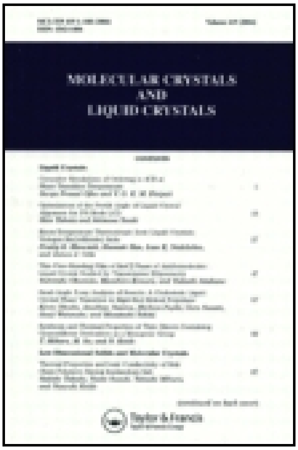

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On a Discovery of a New Chiral Liquid Crystal with Unusual Electrooptic Behavior. Experimental Results

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On a Discovery of a New Chiral Liquid Crystal with Unusual Electrooptic Behavior. Experimental Results

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A new cholesteric liquid crystal was discovered by mixing of liquid crystals DOBAMBC and PCH-7. The mixture of 10–50 per cent wt DOBAMBC—90–50 per cent wt PCH-7 shows strong colouring of the Grandjean-like textures and short rise and decay times for the electrically-induced cholesteric-pseudonematic phase transition. The elastic constants of twist K_{22} and bend K_{33} are calculated from the formulae for the threshold voltage and the wavelength of the Helfrich-Hurault instability. They are estimated with data from our experiment. The elastic constant of twist K_{22} considerably increases while the bend elastic constant K_{33} decreases with the increase of the amount of DOBAMBC. This unusual electro-optic behavior is promising for application in liquid-crystal optoelectronics.

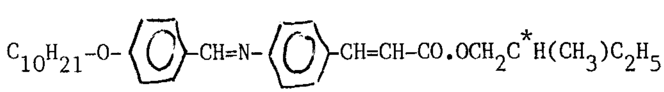
Keywords: DOBAMBC/PCH-7 mixtures, cholesteric-homeotropic pseudonematic phase transition, transient times, textures, Diamant bridge

I. INTRODUCTION

The large-pitch cholesterics (Chs) used in scientific experiments and liquid-crystal optoelectronics are prepared usually by mixing a nematic liquid crystal (NLC) with the small amount of several per cent wt of a short-pitch Ch or a nonmesomorphic chiral additive. In this paper, we study the textural, optic and electro-optic behavior of DOBAMBC/PCH-7 mixtures. The mixtures of 1–5 per cent wt DOBAMBC/99–95 per cent wt PCH-7 show usual textures typical for the conventional large-pitch Chs. However, the mixtures of 10–50 per cent wt DOBAMBC/90–50 per cent wt PCH-7 show different, in our opinion unusual behavior. It results in formation of textures not typical for the large-pitch Chs, especially for a big amount of DOBAMBC and relatively strong colouring of the Grandjean-like textures. The existence of strong rainbow observed with naked eyes after application of a voltage with abovethreshold amplitude on the LC cell illuminated with polarized white light and the observation of short rise and decay times for the chiral-nonchiral phase transition under the influence of an AC electric field with sufficient strength also show the unusual electro-optic behavior of these mixtures. There are only two possibilities for explanation of this behavior. The new chiral LC mixture for 10–50 per cent wt DOBAMBC—90–50 per cent wt PCH-7 mixture is either unusual Ch or unusual smectic C star. The textural, optic and electrooptic behavior of the DOBAMBC PCH-7 mixtures is illustrated with a number of black-white and colour photomicrographs, transient electrooptic curves obtained either by photomultiplier and recorder or by photomultiplier and oscilloscope. A schematic phase diagram of these textures is given. The elastic constants of twist K_{22} and bend K_{33} are calculated from the formulae for the threshold voltage and the wavelength of the Helfrich-Hurault instability. They are estimated with data from our experiments. Finally, the new chiral LC is examined with the use of Diamant bridge verified with the ferroelectric behavior of the smectic C star phase of DOBAMBC.

II. MATERIALS AND CELL PREPARATION

We have studied mixtures of DOBAMBC and PCH-7 LCs. The well-known p-decyloxy-benzylidene-*p*-amino-2-methylbuthyl cinnamate (DOBAMBC)[1] with a chemical formula



(1)

has the following phases and phase transitional temperatures:

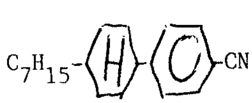
$$\text{Cr } 76°\text{C Sm C star } 95°\text{C Sm A } 117°\text{C I} \quad (2)$$

at heating and

$$\text{Cr } 45°\text{C Sm H } 63°\text{C Sm C star } 95°\text{C Sm A } 117°\text{C I} \quad (3)$$

at cooling.

The seventh homologue of the well-known liquid crystalline series p-cyano-p′-alkyl-phenylcyclohexane (PCH-7)[2–10] with a chemical formula



(4)

has the following phases and phase transitional temperatures[4]:

$$\text{Cr } 30°\text{C N } 60°\text{C I} \quad (5)$$

Additionally we have studied DOBAMBC/8CB, DOBAMBC/PCH-5 and DO-

BAMBC/1132 TNC (PCH-m) mixtures. During the experiments we have used conventional sandwitch LC cells described in detail elsewhere.[11]

III. EXPERIMENTAL RESULTS

The LC cell consisted of two glass plates covered with a thin semi-transparent conductive layer, two polymer non-conductive foils with a thickness of 8, 10 and 20 μm. Initially a small drop of PCH-7 was added laterally to the isotropic phase of DOBAMBC placed in the cell. This well-known "gradient" method permits to observe easily all possible liquid crystalline phases which are formed under the concentration gradient of PCH-7. The various liquid crystalline phases were observed under a polarizing microscope in transmitted white light. Four LCs were formed: nematic, new chiral phase, smectic A and ferroelectric smectic C star. The first three liquid crystalline phases are shown in Figure 1. The formation of these LCs was possible also when the drop of the PCH-7 was in the nematic phase and the DOBAMBC was in the crystalline phase. We also have studied the DOBAMBC/PCH-5 and DOBAMBC/1132 TNC (PCH-m) mixtures and observed the same LCs. The new chiral phase, however, was not observed in DOBAMBC/8CB mixtures. The replacement of the more active PCH-R LC with the less active 4-n-octyl-4′-cyanobiphenyl (8CB) led to observation of only two LCs: smectic A phase and ferroelectric smectic C star phase. Further, we have prepared seven

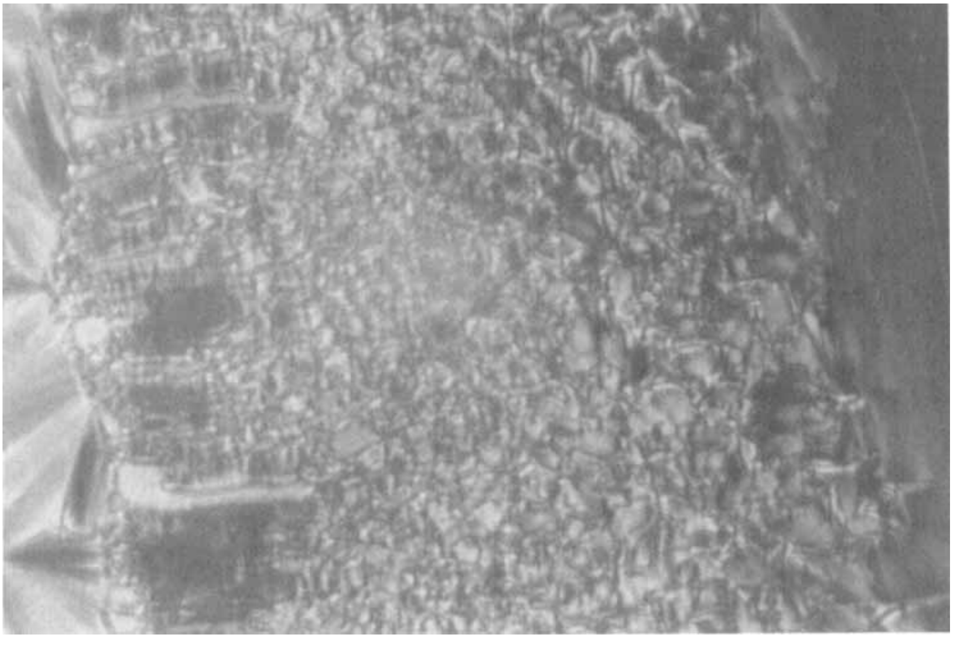


FIGURE 1 Nematic, unusual cholesteric and smectic A phases obtained in a mixture of DOBAMBC/PCH-7 with a thickness of 10 μm, T = 29°C, the long side of the photomicrograph corresponds to 850 μm (magnification ×63). See Color Plate I.

DOBAMBC/PCH-7 mixtures. The glass plates of the LC cells were previously rubbed with a diamond paste for obtaining of planar orientation of the LC director. The LC mixture was placed in the Mettler FP 82 hot stage. The electronic regulation of the temperature was effected by Mettler FP 800 central processor. The LC mixtures were observed under PZO polarizing microscope in transmitted white light.

A Schematic Phase Diagram of the DOBAMBC/PCH-7 Mixtures

The DOBAMBC/PCH-7 mixtures showed the following liquid crystalline phases:

a) The 5 per cent wt DOBAMBC—95 per cent wt PCH-7 mixture (mixture A) was revealed by the typical properties of the conventional large-pitch Chs. The phase existed between 28°C and 56°C. On the other hand, the nematic phase of PCH-7 exists between 30°C[2-4] and 60°C.[2] The presence of impurity content, however, can decrease several degrees[3,5-10] the value of T_c for the nematic-isotropic phase transition. The PCH-7 studied in our experiment was nematic between 30°C and 58°C. So, the addition of small amount of DOBAMBC shifts slightly the temperature interval of the nematic phase of PCH-7. It is remarkable that the new chiral phase existed in this temperature interval up to 25 per cent wt of DOBAMBC.

b) The 7.5 per cent wt DOBAMBC—92.5 per cent PCH-7 mixture (mixture B) showed different textures resembling the "paramorphic mosaic" textures typical for a number of smectics. We have called such textures "paramorphic" since they resemble the textures of the ferroelectric smectic C star. "Mosaic" and "paramorphic mosaic" textures for various smectics have been shown in the book by Demus and Richter.[12] These textures depend strongly on the type of the previous phase. For example, "paramorphic mosaic" textures are peculiar also for the ferroelectric smectic C star phase of DOBAMBC (Figure 2a in Reference 13). Typical "fan-shaped" textures were observed, however, after cooling from the previous isotropic phase.

c) The 10 per cent wt DOBAMBC—90 per cent wt PCH-7 mixture (mixture C) was observed with more regular "paramorphic mosaic" textures as is shown in Figure 2a.

d) The 25 per cent wt DOBAMBC—75 per cent wt PCH-7 mixture (mixture D) is shown in Figure 2b and resembles a "fan-shaped" texture with stripes in some regions.

e) The 35 per cent wt DOBAMBC—65 per cent wt PCH-7 mixture (mixture E) showed typical "fan-shaped" textures. These textures were very similar to those already observed by Saupe[14] in MBBA-ChN mixtures and by Bouligand[15] in MBBA-Canadian balsam mixtures. For this mixture, it was observed a slight decrease of T_c for the new chiral phase-isotropic phase transition (55°C).

f) The 50 per cent wt DOBAMBC—50 per cent PCH-7 mixture (mixture F) showed further a slight decrease of T_c for the new chiral phase-isotropic phase transition (54°C).

g) The 65 per cent wt DOBAMBC—35 per cent wt PCH-7 mixture (mixture G) showed only the smectic A phase. The crystal-smectic A transition was observed at 23°C and the smectic A-isotropic transition at 87.5°C. This LC mixture showed

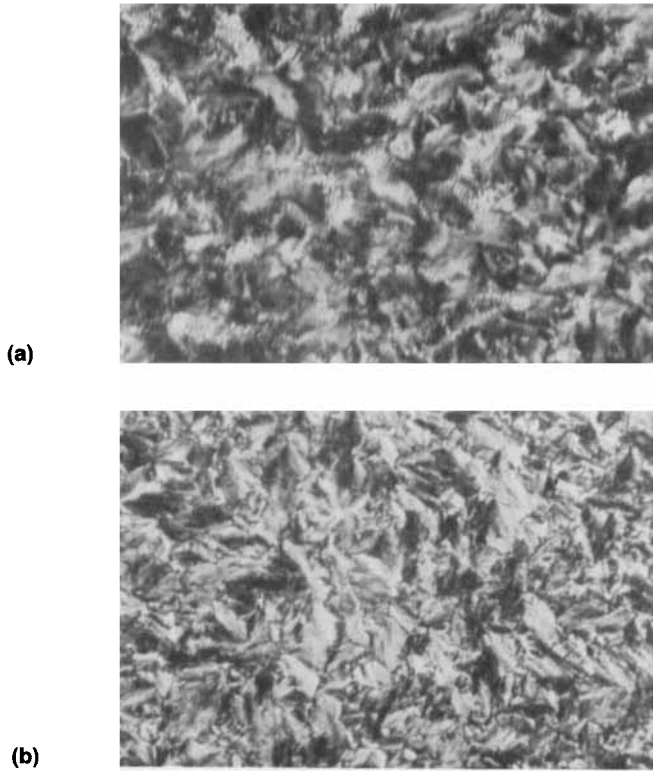


FIGURE 2 Textures in mixtures C and D, T = 29°C, P ⊥ A, the long side of the photomicrographs corresponds to 485 μm (magnification ×100). a) "Paramorphic mosaic" textures with striped regions obtained in a 10 per cent wt DOBAMBC—90 per cent wt PCH-7 mixture with a thickness of 8 μm. b) "Fan-shaped" textures with striped regions obtained in 25 per cent wt DOBAMBC—75 per cent wt PCH-7 mixture with a thickness of 8 μm.

typical smectic A textures. For example, heating of the sample from the crystal phase led to formation of typical "polygonal" smectic A textures.

h) The 80 per cent wt DOBAMBC—20 per cent wt PCH-7 mixture (mixture H) showed also only the smectic A phase. The crystal-smectic A phase transition was observed at 22°C and the smectic A-isotropic phase transition was observed at considerably higher temperature (99°C).

i) The 90 per cent wt DOBAMBC—10 per cent wt PCH-7 mixture (mixture I) showed the ferroelectric smectic C star phase and the smectic A phase. The ferroelectric smectic C star phase was observed at 27°C, the smectic A phase at 60°C and the isotropic phase at 115°C. No attempts were made for the observation of the ferroelectric smectic H phase at cooling.

All these experimental results are schematically shown in the phase diagram (Figure 3) in the way already used by Geelhaar.[16]

Electrooptic Behavior

The second part of the experimental results concerns the study of the electrooptic behavior of thin LC cells with a thickness of 8 μm. We have studied the elec-

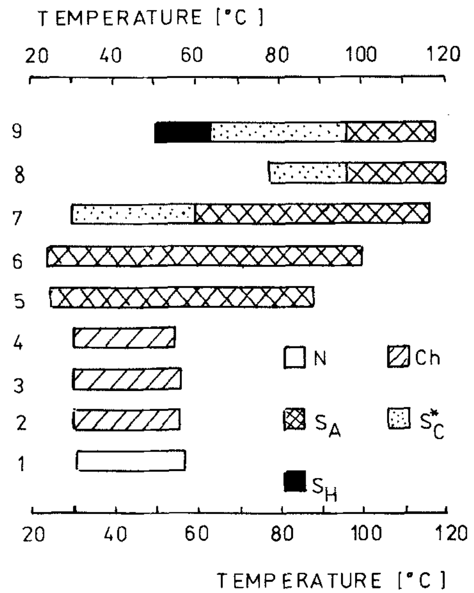
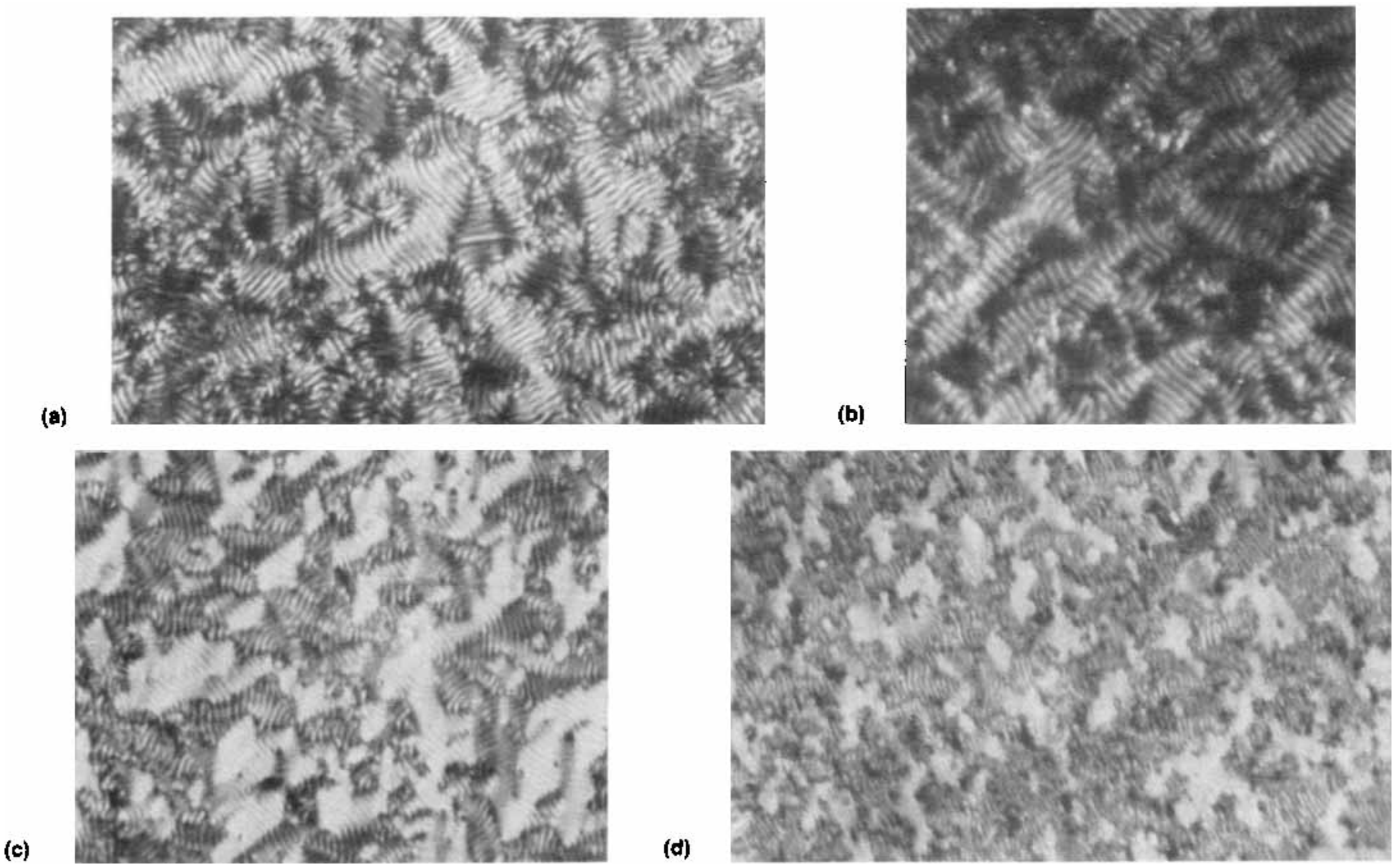


FIGURE 3 Temperature range of the LC phases of PCH-7(1), mixtures A to D(2), mixture E(3), mixture F(4), mixture G(5), mixture H(6), mixture I(7), DOBAMBC at heating(8) and DOBAMBC at cooling(9).

trooptical behavior of the new chiral phase and the smectic A phase obtained with DOBAMBC/PCH-7 mixtures. Let's first suppose that the new chiral phase is cholesteric. As noted, the initial texture of this new chiral phase was usually non-oriented with spiralling in the plane of the electrodes when the LC was obtained after heating from the crystal phase or with a "fan-shaped" texture when the LC was obtained after cooling from the isotropic phase. For simplicity we shall focus our attention on the formation of electrically-induced well-defined striped regions which evidently are consequences of the Helfrich-Hurault deformations[17-19] extensively studied both theoretically and experimentally (see for example References 20 to 22). The electrically-induced textures appeared at a threshold voltage of 2–20 V (frequency of 5 kHz) which depends on the amount of DOBAMBC. They were formed 2.5 V for mixture B, 3.0 V for mixture C (Figure 4a), 4.0 V for 15 per cent wt DOBAMBC—85 per cent wt PCH-7 (Figure 4b), 6 V for mixture D (Figure 4c) and 20 V for mixture E (Figure 4d). Figure 4a illustrates typical "polygonal" textures (compare to plates 26 and 27 in the book by Demus and Richter),[12] Figure 4b and 4c show typical "chevrons" studied in detail by Bouligand[23] and Figure 4d resembles banded "paramorphic mosaic" smectic textures. The wavelength of the Helfrich-Hurault instability was measured to be about 6 μm for mixtures B and C, 4 μm for 15 per cent wt DOBAMBC—85 per cent wt PCH-7, 2 μm for mixture D and 1–1.5 μm for mixture E. Complete unwinding of the helix in the striped domains was effected about 10 V for the mixtures B to D and above 20 V for the mixture E.

A special electrooptic behavior showed mixture F. The initial texture was non-oriented and similar to Schlieren texture in the smectic C with disclinations oriented

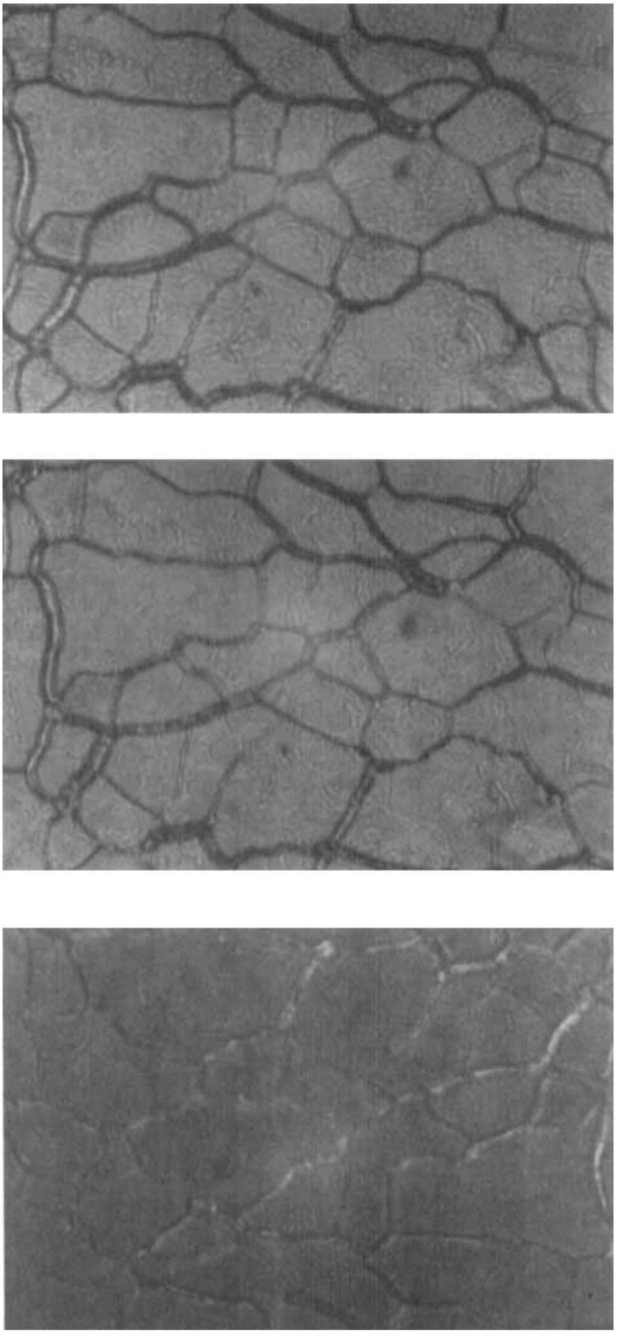


(a) (b) (c) (d)

FIGURE 4 Electrically-induced textures in DOBAMBC/PCH-7 obtained at T = 29°C. a) Electrically-induced "polygonal" textures obtained in a 10 per cent wt DOBAMBC—90 per cent wt PCH-7 mixture with a thickness of 8 μm. U = 3.0 V, f = 5 kHz, P ⊥ A, the long side of the photomicrograph corresponds to 485 μm (magnification ×100). b) Electrically-induced "chevrons" obtained in a 15 per cent wt DOBAMBC—85 per cent wt PCH-7 mixture with a thickness of 8 μm. U = 4 V, P ⊥ A, the side of the photomicrograph corresponds to 173 μm (magnification ×200). c) Electrically-induced "chevrons" obtained in a 25 per cent wt DOBAMBC—75 per cent wt PCH-7 mixture with a thickness of 8 μm. U = 6 V, P 45° A, the long side of the photomicrograph corresponds to 205 μm (magnification ×200). d) Electrically-induced "paramorphic mosaic" textures with stripes obtained in a 35 per cent wt DOBAMBC—65 per cent wt PCH-7 mixture with a thickness of 8 μm. U = 20 V, P ∥ A, the long side of the photomicrograh corresponds to 260 μm (magnification ×100).

perpendicular to the glass plates. Two threshold voltages were observed for this mixture: the first threshold voltage was connected to the appearance of "fan-shaped" texture at 10 V. At 20 V, domains appear inside the "fans" and at a slightly higher voltage the LC was transformed into a homeotropic LC. Switching off the voltage, the unwound (homeotropic) LC returns to Grandjean-like texture with oily-streaks having nice and strong colouring due to the selective reflection of the light[24,25] or to birefringents effects. For example, the Grandjean-like orientation of 20 per cent wt DOBAMBC—80 per cent wt PCH-7 showed the following colours: yellow-light green when the polarizer (P) and the analyzer (A) are parallel, dark green (P 40° A), wine-red-green (P 65° A), wine-red (P 90° A) and dark yellow (P 135° A). Let's point out that in this case the colours are due rather to birefringent effects since the pitch of the chiral phase is only several times smaller. Three typical colours are shown in Figures 5a, 5b and 5c. Let us note that under the polarizing microscope the colours were more stronger. The brighter colours which we saw in the photomicrographs are due to technical causes: the quality of the photomicrographic technique and the colour films. The nonideal orientation of the LC, and the slight movement of the polarizer with respect to the analyzer also lead to considerable change in colours. In some cases, depending on the thickness of the cell, the initial texture connected with the orientation of the director at the boundaries and the strength of the applied voltage, the homeotropic LC was returned with a slow relaxation to the initial scattering textures. Our experimental results clearly show a cholesteric-homeotropic pseudonematic transition which was widely studied in the last 10–15 years.[26–33]

The electrooptic transmission curves of a LC cell with 10 per cent wt DOBAMBC—90 per cent wt PCH-7 and a thickness of 8 μm were performed with BBC Goertz Metrawatt electronic recorder (type SE 120). They are shown in Figure 6. The applied voltage was 3 V, 5 kHz (curve 1), 10 V (curve 2) and 15 V (curve 3). These electrooptic transmission curves were obtained at crossed polarizer and analyzer and a temperature of 29°C. These curves show the big changes in the intensity of the transmitted light through the cell at switch off and switch on of the voltage when it is with a sufficient strength. This good contrast is also due to the unusual black view of the homeotropic pseudonematic LC under the polarizing microscope at crossed polarizer and analyzer. The black view of the homeotropic pseudonematic is much more intensive with respect to the usual nematics probably due to the presence of the long DOBAMBC molecules and to the eventual change of the elastic constants[34] and decrease of the thermal fluctuations.[35] The electrooptic transmission curves shown in Figure 6 are much better than those obtained for 5 per cent DOBAMBC—95 per cent wt PCH-7. As noted, such mixtures were with electrooptic behavior typical for conventional large-pitch Chs. The considerable improvement in the contrast of the LC cells under study began at 7,5 per cent wt of DOBAMBC. The rise and decay times were measured by photomultiplier and Tektronix oscilloscope (type 2246 A). The oscillogram is shown in Figure 7 for mixture C. The LC was with a thickness of 8 μm. The voltage impulse was with a length of 10^5 μs, a period of $2{,}5.10^4$ μs and a height of 10 V. From this curve it is clear that the rise and decay times are less tha 10 ms. Let's estimate these values relative to those of the conventional Chs. First of all we need the value of the pitch



(a)

(b)

(c)

FIGURE 5 Grandjean-like texture with oily streaks obtained in a 20 per cent wt DOBAMBC-80 per cent wt PCH-7 mixture with a thickness of 20 μm, T = 29°C, the long side of the photomicrograph corresponds to 850 μm (magnification ×63). a) Dark green (P 40° A). b) Wine red (P 90° A). c) Dark yellow (P 135° A). See Color Plate II.

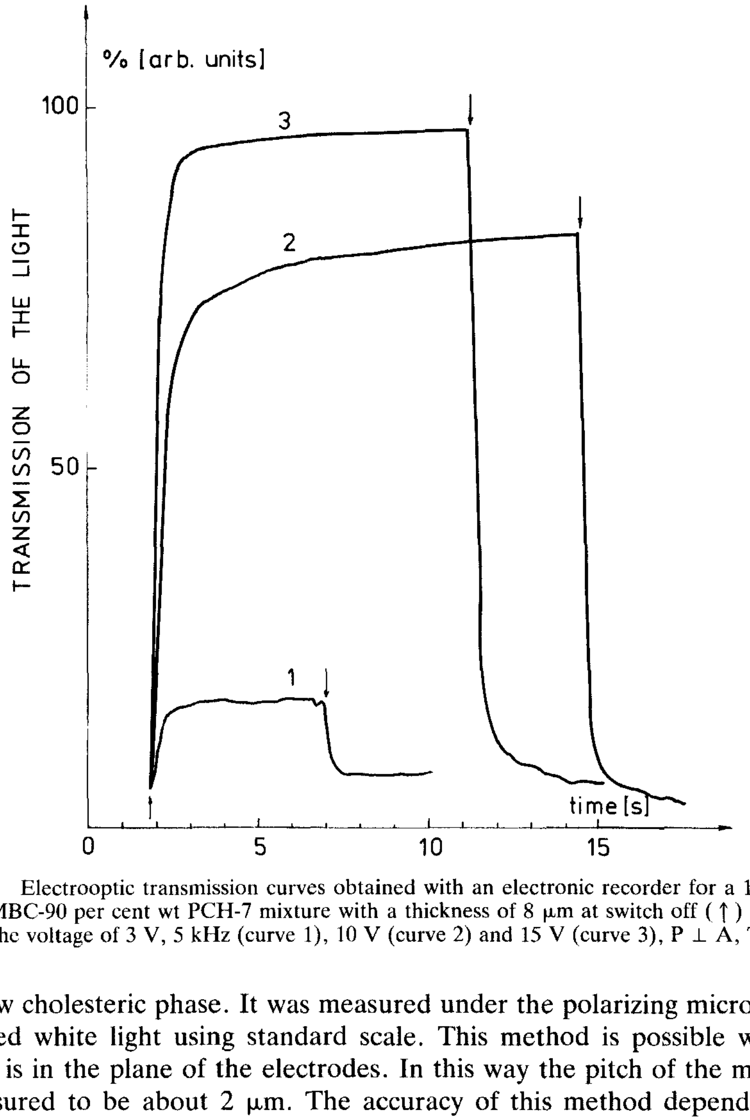


FIGURE 6 Electrooptic transmission curves obtained with an electronic recorder for a 10 per cent wt DOBAMBC-90 per cent wt PCH-7 mixture with a thickness of 8 μm at switch off (↑) and switch on (↓) of the voltage of 3 V, 5 kHz (curve 1), 10 V (curve 2) and 15 V (curve 3), P ⊥ A, T = 29°C.

of the new cholesteric phase. It was measured under the polarizing microscope in transmitted white light using standard scale. This method is possible when the spiralling is in the plane of the electrodes. In this way the pitch of the mixture C was measured to be about 2 μm. The accuracy of this method depends on the number of the stripes and is higher for many stripes and lower for several stripes. In our opinion we know the pitch with 10–15 per cent accuracy. The pitch decreases with the increase of the amount of DOBAMBC and reaches the value of the pitch of the ferroelectric smectic C star phase of DOBAMBC which is between 1 and 3 μm depending on the temperature (we have measured the pitch at a temperature of 29°C).[36] If we compare the rise and decay times of the cells with the mixtures B and C which were obtained in our experiment with those typical for the conventional large-pitch Chs,[37] we see that the rise and decay times of the DOBAMBC/PCH-7 mixtures are 5–10 times shorter (see Table I in Reference 37). On the other hand, the decay times of these mixtures are shorter relatively than those of the nematic PCH-5 which have been measured to be between 80 and 25 ms depending on the temperature.[38] The relaxation of the homeotropic pseudonematic is effected with the appearance of the Grandjean-like textures. This relaxation can be estimated by the formula:

$$\tau \text{ decay} = \eta\, p_0^2/K_{22}\, \pi^4 \tag{6}$$

where η is the rotational viscosity, p_0 is the equilibrium helix pitch and K_{22} is the twist elastic constant.[37]

Let us apply this formula to DOBAMBC-PCH-7 mixtures. With the increase of the amount of DOBAMBC we expect increase of the viscosity and the elastic constant of twist K_{22}. The type of the formula for the relaxation of the homeotropic pseudonematic to the initial Grandjean-like texture as well as the small value of the decay time in comparison to that of the nematic PCH-7 show that the increase of the elastic constant is bigger relatively to the increase of the viscosity. This suggestion can be verified from our experimental results showing the appearance of the Helfrich-Hurault instability and the following formulae taken from the theory of Hurault:

$$U_c^2 = (8\,\pi^3/\Delta\varepsilon)(6K_{22}K_{33})^{1/2}(L/p_0) \tag{7}$$

$$\lambda_c^2 = (3K_{33}/2K_{22})^{1/2}Lp_0 \tag{8}$$

which give the threshold voltage and the wavelength of the instability. From the relations (7) and (8) it is possible to find expressions for calculating the value of the elastic constants of twist K_{22} and bend K_{33}:

$$K_{22} = (1/2)(1/8\,\pi^3)(p_0/\lambda_c)^2\,\Delta\varepsilon\, U_c^2 \tag{9}$$

$$K_{33} = (1/3)(1/8\,\pi^3)(\lambda_c/L)^2\,\Delta\varepsilon\, U_c^2 \tag{10}$$

Let us calculate the value of these elastic constants for mixture C, 15 per cent wt DOBAMBC—85 per cent wt PCH-7 and mixture D in the CGSE system. Taking $U_c = 3/300$ stat V, 4/300 stat V and 6/300 stat V and $\lambda_c = 6\ \mu m$, 4 μm and 2 μm, respectively and $p_0 = 2\ \mu m$ and $L = 8\ \mu m$ (all values are obtained from our experiment) and $\Delta\varepsilon = 10$ (see References 7 to 10), we obtain the following values for K_{22} and K_{33} at $T = 29°C$:

$$K_{22} = 0,\ 2.10^{-6} \text{ dynes, } 0,\ 9.10^{-6} \text{ dynes and } 8.10^{-6} \text{ dunes, respectively.} \tag{11}$$

and

$$K_{33} = 0,\ 8.10^{-6} \text{ dynes, } 0,\ 6.10^{-6} \text{ dynes and } 0,\ 3.10^{-6} \text{ dynes, respectively.} \tag{12}$$

The relations (11) and (12), although approximative, clearly show the tendency of the considerable increase of the value of K_{22} and moderate decrease of K_{33} with the increase of the amount of DOBAMBC. However, additional experiments are needed for the detail measurements of the elastic and viscosity constants.

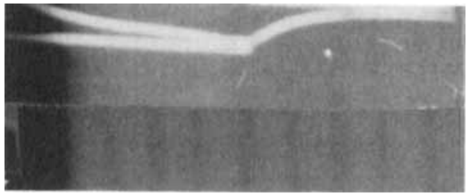


FIGURE 7 Oscillogram with transient rise and decay times for mixture C consisting of 10 per cent wt DOBAMBC-90 per cent wt PCH-7 with a thickness of 8 μm. The voltage impulse was with length of 10^5 μs, period of 2, 5.10^4 μs and height of 10 V. The whole time scale is 20 ms with 2 ms per division.

The mixture G, as noted showed the existence of a smectic A phase. The application of an AC electric field led to reversible electro-optic effects[40,41] which began at 20 V (frequency of 5 kHz) and finished at 40 V. Polygonal-homeotropic-polygonal phase transition was observed. The electrooptic behavior clearly demonstrated the positive dielectric anisotropy of the mixture G.

Dielectric anisotropy of the mixture H, however, was negative and the electrohydrodynamic behavior was typical for the smectic A with negative dielectric anisotropy. This electrooptic behavior was irreversible and began at 20 V with electrohydrodynamic movement of the fluid, accompanied with dynamic scattering of the light passing through the LC cell and followed by irreversible transformation of the focal conic smectic A texture into polygonal smectic A texture.

We have not studied in detail the mixture I consisting of 90 per cent wt DOBAMBC—10 per cent wt PCH-7 which possesses a ferroelectric smectic C star phase at room temperature.

On the Measurement of Eventual Polarization of the 10–50 Per Cent Wt DOBAMBC—90–50 Per Cent Wt PCH-7 Mixtures

First we repeated the experimental results of Kai *et al.*[13] who investigated the P-E hysteresis in thick DOBAMBC cells with vertical position of the smectic C star planes and a periodic variation of the director in the plane of the electrodes (see Figure 2b in Reference 13). The initial orientation of the ferroelectric smectic C phase of DOBAMBC in cells constructed by us was very bad with formation of randomly oriented "fan-shaped" domaines and a bed periodicity as is illustrated in Figure 8a. For obtaining a better orientation, we have applied a method proposed by Kuwahara *et al.*[42] According to this method DC or low-frequency electric field is applied on the isotropic phase of the LC followed by cooling down to the smectic A and the ferroelectric smectic C star phases (the electric field can be removed after the formation of the smectic A phase). Applying a voltage between 30 and 50 V with a frequency of 50 Hz on the isotropic phase of DOBAMBC with a thickness of 20 μm, we have obtained large smectic A "fan-shaped" domains of the ferroelectric smectic C star phase shown in Figure 8b. Using such cells and the well-known Diamant bridge[43,44] (see Figure 9), we observed the hysteresis curves obtained by Kai *et al.*[13] at voltage between 7.5 and 16 V with low-frequency between 16 and 150 Hz. Under the polarizing microscope we have observed pronounced pulsations of the light passing through the cell, especially at low frequency. The

(a)

(b)

FIGURE 8 Demonstration of the orienting effect of a low-frequency voltage with a frequency below 50 Hz and a value between 30 and 50 V applied on the isotropic phase of DOBAMBC which was cooled in the presence of the voltage down to the smectic A and ferroelectric smectic C star phases. a) Badly-oriented ferroelectric smectic C star phase of DOBAMBC with a thickness of 20 μm before the application of the voltage, P ⊥ A. b) Large "fan-shaped" domains with nearly planar position of the smectic C star layers and undulations in the electrode plane of the same DOBAMBC layer after the application of the voltage, P ⊥ A.

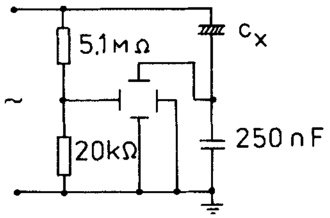


FIGURE 9 Electrical schema of the Diamant bridge used during the measurements.

replacement of the DOBAMBC with cells filled with the 10–50 per cent wt DOBAMBC—90–50 per cent wt PCH-7 mixtures did not show any hysteresis. This experimental result clearly show that in this accuracy (0.1 nC/cm^2) these mixtures do not possess any ferroelectric properties. Consequently, they are cholesterics with unusual electrooptic behavior.

In conclusion, we have studied textural, optic and electrooptic properties of DOBAMBC/PCH-7 mixtures. For some amount of DOBAMBC they showed electrooptic behavior which is promising for application in liquid-crystal optoelectronic.

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