراري التفاضلي وتمت مناقشة تكوين الاواصر الهيدروجينية بين المعقدات الواهبة و المستقبلة.

Introduction:

Liquid crystal dimers which are also known bimesogens are formed by covalently linking of two mesogenic units through a flexible spacer. They have been attracting a great deal of interest in recent year both in theoretical and experimental studies due to their quite unusual properties as compared to conventional low molar mass liquid crystals [1-3]. Hydrogen bond liquid crystal is an important member of liquid crystals family. Kato et al. have reported a novel family of liquid crystals in which different molecules are self-assembled through selective recognition between hydrogen bonding donor and acceptor moieties [4 - 6]. Interest in study of self - assembly bond liquid crystals has dramatically increased in recent year because of its role molecular recognition and assemble. Intermolecular hydrogen bonds don't only play an especially important role in biological system but also in the design and engineering of architectures of many materials and can affect the chain length, chain packing ,

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rigidity and molecular order [7 - 10]. Many workers are interested in synthesis of H – bonding liquid crystals and their mesomorphic properties [11, 12]. Compounds producing liquid crystals usually involve carboxylic acids and their derivatives as donor molecules, and pyridine, 4, 4-bipyridine derivatives as acceptor molecules. The compound having linear structures shows high thermal stability and a new mesophase can appear if one of the two interacting molecules happens itself to be mesogenic [13, 14]. In the light of the above informations we decided to synthesize a series of H-bond symmetric dimer RnD containing chalcone as a central linkage. Mesogens with a chalcone central linkage are rare, chalcone linkage present with other linkages like azomethine, ester or azo. We study the effect of introducing an alkoxy chain with increasing the length of alkoxy chain on liquid crystalline properties.

Experimental:

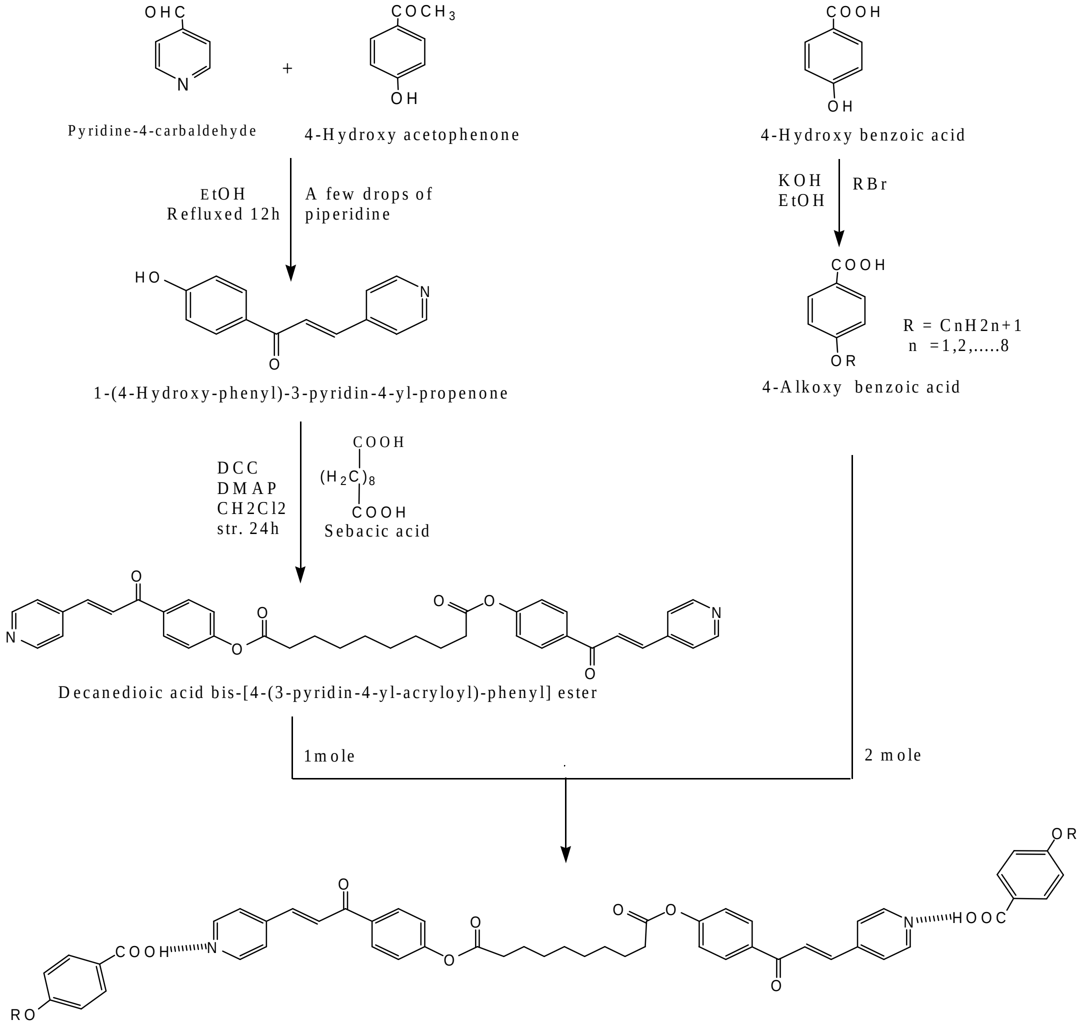
Compounds 4- alkoxy benzoic acids were prepared according to the literature method [15]. The RnD dimers were prepared according to the reaction scheme 1. The synthetic route used in the preparation of these symmetric dimers involved three steps: (i) the reaction of pyridine-4-carbaldehyde with 4-hydroxyacetophenone to produce the 1-(4- Hydroxyphenyl)-3-pyridin-4-yl propenone (PY) (ii) the subsequent reaction of these (2mole) with sebacic acid (1mole) to obtain the decanedioic acid bis-[4-(3-pyridin-4-yl-acryloyl)-phenyl]ester (D) (iii) the reaction of these products with a different 4-alkoxy benzoic acid (2mole) yielded the H-bonding dimers. All intermediates and final products were structural characterized by FT-IR spectra were recorded as KBr pellets on a 8400s shimadzu spectrometer, ^{1}HNMR and ^{13}C-NMR spectra were recorded on 300 MHz Brucker using DMSO as solvent and TMS as internal standard and Elemental analysis was performed on ECS 4010 CHNSO Analyzer (costech analytical technologies, INC). The optical textures of the mesophases were observed with Leica DM2500 P optical polarized microscope equipped with an instec HCS302 heating and cooling stage. DSC curves were performed on a DSC-20Q (TA instrument) with a heating rate of 10 ^{0}C/min to measure the thermal behaviour.

Preparation of 1-(4- Hydroxyphenyl)-3-pyridin-4-yl propenone (PY)

Mixture of 4- carbaldehyde pyridine (0.1mol), 4-hydroxyacetophenone (0.1mol) and a few drops of piperidine in 40ml absolute ethanol was refluxed for 12h. The reaction mixture was concentrated up to its half volume and then was poured to ice water with stirring , solid separated ,which was filtered, dried and crystallized from ethanol giving yellow solid [16] yield 79%, m.p 296-298^{0}C, FT-IR (KBr, cm^{-1}), 3100- 3475 (O-H), 3065 (C-H aromatic), 1660(C=O ketone), 1585 (C=C aromatic). ^{1}HNMR (250MHZ, DMSO, TMS): δ=8.721(m, 2H pyridine, meta to CH=CHCO), 8.124(m,1H,CH in $\underline{\text{CH}}$=CHCO), 7.94(d,1H,CH in CH=$\underline{\text{CH}}$CO), 7.672 (d,4H phenyl, meta to OH), 7.451(m,4H pyridine, ortho to CH=CHCO), 7.011(d,4H phenyl, ortho to OH). Elem. Anal. Calculated for $C_{14}H_{11}NO_2$: C, 74.65%, H, 4.92%, N, 6.22%. Found: C, 74.59%, H, 4.99%, N, 6.32%.

Preparation of decanedioic acid bis[4-(3-pyridin-4-yl-acryloyl)-phenyl]ester(D)

1-(4- Hydroxyphenyl)-3-pyridin-4-yl propenone (0.2mol), sebacic acid (0.1mol) and 4- dimethyl amino pyridine DMAP (0.04 mol) were mixed in dry dichloromethane (25ml). 1,3-dicyclohexyl carbodiimide DCC (0.5mol)was then added to the mixture and stirred at room temperature for 24h. precipitated material were removed by filtration and recrystallized from ethanol giving pale yellow solid yield 84%, m.p 278-280 ^{O}C, Elem.anal. calculated for $C_{38}H_{36}N_2O_6$: C, 74.01, H, 5.88, N, 4.54, Found C, 74.32, H, 5.71, N, 4.50, IR (KBr) cm^{-1} 1600 (C=C aromatic), 1660 (C=O ketone), 1740 (C=O ester), 3030 (C-H aromatic), 2892-2936 (C-H aliphatic), ^{1}HNMR(DMSO-d_6), δ= 8.711 (d, 4H pyridine, meta to CH=CHCO), 8.169 (m, 2H,CH in $\underline{\text{CH}}$=CHCO), 7.75 (d,2H,CH in CH=$\underline{\text{CH}}$CO), 7.672(d,4H phenyl, ortho to CH=CHCO), 7.419(m, 4H pyridine, ortho to CH=CHCO), 6.972 (d, 4H phenyl, meta to CH=CHCO), 2.25 (m,4H,CH_2), 1.62 (m,4H,CH_2), 1.27 (m,8H,CH_2). Figure 1 shows ^{1}H-NMR for compound (D).



Scheme 1- Synthesis of H-bonded dimeric liquid crystals RnD

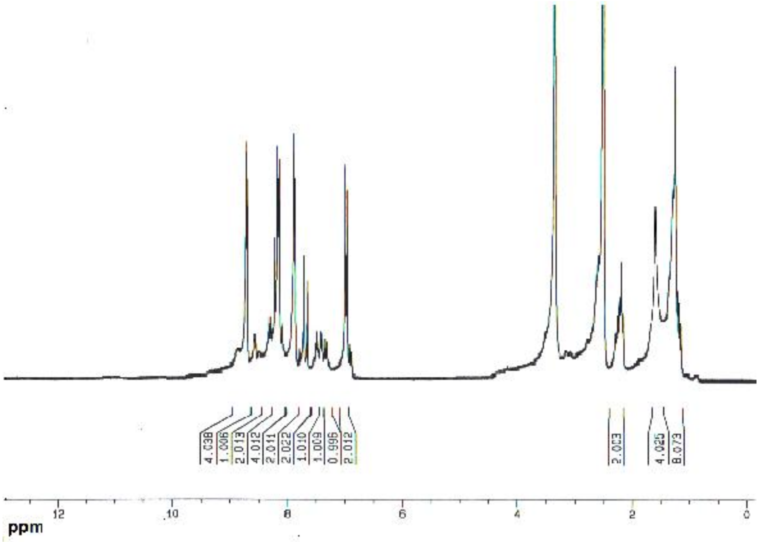


Figure 1- ^{1}HNMR spectra of D compound

Preparation of H-bonded dimers (RnD)

All dimers examined in present study were prepared by an evaporation technique. The H-bond acceptor, a linear chain decanedioic acid bis[4-(3-pyridine-4-yl-acryloyl)phenyl] ester (0.1mmol) and 4-alkoxybenzoic acid(0.2 mmol) as a H-bond donor were prepared by dissolving equimolar amounts in 15ml pyridine, yielding a clear solution. Most of the solvent was first evaporated slowly at 60 ^{0}C under atmospheric pressure .The remainder of solution was then dried in a vacuum at 80 ^{0}C for several days [13, 14 and 17]

Results and discussion:

FT-IR spectroscopy is sensitive to the change of molecular conformation inter and intramolecular interactions. The formation of H-bonded dimers as shown in figure 2. was confirmed by FTIR spectroscopic experiments. The IR spectra of compound (PY) showed the characteristic stretching new strong band at 2475 cm^{-1} and a weak bands centred between 1875-1920 cm^{-1}, resulting from self-association of hydroxyl and pyridine through intermolecular H-bonding, the IR spectra of compound (D) appearance of band at1765cm^{-1} which is characteristic of C=O stretching vibration of ester groups and disappearance of intermolecular H-bonding bands indicated that the reaction of hydroxyl with acid chloride to obtain compound(D) is successful and the IR spectra of dimeric liquid crystals showed the characteristic stretching new strong band at 2484cm^{-1} and a weak bands centred between 1890-1917 cm^{-1} can be seen very clearly, resulting from self- association of carboxylic acid and pyridine through intermolecular H-bonding [4,7 and 12], . The structure of the new prepared dimeric liquid crystals was characterized by ^{1}HNMR and ^{13}CNMR spectroscopy as shown in table 1. Typical ^{1}HNMR and ^{13}CNMR spectra for some of these dimers are shown in figure. 3 and 4.

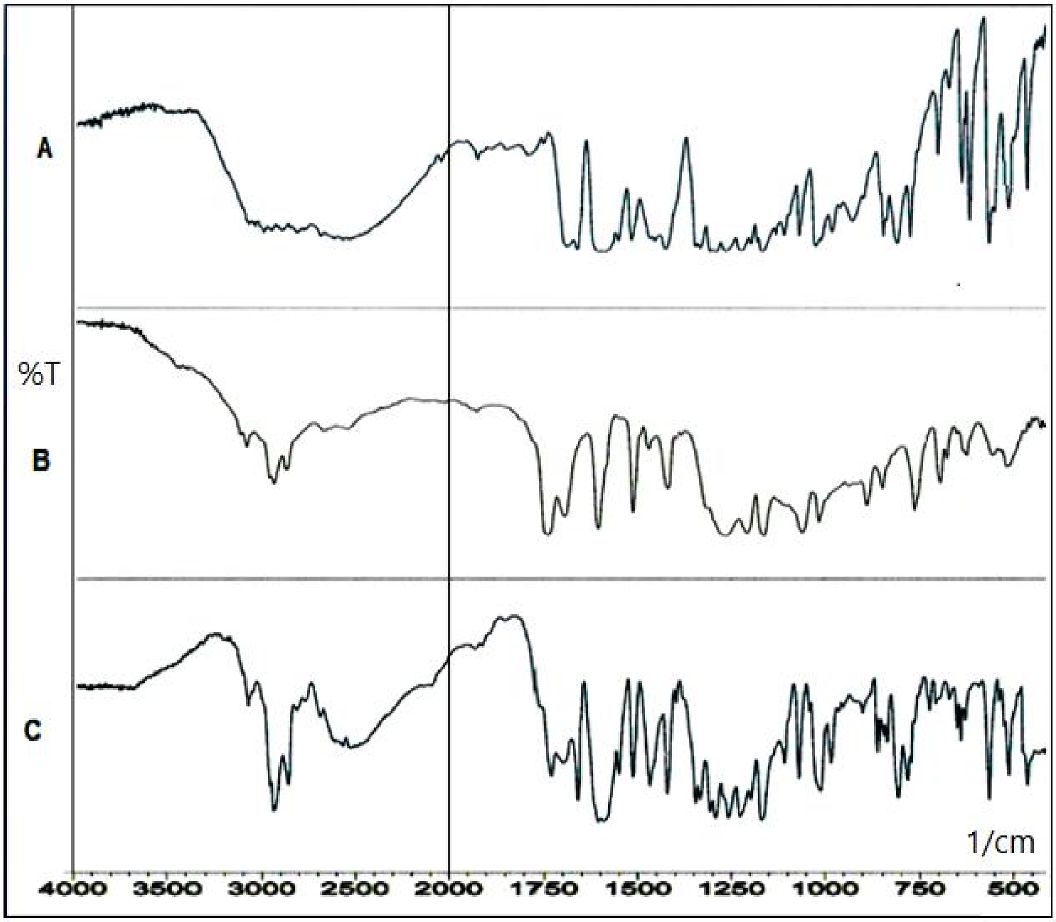


Figure 2- FTIR spectra for prepared compounds: A (PY), B (D) and C (R6D)

Table 1-Spectral data of newly prepared compounds

Dimer	**Spectral data**
R1D	IR, ¬̃ /cm^{-1}: 3080 (C-H aromatic),2940-2853 (C-H aliphatic), 2525 and 1910 intermolecular H-bonding), 1740 (CO ester), 1675 (CO carboxylic acid), 1665 (CO ketone), 1600 (C=C-CO), 1590(Ph) ^{1}H NMR (DMSO-d_6), ¢: 1.310 (s, 8H, CH_2), 1.585 (m, 4H, CH_2), 2.315 (m, 4H, CH_2), 3.907 (s, 6H, CH_3), 6.820 (m, 4H, phenyl, ortho to alkoxy), 7.460-7.835 (m, 16H, phenyl and pyridine ortho to CH=CHCO), 7.880 (d,4H, CH=CHCO), 8.649(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-d_6), ¢: 186.970(2CO), 168.890(2COOH), 164.660(2COO), 164.050 (2C), 154.950 (2C), 150.140(2CH), 144.355(2C), 142.530 (2CH=CHCO), 139.425(2C) ,130.715 (2CH), 130.125(2CH), 129.585 (2CH=CHCO), 122.285 (2C), 121.940(2CH), 120.750 (2CH), 114.135(2CH), 57.051(2CH_3), 33.189 (CH_2), 30.145 (CH_2), 29.820(CH_2), 25.524 (CH_2)
R2D	IR, ¬̃ /cm^{-1}: 3065 (C-H aromatic), 2930-2853 (C-H aliphatic), 2520 and 1910 (intermolecular H-bonding), 1745 (CO ester), 1670 (CO carboxylic acid), 1660 (CO ketone), 1600 (C=C-CO), 1590(Ph) ^{1}H NMR (DMSO-d_6), ¢: 1.330 (s, 14H, CH_3 & CH_2), 1.550 (m, 4H, CH_2), 2.340 (m, 4H, CH_2), 4.076 (m, 4H, CH_2), 6.833 (m, 4H, phenyl, ortho to alkoxy), 7.410-7.811 (m, 16H, phenyl and pyridine ortho to CH=CHCO), 7.890 (d, 4H, CH=CHCO), 8.649(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-d_6), ¢: 186.973(2CO), 168.895(2COOH), 164.657(2COO), 164.049 (2C),154.941(2C),150.139(2CH),144.350(2C), 142.534 (2CH=CHCO), 139.415(2C) ,130.715 (2CH), 130.105(2CH), 129.590 (2CH=CHCO), 122.295 (2C), 121.947(2CH), 120.757 (2CH), 114.133(2CH), 65.3853 (2CH_2), 33.781 (CH_2), 30.121(CH_2), 29.7564 (CH_2), 25.494 (CH_2), 14.350(2CH_3)
R3D	IR, ¬̃ /cm^{-1}: 3075 (C-H aromatic), 2945-2850 (C-H aliphatic), 2515 and 1915 (intermolecular H-bonding), 1745 (CO ester), 1670 (CO carboxylic acid), 1665(CO ketone), 1605 (C=C-CO), 1595(Ph) ^{1}H NMR (DMSO-d_6), ¢: 0.972(t, 6H, CH_3),1.310 (m, 8H, CH_2), 1.684 (m, 8H CH_2), 2.315 (m, 4H, CH_2), 4.017 (s, 4H, CH_2), 6.815 (m, 4H, phenyl, ortho to alkoxy), 7.450-7.825 (m, 16H, phenyl and pyridine ortho to CH=CHCO),7.875(d,4H, CH=CHCO), 8.650(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-d_6), ¢: 186.973(2CO), 168.895(2COOH), 164.657(2COO), 164.049 (2C), 154.940(2C),150.145(2CH),144.355(2C),142.540(2CH=CHCO),139.415(2C),130.725(2CH) ,130.11(2CH),129.590(2CH=**C**HCO),122.300(2C), 121.950(2CH), 120.805 (2CH), 114.145 (2CH), 74.395 (2CH_2), 33.195(CH_2), 30.125(CH_2), 29.725(CH_2), 25.510 (CH_2), 23.516 (2CH_2) , 12.540 (2CH_3)
R4D	IR, ¬̃ /cm^{-1}: 3080 (C-H aromatic), 2940-2840 (C-H aliphatic), 2510 and 1925 (intermolecular H-bonding), 1745 (CO ester), 1675 (CO carboxylic acid), 1660 (CO ketone), 1610 (C=C-CO), 1595(Ph) ^{1}H NMR (DMSO-d_6), ¢: 0.980(t, 6H, CH_3), 1.329 (s, 12H, CH_2), 1.695(m, 8H, CH_2), 2.320 (m, 4H, CH_2), 3.950 (s, 4H, CH_2), 6.820(m, 4H, phenyl, ortho to alkoxy), 7.470-7.855 (m, 16H, phenyl and pyridine ortho to CH=CHCO), 7.885 (d,4H, CH=CHCO), 8.650(d ,4H, pyridine meta to CH=CHCO) ^{31}C NMR (DMSO-d_6),¢: 187.255(2CO), 168.955(2COOH), 164.655(2COO), 164.055 (2C), 154.955(2C), 150.095(2CH), 144.35(2C), 142.55 (2**C**H=CHCO), 139.115(2C), 130.735 (2CH), 130.145(2CH), 129.575 (2CH=**C**HCO), 122.313(2C),1.964(2CH), 120.821 (2CH), 114.147(2CH), 72.154(2CH_2), 33.255(CH_2), 32.877 (2CH_2), 31.016(CH_2), 29.735(CH_2), 25.615(CH_2), 20.012(2CH_2), 14.197 (2CH_3)

R5D	IR, $\tilde{\neg}$/cm^{-1}: 3080 (C-H aromatic), 2950-2845 (C-H aliphatic), 2520 and 1915 (intermolecular H-bonding), 1745 (CO ester), 1670 (CO carboxylic acid), 1665 (CO ketone), 1605 (C=C-CO), 1595(Ph) ^{1}H NMR (DMSO-*d*$_6$), ¢: 0.975(t, 6H, CH_3),1.325 (s, 16H, CH_2), 1.695(m, 8H, CH_2), 2.325 (m, 4H, CH_2), 4.030 (m, 4H, CH_2), 6.820 (m, 4H, phenyl, ortho to alkoxy), 7.470-7.845 (m, 16H, phenyl and pyridine ortho to CH=CHCO) ,7.865 (d,4H, CH=CHCO), 8.650(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-*d*$_6$), ¢: 187.103(2CO), 168.755(2COOH), 164.755(2COO), 164.050 (2C),154.840(2C),150.145(2CH),144.355(2C),142.540(2**C**H=CHCO),139.415(2C), 130.725 (2CH), 130.110(2CH), 129.590(2CH=**C**HCO), 122.300 (2C), 121.950(2CH), 120.805 (2CH), 114.145(2CH), 72.230(2CH_2), 33.215 (CH_2), 30.450(2CH_2), 30.145(CH_2), 29.725 (CH_2), 28.950(2CH_2), 25.490 (CH_2), 23.116 (2CH_2), 14.450 (2CH_3)
R6D	IR, $\tilde{\neg}$/cm^{-1}: 3065 (C-H aromatic), 2935-2865 (C-H aliphatic), 2520 and 1910 (intermolecular H-bonding), 1745 (CO ester), 1670 (CO carboxylic acid), 1660 (CO ketone), 1605 (C=C-CO), 1593(Ph) ^{1}H NMR (DMSO-*d*$_6$), ¢: 0.985(t, 6H, CH_3),1.315 (s, 20H, CH_2), 1.701(m, 8H, CH_2), 2.325 (m, 4H, CH_2), 3.971 (s, 4H, CH_2), 6.825 (m, 4H, phenyl, ortho to alkoxy), 7.450-7.855 (m, 16H, phenyl and pyridine ortho to CH=CHCO), 7.870 (d,4H, CH=CHCO), 8.645(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-*d*$_6$), ¢: 187.103(2CO), 168.755(2COOH), 164.755(2COO),164.050 (2C), 154.840(2C),150.145(2CH),144.355(2C),142.540(2**C**H=CHCO),139.41(2C),130.725 (2CH) ,30.11 (2CH),129.59 (2CH=**C**HCO),122.30(2C), 121.95 (2CH), 120.805 (2CH), 114.145(2CH), 72.230(2CH_2), 33.215 (CH_2), 32.75 (2CH_2), 30.65 (2CH_2), 30.14 (CH_2), 29.72 (CH_2), 26.45 (2CH_2), 25.49(CH_2), 23.135(2CH_2), 14.355 (2CH_3)
R7D	IR, $\tilde{\neg}$/cm^{-1}: 3066 (C-H aromatic), 2937-2858 (C-H aliphatic), 2525 and 1910 (intermolecular H-bonding), 1740 (CO ester), 1670 (CO carboxylic acid), 1665 (CO ketone), 1600 (C=C-CO), 1591(Ph) ^{1}H NMR (DMSO-*d*$_6$), ¢: 0.896 (t, 6H, CH_3), 1.296 (m, 24H, CH_2), 1.691(m, 8H, CH_2), 2.310 (m, 4H, CH_2), 3.995 (m, 4H, CH_2), 6.96 (m, 4H, phenyl, ortho to alkoxy), 7.417-7.824 (m, 16H, phenyl and pyridine ortho to CH=CHCO), 7.860 (d,4H, CH=CHCO), 8.651(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-*d*$_6$), ¢:187.103(2CO), 168.755(2COOH), 164.755(2COO), 164.050 (2C),154.840(2C),150.145(2CH),144.355(2C),142.540(2**C**H=CHCO), 139.415(2C) ,130.725 (2CH), 130.110(2CH), 129.590(2CH=**C**HCO), 122.300 (2C), 121.950(2CH), 120.805(2CH), 114.145(2CH), 72.230(2CH_2), 33.215 (CH_2), 32.650(2CH_2), 30.650(2CH_2), 30.127(2CH_2) 30.145(CH_2), 29.725 (CH_2), 26.655(2CH_2), 25.490 (CH_2), 23.125(2CH_2), 14.265 (2CH_3)
R8D	IR, $\tilde{\neg}$/cm^{-1}: 3070 (C-H aromatic), 2930-2865 (C-H aliphatic), 2520 and 1915 (intermolecular H-bonding), 1742 (CO ester), 1673 (CO carboxylic acid), 1663 (CO ketone), 1602 (C=C-CO), 1591(Ph) ^{1}H NMR (DMSO-*d*$_6$), ¢: 0.915(t, 6H, CH_3),1.310 (m, 28H, CH_2),1.701(m, 8H, CH_2), 2.310 (m, 4H, CH_2), 4.002(m, 4H, CH_2), 6.95 (m, 4H, phenyl, ortho to alkoxy), 7.437-7.844 (m, 16H , phenyl and pyridine ortho to CH=CHCO), 7.865 (d,4H, CH=CHCO), 8.650(d ,4H, pyridine meta to CH=CHCO) ^{13}C NMR (DMSO-*d*$_6$), ¢: 187.103(2CO), 168.755(2COOH), 164.755(2COO), 164.050(2C), 154.840(2C),150.145(2CH),144.355(2C),142.540(2**C**H=CHCO),139.415(2C),130.725 (2CH), 130.110(2CH), 129.590(2CH=**C**HCO), 122.300(2C), 121.950(2CH), 120.805 (2CH), 114.145(2CH), 72.230(2CH_2), 33.215 (CH_2), 32.550(2CH_2), 30.650(2CH_2), 30.417(2CH_2) 30.145(CH_2), 29.825(2CH_2), 26.685 (2CH_2), 25.490 (CH_2), 23.130(2CH_2), 14.205 (2CH_3)

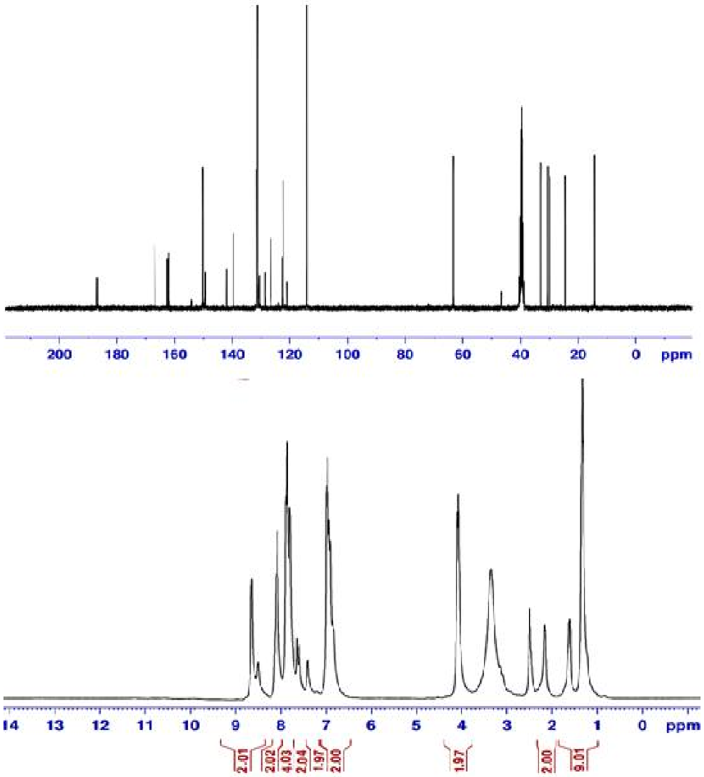


Figure 3- ^{1}H NMR and ^{13}C NMR for H- bonding dimer R2D

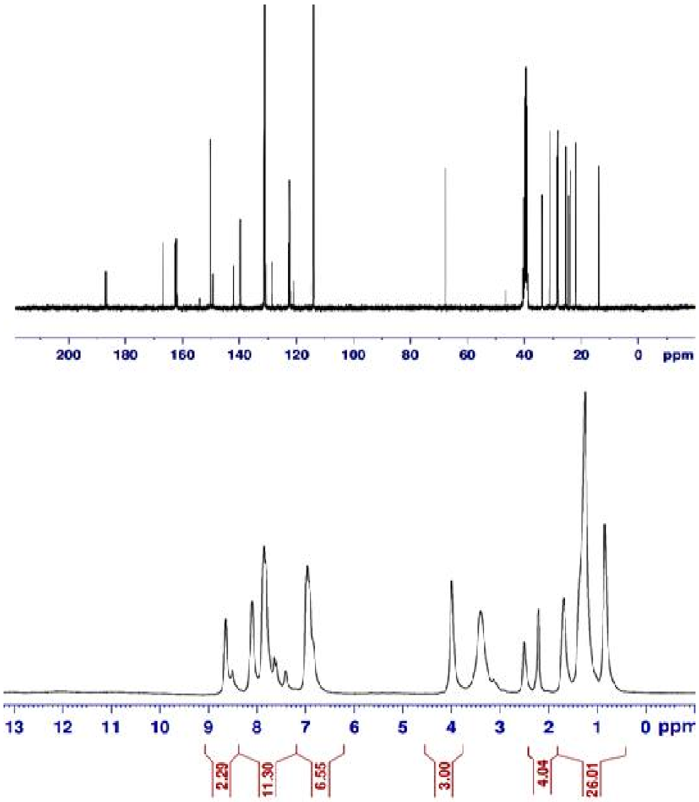


Figure 4- ^{1}H NMR and ^{13}C NMR for H- bonding dimer R7D

The liquid crystalline properties of RnD dimers were investigated and study by DSC and polarized microscopy (POM), the POM images accord well with the DSC data .The transition temperatures and enthalpies of these complexes are summarized in table 2. From these results of DSC curves, we find the melting point of D is 225 ^{0}C and no exhibited liquid crystalline phase. The members of the series RnD (n = 1,2,….4) exhibit two clear endothermic events on heating are observed as shown in figure 5 and examination on optical polarized microscope, which are successively a melting transition from a crystalline to nematic phase accompanying a large enthalpy change and the isotropic transition from the nematic phase to isotropic liquid with a small enthalpy change. Upon cooling from the isotropic phase, two exothermic transitions occur corresponding to the transition from an isotropic phase to nematic phase and from nematic phase to a crystal phase, respectively. Subsequent increasing of terminal alkoxy chains length RnD (n = 5, 6,7, and 8) exhibit two clear endothermic peaks on heating are observed, which are successively a smectic transition from crystalline to a smectic A phase accompanying a large enthalpy and the isotropic transition from the smectic A phase to isotropic liquid with a small enthalpy change. Upon cooling from the isotropic phase, two exothermic transitions occur corresponding to the transition from an isotropic phase to smectic A phase. Figure 6 illustrate the textures of the mesophase for some compounds of these series.

Table 2- Thermal transitions of RnD series. Temperature in ^{0}C, enthalpies of transition (In parenthalpieses) in KJ/mol

Compound	Cr→SA	Cr→N	Isotropic transition
R1D		178.2(31.2)	221.7(9.2)
R2D		180.5(36.7)	227.9(10.8)
R3D		165.3(30.1)	214.6(8.6)
R4D		171.1(34.5)	220.3(9.4)
R5D	158.4(28.1)		210.2(8.3)
R6D	163.3(31.0)		211.0(8.4)
R7D	156.6(23.4)		204.6(7.9)
R8D	160.1(25.3)		206.1(8.2)

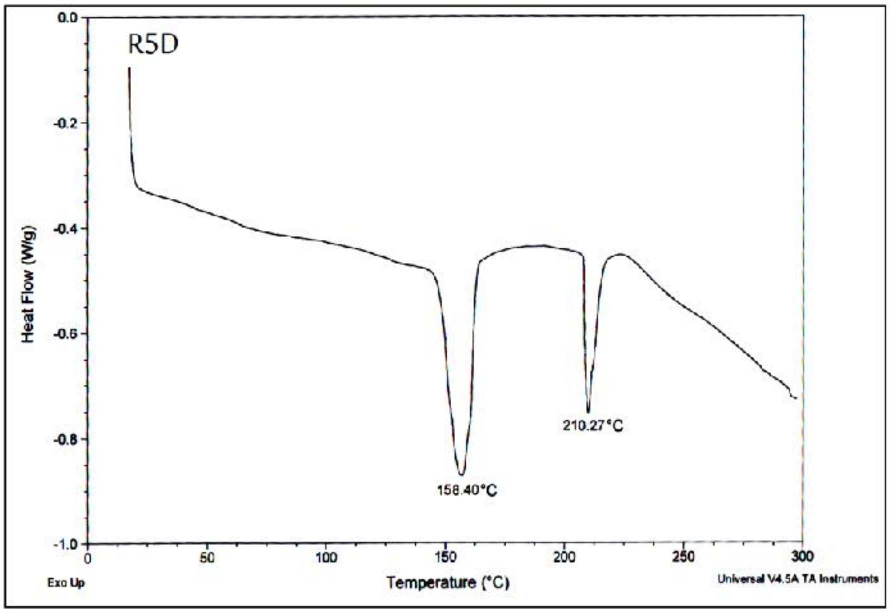


Figure 5- DSC thermogram for compound R5D

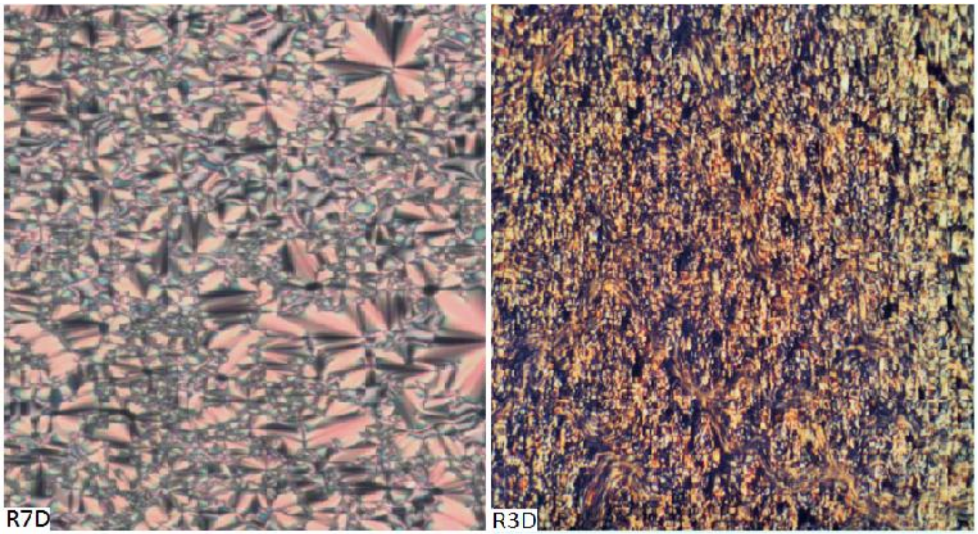


Figure 6- Optical texture of R3D at 185 ^{0}C on cooling and R7D at 190 ^{0}C on cooling

The dependence of the transition temperatures on the number of carbon atoms, n, in the terminal alkoxy chains is shown in figure 7. All the members of the series exhibit enantiotropic mesophases. There is a pronounced odd-even effect in the clearing liquid crystalline transition temperatures in which the even members have the greater values, and as expected this alternation attenuates with increasing alkoxy length and reduce the clearing and melting temperatures with increased alkoxy terminal chains length which based on the effect of increasing the number of possible conformations to the long alkoxy chain with the resulting distortions of the cylindrical shape of the mesogen**.**

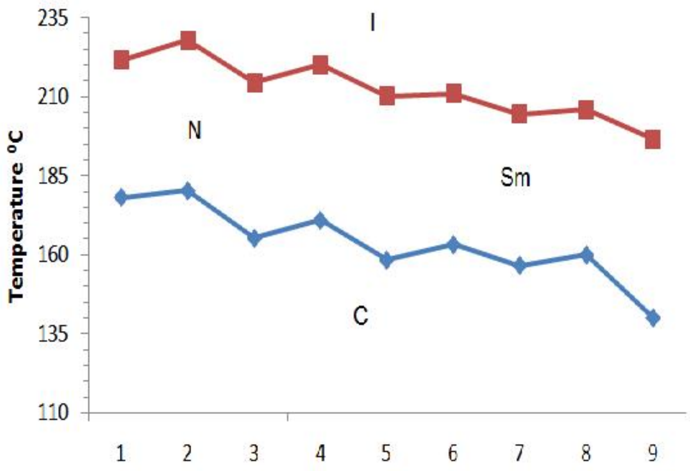


Figure 7- Representation the relation-ship between the numbers of carbon atoms (n) and the transition temperature (^{0}C) for the RnD series

Conclusions

In this study, usefulness of H-bonding liquid crystal materials containing chalcone moiety, where synthesis the proton acceptor decanedioic acid bis[4-(3-pyridin-4-yl-acryloyl)-phenyl]ester (D) and synthesis the proton donor 4-alkoxy benzoic acid , then successfully synthesized new H-bonding dimeric liquid crystals with different types of the mesophase stabilized by the hydrogen bonds between the pyridyl group D and the carboxylic acid group of the 4-alkoxy benzoic acid Rn , we confirmed via FTIR spectroscopy that the H-bonds were formed in the RnD series. Mesophase properties were investigated by DSC and polarizing microscope, the results indicated that compound D did not show mesophase, while the compounds RnD (n = 2, 3 and 4) exhibit nematic phases, while when increasing the length of terminal chain (n = 5,6,7 and 8) exhibited smectic A phases. These properties of hydrogen bonded liquid crystalline supramoleculars are interested in the field of switching devices, optical data storage and optoelectronics.

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