CHAPTER IV

ELASTICITY AND ORIENTATIONAL ORDER IN SOME TRANS-p-n-ALKOXY-α-METHYL CYANOPHENYL CINNAMATES

Introduction

In this Chapter we present the elastic constants for a new series of compounds, namely, trans-p-n-alkoxy-α-methyl cyanophenyl cinnamates. The transition temperatures are given in Table 4.1. The compounds were prepared in our Chemistry laboratory by Mr. B.K. Sadashiva (1976). The compounds are colourless, chemically stable, fairly low temperature liquid crystals. They have strong positive dielectric anisotropy. In this homologous series third, fifth, sixth and seventh members exhibit monotropic nematic phases while the tenth member exhibits a monotropic smectic A phase also. We have studied the second, third, fourth, eighth, ninth and tenth homologues of this series, because these exhibit nematic phase over reasonably large temperature ranges. It is found that these compounds supercool considerably. For this reason, we have made measurements only while cooling the sample. The viscosity of these esters is much larger than that of the cyanobiphenyls. This is clear from the time taken by a deformed sample to relax back after the deforming field is removed.

This fact has to be borne in mind while measuring the critical field: the magnetic field is reduced in steps of ~ 25 gauss and a long time (~ 1 min) is allowed to elapse between successive steps.

As we shall see later in this Chapter, the splay elastic constant of 10 OMCPC does not diverge as smectic-nematic transition is approached while k_{22} and k_{33} do confirming that the lower temperature phase is smectic A

The complete experimental details for the measurements of k_{11}, k_{22} and k_{33} have already been given in Chapters II and III. We shall now present the results.

Results and calculations

For the calculation of the temperature variation of elastic constants we need the values of S and ρ . The relative values of S and ρ are calculated from the refractive index measurements (see Appendix II).

(i) Refractive index: The values of n_o and n_e for three wavelengths λ5461 Å, λ 5893 Å and λ6328 Å

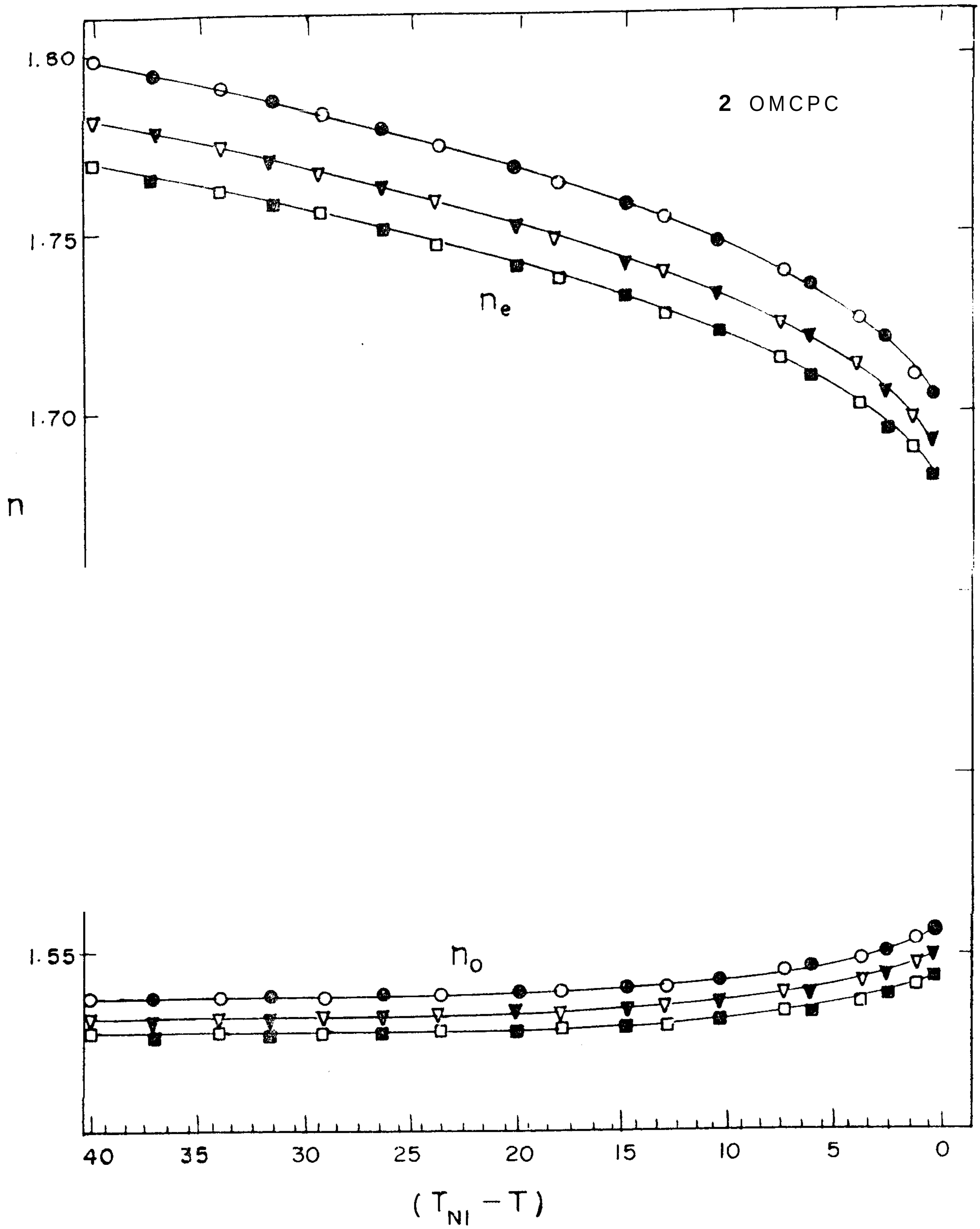


Figure 4.1a

The refractive indices of 2 OMCPC as functions of the relative temperature; The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively.

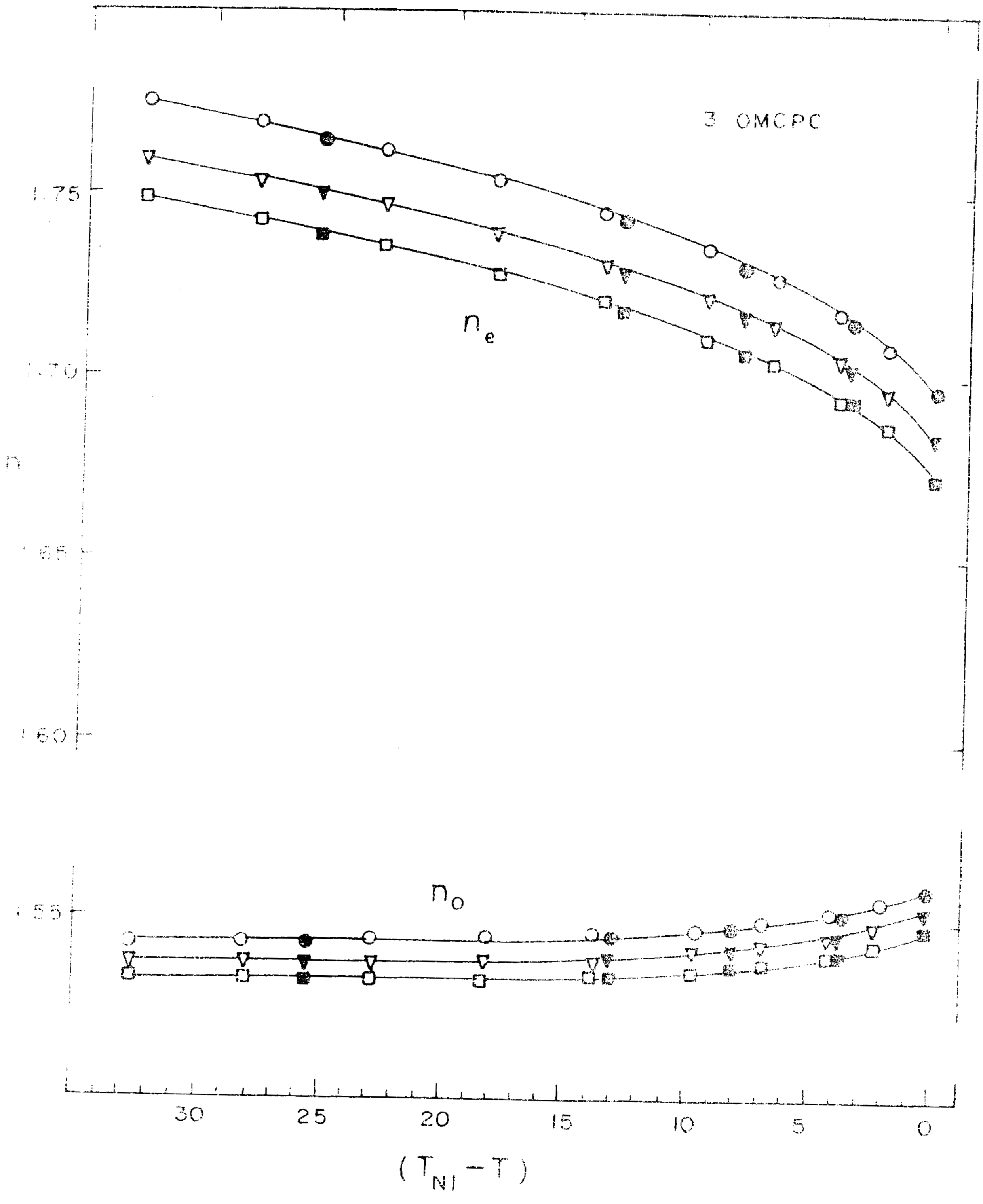


Figure 4.1b

The refractive indices of 3OMCPC as functions of the relative temperature. The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively.

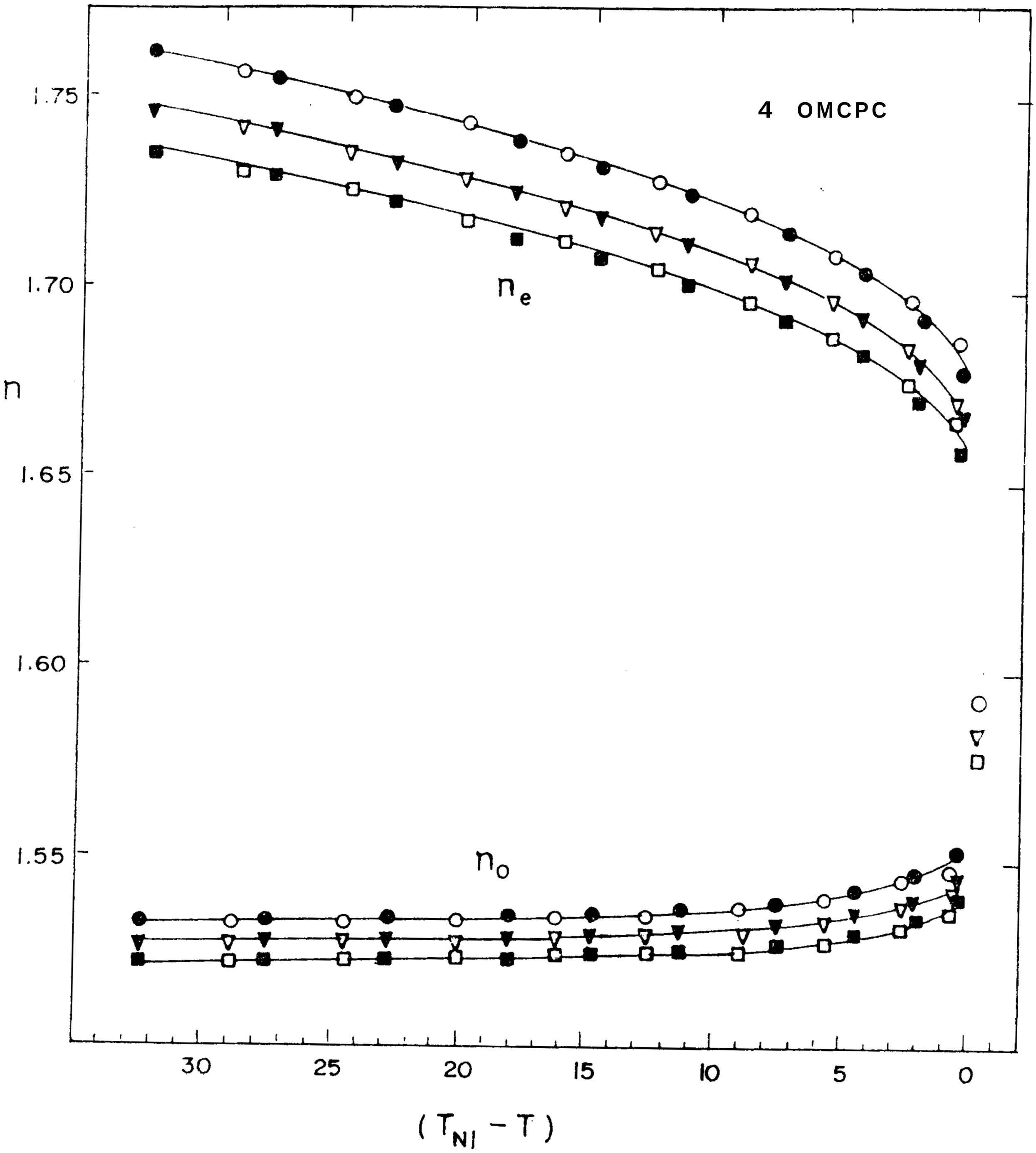


Figure 4.1c

The refractive indices of 4 OMCPC as functions of the relative temperature. The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively.

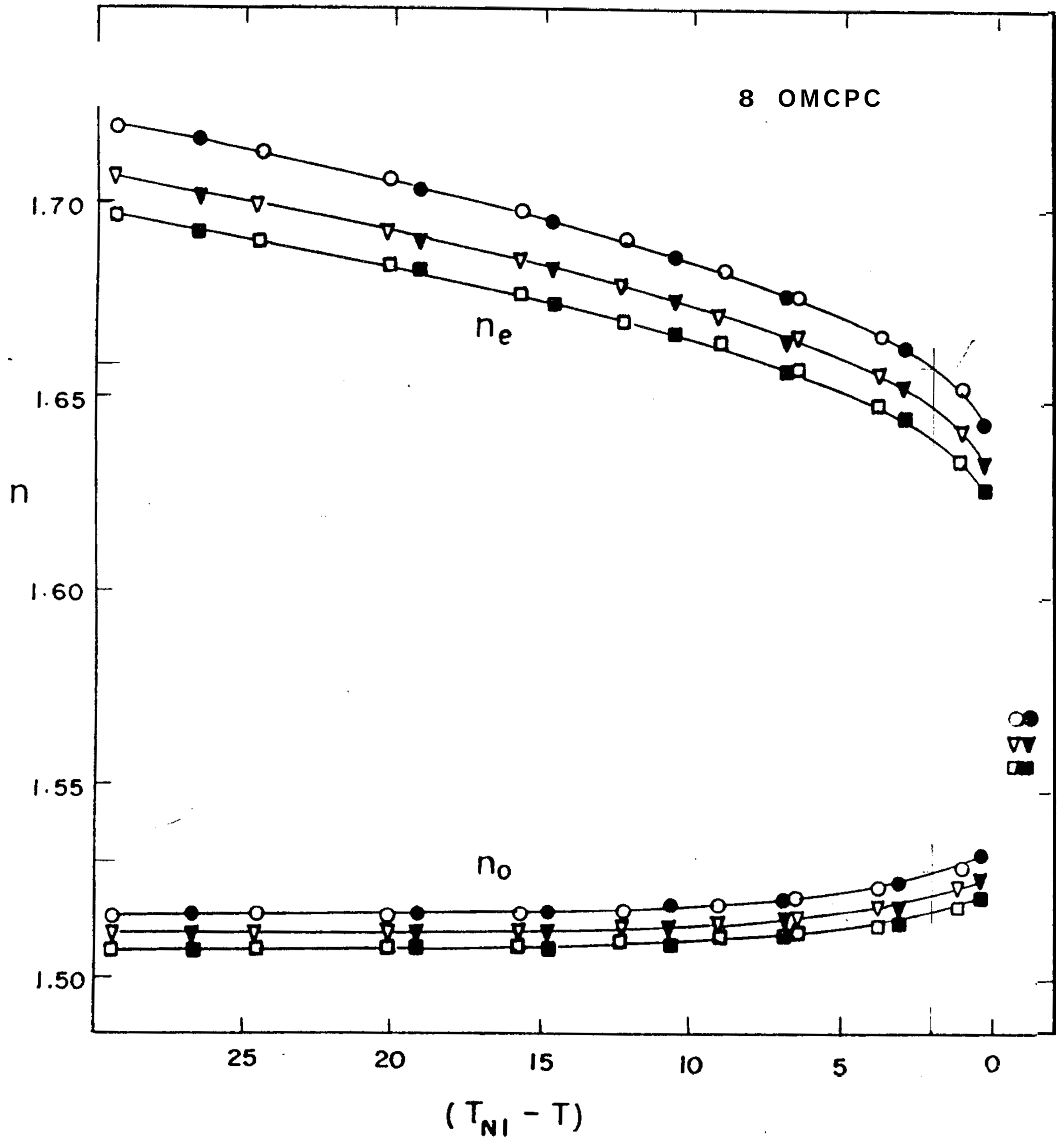


Figure 4.1d

The refractive indices of 8 OMCPC as functions of the relative temperature. The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively.

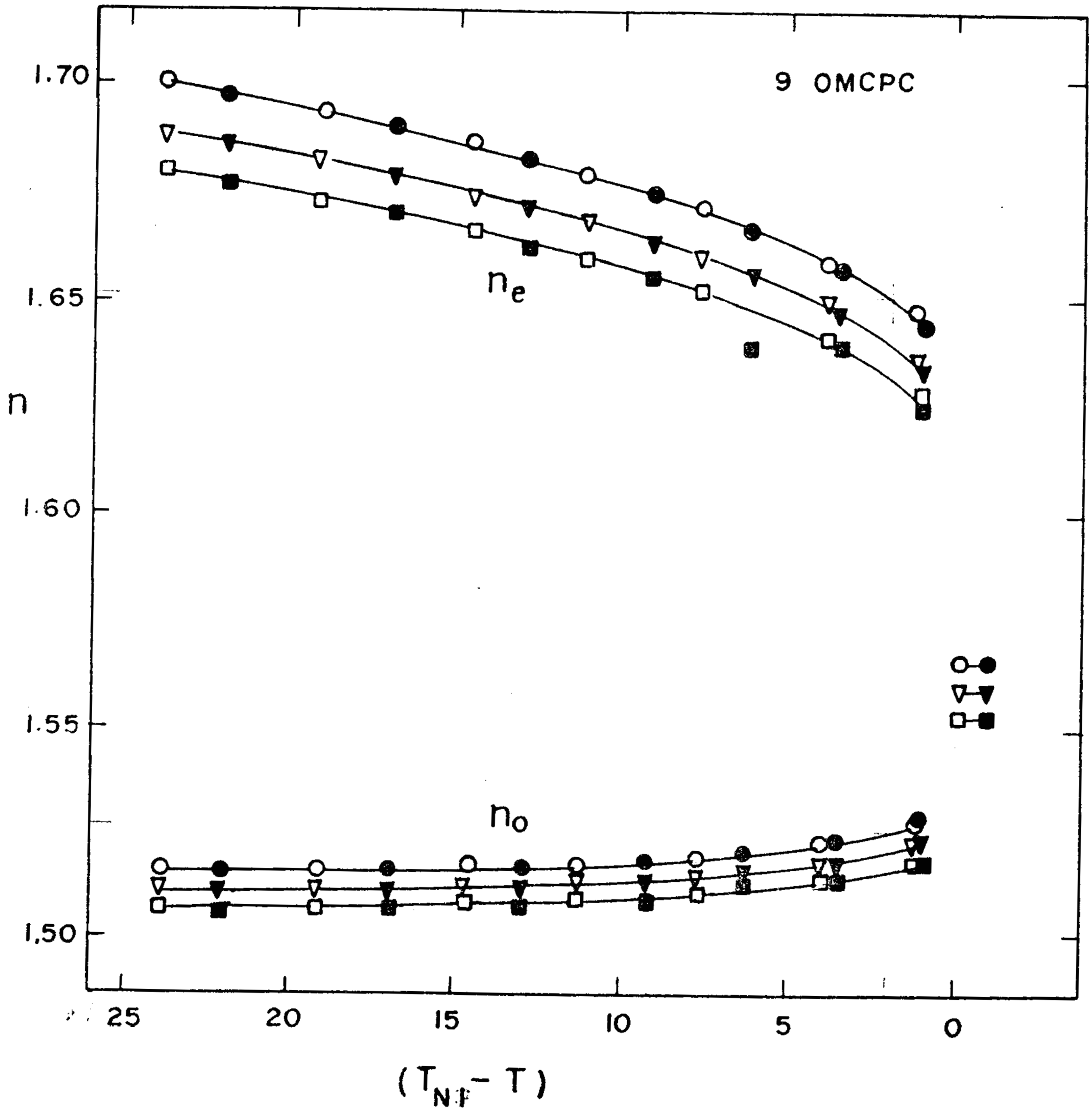


Figure 4.1e

The refractive indices of 9 OMCPC as functions of the relative temperature. The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively,

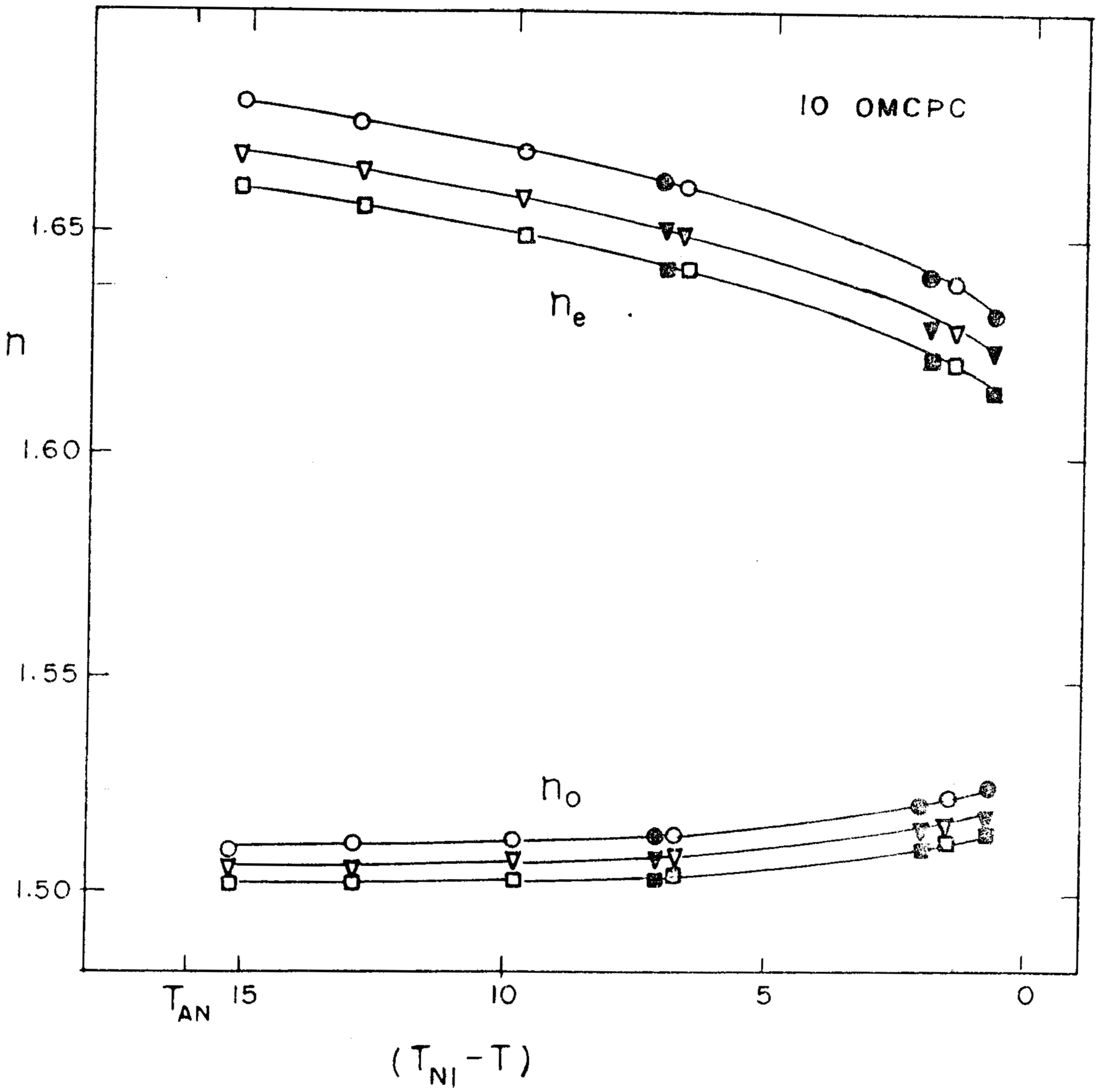


Figure 4.1f

The refractive indices of 10 OMCPC as functions of the relative temperature. The circles, triangles and squares are the values for λ 5461 Å, λ 5893 Å and λ 6328 Å respectively;

are given in Table 4.2. They are plotted in figure 4.1. The values from different samples are marked separately.

(ii) <u>Density</u>: We have measured the densities of only two compounds in fhe series. The measurements were made for 2 OMCPC at 13°C below T_{NI} and for 8 OMCPC at 8°C below T_{NI}, using the capillary method (see Appendix II). From the refractive index data, $\bar{\alpha}$ is calculated for these compounds for different wavelengths.

Assuming a uniform increment $\left(\frac{\bar{\alpha}_8 - \bar{\alpha}_2}{6}\right)$ in $\bar{\alpha}$ on going from one to the next higher member of the series, $\bar{\alpha}$ is estimated for other compounds also. Using the values of $[\overline{(n^2 - 1)}/\overline{(n^2 + 2)}]$ normalised to λ 5893 Å values, the densities at $(T_{NI} - T) = 10°C$ for other compounds are calculated. Table 4.3 gives the measured and estimated values of ρ and $\bar{\alpha}$.

Assuming again that $\bar{\alpha}$ is temperature independent, we have calculated the temperature variation of ρ using $\bar{\alpha}$ and $\overline{(n^2 - 1)}/\overline{(n^2 + 2)}$ (see equation (3.1)). Table 4.4 contains the density values calculated for various relative temperatures using equation (3.1). Two independent measurements on different samples were made for all compounds. The temperature variation of density is plotted in figure 4.2.

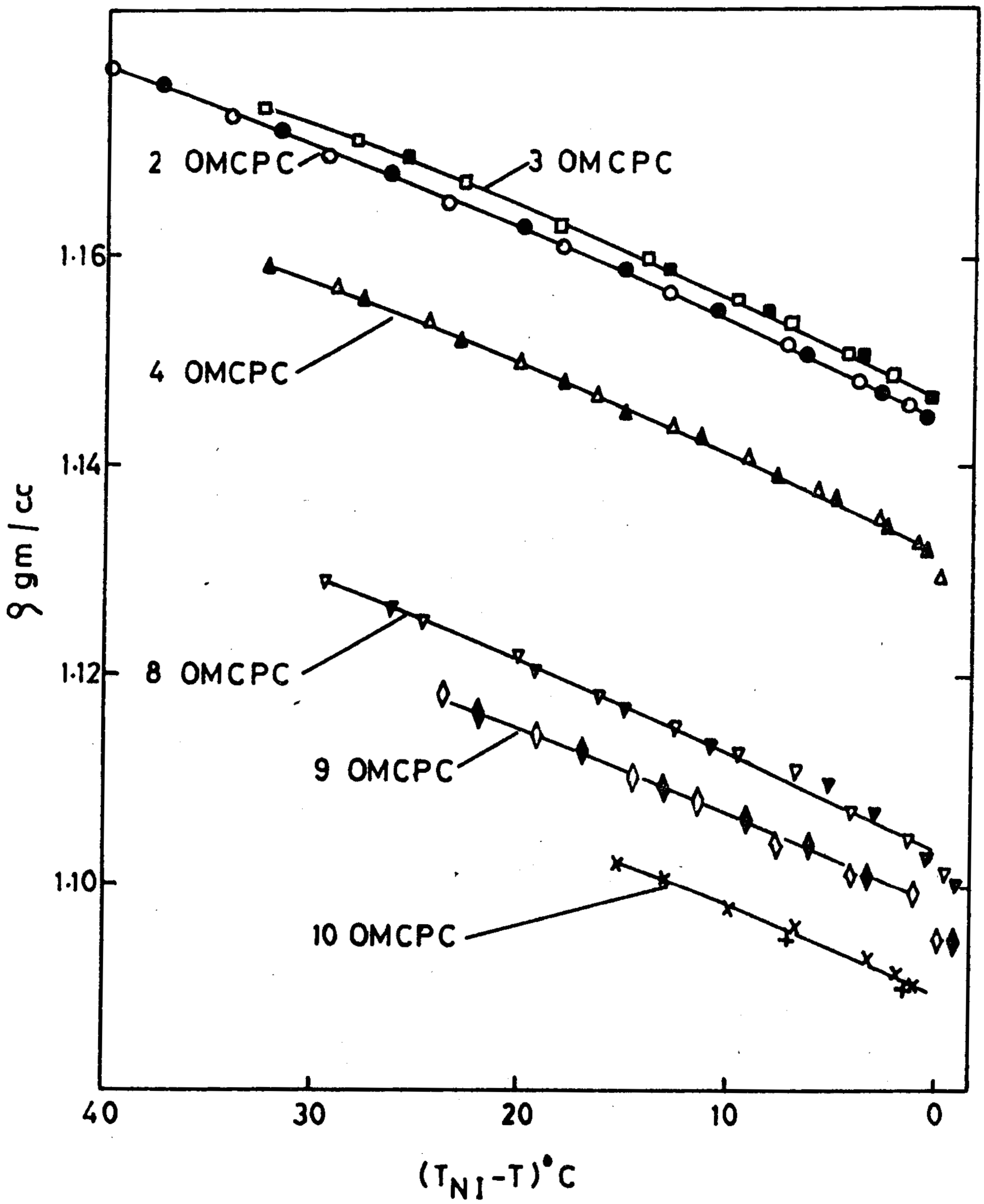


Figure 4.2

Variation of the density with relative temperature of six homologues of n OMCPC calculated from the optical data. Each symbol represents a value averaged over the calculations for three wavelengths.

(iii) Order parameter S: The temperature variation of order parameter of 8 OMCPC has been recently determined by Fernandes (1976) from I.R. dichroism studies. The temperature variations of S and $(n_e^2 - n_o^2)/(\overline{n^2} - 1)$ agree quite well. With $\frac{\bar{\alpha}}{\Delta\alpha} = 1.35$ for λ5893 Å, the order parameter calculated from optical anisotropy studies agrees with that from I.R. studies within ±0.5% throughout the entire nematic range. Thus $\Delta\alpha_{8\ OMCPC}$ was calculated using $\bar{\alpha}$ value from density data. The change in $\Delta\alpha$ on going from one member of the series to the next was calculated assuming an all-trans configuration of the end chain for all the members studied. The details of calculations are given in Appendix II. (As mentioned in the previous chapter, even if the all-trans configuration is not valid, the error involved in estimating $\Delta\alpha$ is small because change of $\Delta\alpha$ from one member to the next is less than 1% .) The estimated values of α and are given in Table 4.5. The temperature variation of absolute values of S thus calculated are given in Table 4.6. They are represented graphically in figure 4.3.

(iv) Elastic constants: As shown in Chapter I we have

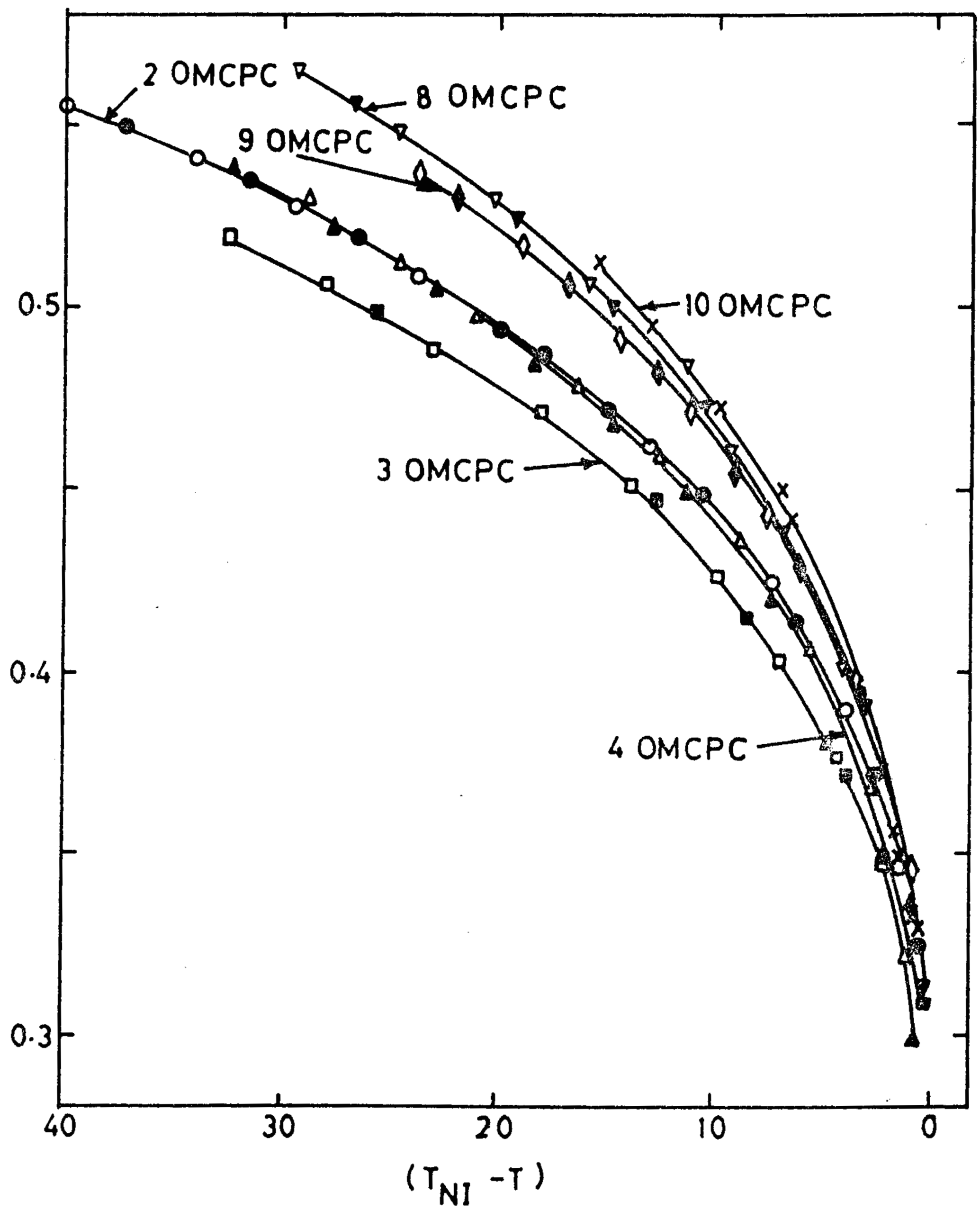


Figure 4.3

Variation of the order parameter with temperature for sir homologues of nOMCPC. The values for λ 5461 Å and λ 6328 Å are normalized to that for λ 5893 Å at the lowest temperature.

$$k_{11} = \frac{H_c^2 \, x_o^2}{\pi^2} \, \Delta\chi_{om} \cdot S \cdot \rho$$

Since the values of $\Delta\chi_{om}$ of the compounds studied here are unknown, we have calculated the values of $k_{11}/\Delta K$ as functions of temperature (AX is the anisotropy of the magnetic susceptibility of a gram molecule of thr substance). As mentioned in Chapter II we assume that the anisotropy of susceptibility is essentially determined by the aromatic part of the molecule so that AX is constant far all members of the series.

$$\frac{k_{11}}{\Delta K} = \frac{H_c^2 \, x_o^2}{\pi^2 \, M} \, S \cdot \rho \qquad (4.1)$$

Tables 4.7, 4.8 and 4.9 give the temperature variations of splay, twist and bend constants respectively. We have least squares fitted the values to an equation $\frac{k_{11}}{\Delta K} = CS^x$ (Table 4.10) except for k_{22} and k_{33} of 10 CMCPC. Figures 4.4, 4.5 and 4.6 give the values of $k_{11}/\Delta K$, along with the fitted curves.

Discussions

For the sake of comparison, we have plotted the nematic-isotropic transition temperatures and tho

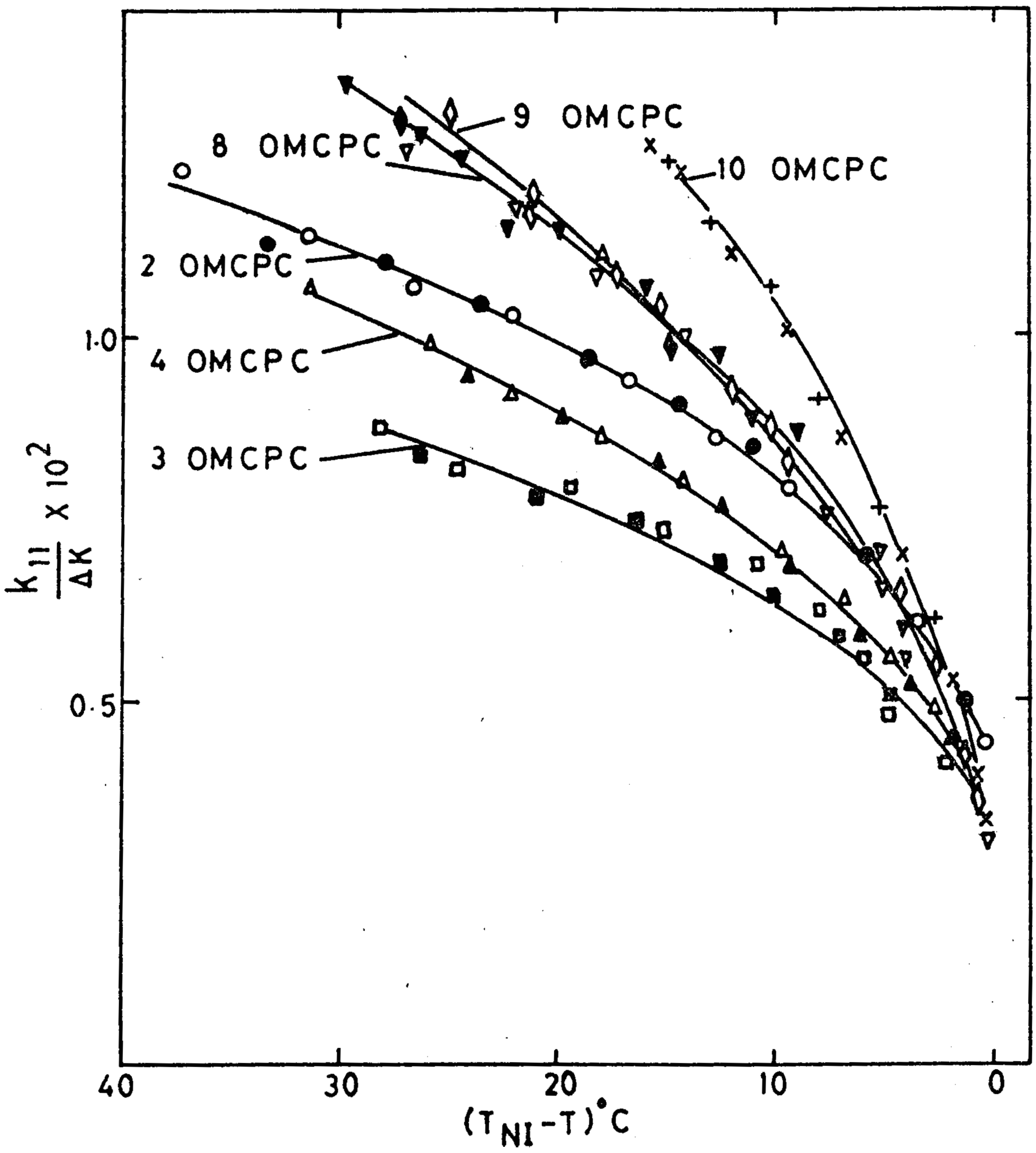


Figure 4.4

Temperature variation of $k_{11}/\Delta K$ of n-OMCPC.

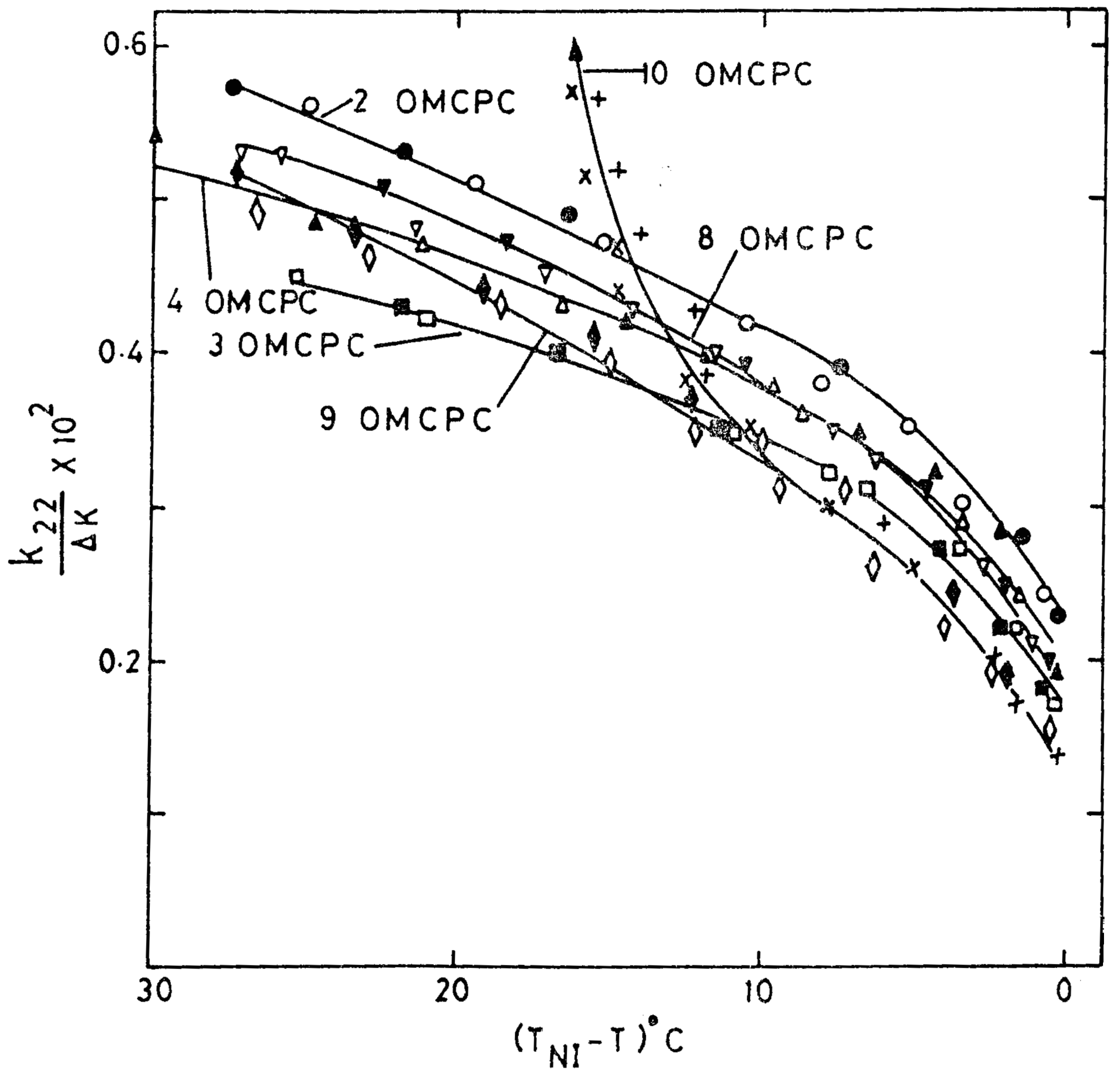


Figure 4.5

Temperature variation of $k_{22}/\Delta K$ of n-OMCPC.

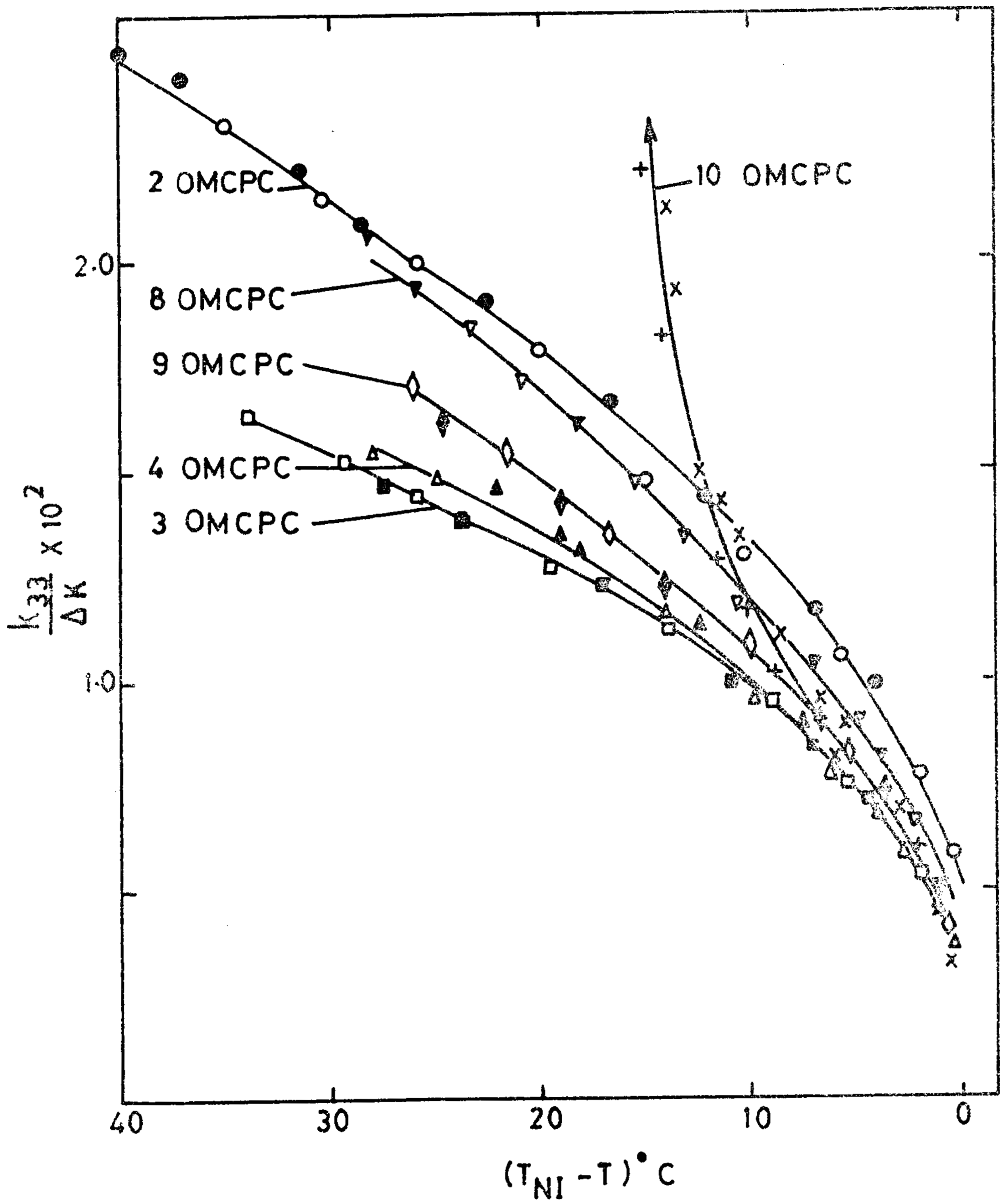


Figure 4.6

Temperature variation of $k_{33}/\Delta K$ of n–OMCPC.

corresponding heats of transition (Sadashiva, private communication) of those homologues studied in figure 4.7. In the lower section of the figure, S, $k_{11}/\Delta K$, $k_{22}/\Delta K$ and $k_{33}/\Delta K$ at $T_{NI}-T = 3°C$ ere given. It is obvious that the behaviour in this series is more complicated than in the case of the biphenyls. Firstly T_{NI} alternates regularly in both the groups of three compounds (I group - 2 OMCPC, 3 OMCPC, 4 OMCPC, and II group - 8 OMCPC, 9 OMCPC, 10 OMCPC) that we have studied. The even members have higher transition points, as can be expected for compounds with alkoxy end chains. The alternation is particularly strong in the first group with lower homologues, again as is to be expected.

The order parameters also exhibit a corresponding alternation, although one sees a considerable increase in the order parameters sf the second group as compared with those of the first group. The heats of transition exhibit a trend which is similar to that of S, as is to be expected.

All the elastic constants alternate in both the groups, although there is no uniform trend amongst the three elastic constants. Thus, although the bend constant decreases considerably between the second and

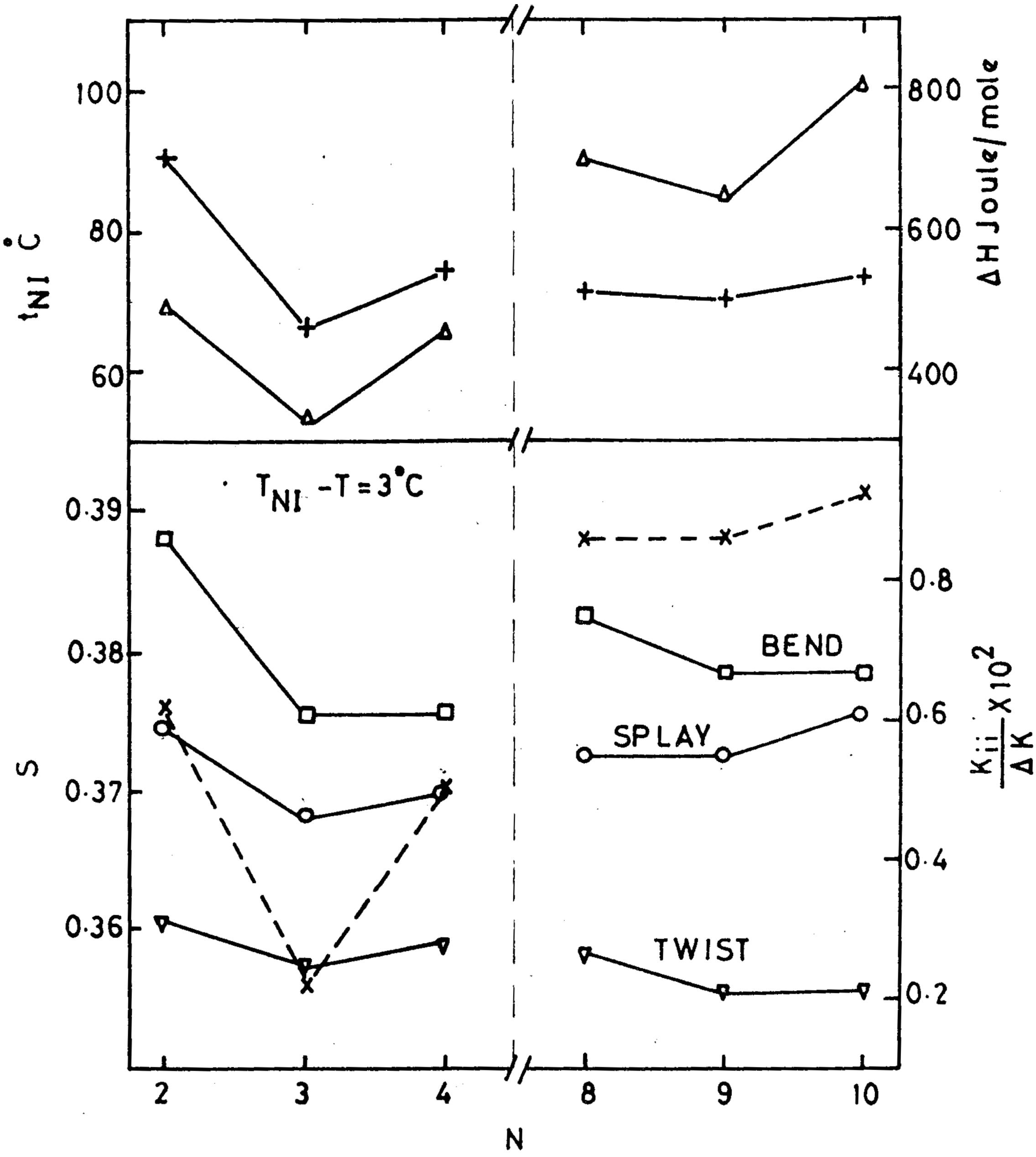


Figure 4.7

The nematic-isotropic transition points (+), *the* beats of transition (Δ), the order parameters (x), splay elastic constants (o), twist elastic constants (∇) and bend elastic constants of n-OMCPC as functions of the number of carbon atoms in the end chain. The parameters plotted in the lower section of the figure are those at $T_{NI} - T = 3°C$. $k_{ii}/\Delta K$ are in cgs units.

third members, there is hardly any increase between third and fourth members despite the fact that both T_{NI} and S show considerable increases between the Utter two members. A similar decrease between eighth and ninth members and a levelling off between ninth and tenth members is also seen. However the tenth member exhibits a smectic phase at lower temperatures and hence k_{33} increases strongly as the temperature is decreased (figure 4.6). k_{22} of the second group of homologues behaves in a similar fashion. On the other hand the splay constant increases considerably between the ninth and tenth members. Thus in the tenth member, k_{11} and k_{33} near T_{NI}, have values close to each other. This is reminiscent of the behaviour of 8CB in which k_{11} kas actually has a larger value than k_{33} near T_{NI}. Like the order parameters both k_{33} and k_{11} increase considerably between 4 OMCPC and 8 OMCPC.

We have also calculated the temperature dependence of the ratios of elastic constants in all the compounds (Table 4.11). k_{11}/k_{22} can be roughly taken to be temperature independent in all compounds except in 4 OMCPC and 8 OMCPC where it decreases with increase in temperature. In all the cases, k_{33}/k_{11} and k_{33}/k_{22} decrease as temperature increases. Further, though these ratios at any given relative temperature are comparable for neighbouring homologues, they are by no means constant throughout the series. It is also interesting to note that at any given relative temperature k_{33}/k_{22} has the lowest value for 4 OMCPC.

Fitting the data to a formula of the type $(k_{11}/\Delta K) = CS^{x}$, we notice that k_{11} and k_{22} of the second, third, fourth and eighth homologues follow approximately the mean field trend of x being close to 2, with the exception of k_{22} of 4 OMCPC for which x is considerably less than 2 (4 OMCPC has the lowest index x for k_{33} also). An index x which is lower than 2 for k_{22} may mean that the ratio $\xi_{\perp}/\xi_{\parallel}$ decreases with decreasing temperature, i.e., the cybotactic group with smectic-like order is getting elongated at lower temperatures. In the case of k_{33}, x is considerably greater than 2 for all the compounds suggesting an increase in $\xi_{\parallel}$ as the temperature is decreased. However there are no X-ray data available as yet, on any of these compounds. It would be interesting to test the above inferences from the X-ray studies.

Thus the properties of this series of compounds changes in a fairly complicated manner. Although the different properties show the odd-even effect, there appears to be considerable differences between the two groups that are studied. Since the molecules are strongly polar, with a nitrile group sticking at one end of the molecule, we may have again double-molecular layers due to strong antiparallel correlations between neighbouring molecules (see for example McMillan 1973, Leadbetter et al. 1975). The substantial increases in S, ΔH and k_{33} between 4 OMCPC and 8 OMCPC are particularly noteworthy. The fifth, sixth and seventh homologues form monotropic nematic phases (figure 4.8). From the figure it is evident that the melting point of the crystal steadily decreases between tho second and fourth homologues and then increases drastically between the fourth and fifth members and thereafter again decreases steadily till the ninth member. Thus, it is possible that the crystal structure nay change considerably between tho fourth and fifth members. Thus the two groups of compounds studied may have different crystal structures. It is also quite probable that the structure of short range order in these two groups of compounds is somewhat different. This should be such as to give rise to the elevated values of S, ΔH and k_{33} for the second group of compounds. Again, it would be interesting to check this point by X-ray studies.

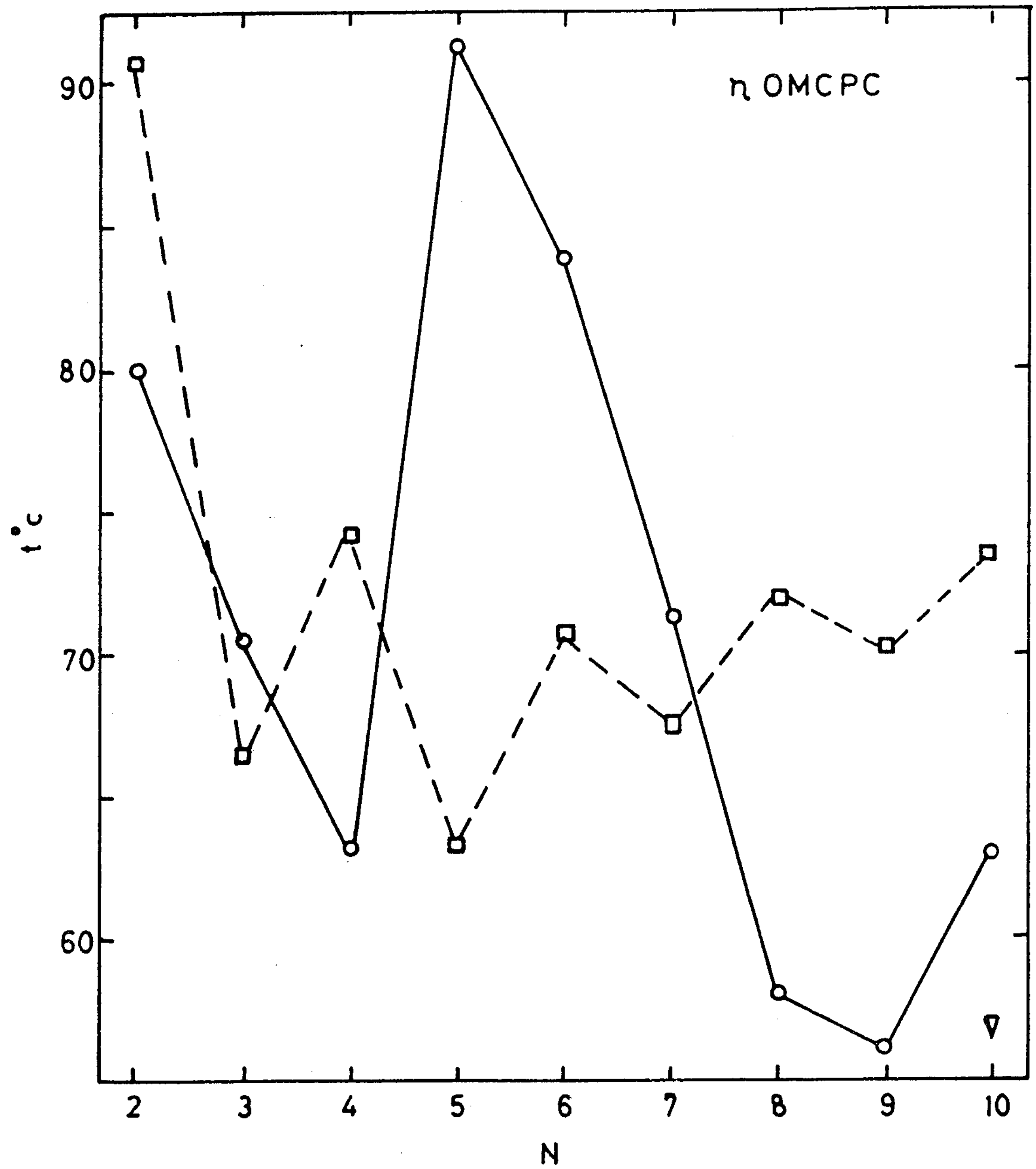


Figure 4.8

Transition temperatures of second to tenth homologues of nOMCPC as functions of the number of carbon atoms in the end chain: solid-nematic or solid-isotropic transition pointa (circles), nematic-isotropic transition points (squares) and smectic-nematic transition point (triangle).

The temperature variations of density in all the members of the series are shown fa figure 4.2. Normally, the addition of a CH_2-group would tend to reduce the density of the liquid crystal (see e.g. figure 3.6 for cyanobiphenyls). However we see that between 2 OMCPC and 3 OMCPC there is actually a small increase in the density in the nematic phase at the same relative temperature. This may be related with the considerable reduction in T_{NI} itself between them (figure 4.7). The density drops considerably between 3 OMCPC and 4 OMCPC. The drop appears to be slightly more than what one would expect from the addition of a CH_2 group and the increase in T_{NI} between the two compounds. Thus the structure of 4 OMCPC appears to be slightly less closely packed than in the other cases. This should also explain the fact that k_{33}/k_{22} has the lowest values for this compound and that tho index x for k_{22} is < 2. The densities of the compounds in the second group (eighth, ninth and tenth members) show the normal trend.

References

Fernandes, J.R. 1976 (private communication).

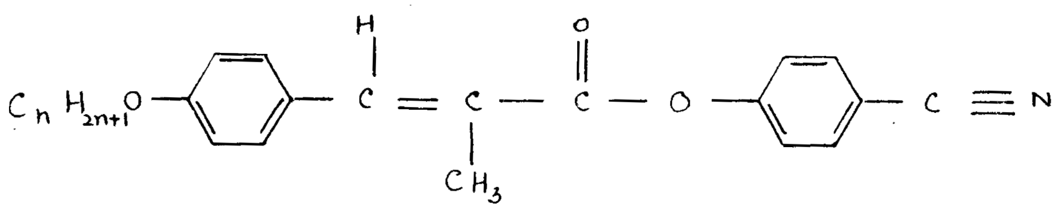
Leadbetter, A.J., Richardson, R.M. and Colling, C.N. 1975 J. de Physique C1-37.

McMillan, W.L. 1973 Phys. Rev. A7, 1419.

Sadashiva, B.K. 1976 Mol. Cryst. Liquid Cryst. 35 (3 & 4), 205.

Table 4.1

Transition temperatures (in °C) of trans-p-n-alkoxy-α-methyl-p'-cyanophenyl cinnamate (nOMCPC) (Sadashiva 1976).



	crystal-smectic or crystal-nematic or crystal-isotropic	smectic-nematic	nematic-isotropic
2 OMCPC	80	-	90.6
3 OMCPC	70.5-71	-	66.6*
4 OMCPC	63	-	73.8
8 OMCPC	58	-	72.0
9 OMCPC	56	-	70.3
10 OMCPC	62.8	57.1*	73.5

*monotropic transitions

Table 4.2: Refractive indices of nOMCPC

(i) 2 OMCPC

$T_{NI}-T$ °C		λ 5461 n_o	λ 5461 n_e	λ 5893 Å n_o	λ 5893 Å n_e	λ 6328 n_o	λ 6328 n_e
0.5	(I)*	1.555	1.704	1.546	1.691	1.543	1.682
1	(II)	1.553	1.709		1.697	1.540	1.689
2.7	(I)	1.549	1.720	1.543	1.706	1.538	1.695
3.8	(II)	1.547	1.725	1.541	1.712	1.535	1.701
6.2	(I)	1.545	1.734	1.538	1.721	1.533	1.710
7.4	(II)	1.544	1.738	1.537	1.724	1.532	1.714
10.6	(I)	1.542	1.747	1.536	1.733	1.531	1.722
13.0	(II)	1.540	1.753	1.534	1.738	1.529	1.727
14.9	(I)	1.540	1.757	1.534	1.742	1.529	1.732
18.0	(II)	1.539	1.763	1.533	1.748	1.528	1.737
20.0	(I)	1.539	1.767	1.533	1.752	1.528	1.741
23.6	(II)	1.538	1.773	1.532	1.758	1.527	1.746
26.4	(I)	1.538	1.778	1.532	1.762	1.527	1.751
29.2	(II)	1.537	1.782	1.531	1.766	1.527	1.755
31.7	(I)	1.537	1.786	1.531	1.770	1.527	1.758
34.0	(II)	1.537	1.789	1.531	1.773	1.527	1.761
37.2	(I)	1.537	1.794	1.531	1.778	1.527	1.766
40.0	(II)	1.537	1.797	1.531	1.781	1.527	1.769

(ii) 3 OMCPC

$T_{NI}-T$ °C		λ 5461 n_o	λ 5461 n_e	λ 5893 Å n_o	λ 5893 Å n_e	λ 6328 n_o	λ 6328 n_e
0.3	(I)	1.559	1,696	1.553	1.683	1.548	1.672
2.3	(II)	1.555	1.707	1.548	1.695	1.543	1.686
3.8	(I)	1.552	1.715	1.546	1.703	1.540	1.694
4.2	(I	1.552	1.717	1.545	1.704	1.540	1.693
6.9	(I	1.549	1.726	1.543	1.713	1.538	1.703
8.2	(I)	1.548	1.730	1.542	1.717	1.537	1.707
9.7	(II)	1.547	1.734	1.541	1.721	1.536	1.710
13.1	(I)	1.546	1.743	1.540	1.728	1.535	1.718
13.9	(II)	1.546	1.744	1.539	1.730	1.535	1.720
18.3	(II)	1.544	1.753	1.538	1.739	1.533	1.727
22.9	(II)	1.544	1.761	1.538	1.746	1.533	1.735
25.6	(I)	1.543	1.764	1.537	1.750	1.533	1.739
28.1	(II)	1.543	1.768	1.537	1.753	1.533	1.742
32.6	(II)	1.543	1.774	1.537	1.759	1.533	1.748

Table 4.2 continued

(Ail) 4 OMCPC

$T_{NI}-T$ °C		λ 5461 Å n_o	λ 5461 Å n_e	λ 5893 Å n_o	λ 5893 Å n_e	λ 6328 Å n_o	λ 6328 Å n_e
-0.2	(I)	1.592		1.584		1.578	
0.6	(II)	1.552	1.677	1.546	1.665	1.540	1.657
0.8	(I)	1.548	1.686	1.542	1.670	1.537	1.665
2.3	(II)	1.546	1.692	1.540	1.680	1.535	1.670
2.7	(I)	1.544	1.697	1.538	1.685	1.533	1.675
4.6	(II)	1.542	1.703	1.536	1.691	1.531	1.682
5.7	(I)	1.540	1.709	1.534	1.697	1.529	1.688
7.6	(II)	1.539	1.714	1.533	1.701	1.528	1.691
9.0	(I)	1.538	1.720	1.532	1.707	1.527	1.697
11.4	(II)	1.537	1.724	1.531	1.711	1.526	1.701
12.6	(I)	1.536	1.728	1.530	1.715	1.526	1.705
14.8	(II)	1.536	1.731	1.530	1.718	1.525	1.708
16.2	(I)	1.535	1.735	1.529	1.722	1.525	1.712
18.1	(II)	1.535	1.738	1.529	1.724	1.524	1.715
20.1	(I)	1.534	1.743	1.528	1.729	1.524	1.718
22.9	(II)	1.534	1.747	1.528	1.732	1.524	1.722
24.5	(I)	1.533	1.750	1.528	1.736	1.524	1.726
27.6	(II)	1.533	1.754	1.528	1.740	1.523	1.729
28.9	(I)	1.533	1.756	1.528	1.742	1.523	1.731
32.4	(II)	1.533	1.761	1.527	1.746	1.523	1.735

(iv) 8 OMCPC

$T_{NI}-T$ °C		λ 5461 Å n_o	λ 5461 Å n_e	λ 5893 Å n_o	λ 5893 Å n_e	λ 6328 Å n_o	λ 6328 Å n_e
-1.1	(I)	1.569		1.562		1.556	
-0.6	II)	1.569		1.562		1.556	
0.4	(I)	1.533	1.643	1.527	1.633	1.523	1.627
1.2	(II)	1.529	1.652	1.524	1.642	1.520	1.634
3.1	(I)	1.526	1.663	1.520	1.653	1.516	1.645
3.9	(II)	1.525	1.666	1.519	1.656	1.515	1.648
6.7	(II)	1.522	1.677	1.517	1.666	1.513	1.657
6.9	(I)	1.522	1.676	1.516	1.666	1.513	1.657
9.2	(II)	1.520	1.683	1.515	1.672	1.512	1.664
10.7	(I)	1.520	1.687	5	1.675	1.510	1.667
12.4	(II)	1.519	1.691	1.514	1.679	1.511	1.670
14.8	(I)	1.518	1.695	1.513		1.509	1.674
15.9	(II)	1.518	1.698	1.513	1.686	1.509	1.677
19.2	(I)	1.517	1.703	1.512	1.691	1.509	1.683
20.3	(	1.517	1.706	1.512	1.693	1.509	1.685
24.6	(	1.517	1.713	1.512	1.700	1.508	1.690
26.6	(	1.517	1.716	1.512	1.702	1.508	1.693
29.4	(	1.516	1.719	1.512	1.797	1.508	1.697

*

Table 4.2 continued

(v) 9 OMCPC

$T_{NI}-T$ °C	5461 Å n_o	5461 Å n_e	5893 Å n_o	5893 Å n_e	6328 Å n_o	6328 Å n_e
-1.1 (I)	1.565		1.558		1.552	
-0.3 (II)	1.564		1.558		1.552	
0.9 (I)	1.528	1.642	1.523	1.632	1.519	1.624
1.0 (II)	1.527	1.645	1.521	1.634	1.518	1.626
3.4 (I)	1.523	1.655	1.518	1.645	1.514	1.638
3.8 (II)	1.522	1.656	1.517	1.647	1.513	1.639
6.1 (I)	1.520	1.665	1.515	1.654	1.514	1.638
7.6 (II)	1.519	1.669	1.514	1.658	1.510	1.650
9.1 (I)	1.518	1.673	1.513	1.662	1.510	1.654
11.1 (II)	1.517	1.677	1.513	1.666	1.509	1.658
12.8 (I)	1.517	1.681	1.512	1.670	1.508	1.661
14.4 (II)	1.516	1.684	1.512	1.672	1.508	1.664
16.8 (I)	1.516	1.688	1.511	1.677	1.508	1.669
19.0 (II)	1.515	1.691	1.511	1.680	1.507	1.671
21.9 (I)	1.515	1.696	1.511	1.685	1.507	1.676
23.7 (II)	1.515	1.699	1.511	1.687	1.507	1.678

(vi) 10 OMCPC

$T_{NI}-T$ °C	5461 Å n_o	5461 Å n_e	5893 Å n_o	5893 Å n_e	6328 Å n_o	6328 Å n_e
0.8 (I)	1.525	1.631	1.519	1.623	1.515	1.614
1.6 (II)	1.522	1.637	1.517	1.627	1.513	1.620
2.0 (I)	1.521	1.639	1.516	1.628	1.512	1.621
6.7 (II)	1.514	1.659	1.509	1.649	1.505	1.641
7.1 (I)	1.513	1.661	1.509	1.650	1.504	1.642
9.9 (II)	1.512	1.667	1.507	1.657	1.503	1.649
13.0 (II)	1.511	1.674	1.506	1.663	1.503	1.655
15.3 (II)	1.510	1.678	1.505	1.667	1.502	1.659

Table 4.3: Average polarizability of nOMCPC

	ρ at $(T_{NI}-T)=10°C$ gm/cc	$\bar{\alpha} \times 10^{24}$ cm^3		
		λ5461 Å	λ5893 Å	λ6328 Å
2 OMCPC	1.156* [at $(T_{NI}-T)=13°C$]	36.70	36.29	35.96
3 OMCPC	1.156	38.29	37.86	37.53
4 OMCPC	1.142	39.88	39.43	39.10
8 OMCPC	1.109* [at $(T_{NI}-T)=8°C$]	46.21	45.72	45.40
9 OMCPC	1.107	47.80	47.29	46.97
10 OMCPC	1.099	49.39	48.86	48.54

*measured values

Table 4.4: Density of nOMCPC

$T_{NI}-T$ °C	Density ρ gm/cc			
	λ5461 Å	λ5893 Å	λ6328 Å	Mean
		(i) 2 OMCPC		
1.3	1.1460	1.1453	1.1455	1.1456
3.8	1.1489	1.1480	1.1472	1.1480
7.4	1.1525	1.1515	1.1512	1.1517
13.0	1.1579	1.1560	1.1556	1.1565
18.0	1.1616	1.1605	1.1601	1.1607
23.6	1.1657	1.1648	1.1648	1.1651
29.2	1.1706	1.1692	1.1688	1.1695
34.0	1.1743	1.1731	1.1727	1.1734
40.0	1.1785	1.1777	1.1774	1.1779
0.5	1.1454	1.1448	1.1445	1.1449
2.7	1.1481	1.1471	1.1466	1.1473
6.2	1.1513	1.1508	1.1505	1.1509
10.6	1.1556	1.1548	1.1542	1.1549
14.9	1.1600	1.1584	1.1580	1.1588
20.0	1.1636	1.1628	1.1623	1.1629
26.4	1.1685	1.1673	1.1671	1.1676
31.7	1.1730	1.1717	1.1710	1.1719
37.2	1.1772	1.1760	1.1757	1.1763
		(ii) 3 OMCPC		
2.3	1.1492	1.1486	1.1484	1.1487
4.2	1.1515	1.1510	1.1502	1.1509
6.9	1.1540	1.1535	1.1535	1.1537
9.7	1.1564	1.1557	1.1556	1.1559
13.9	1.1604	1.1594	1.1595	1.1598
18.3	1.1635	1.1634	1.1622	1.1630
22.9	1.1676	1.1671	1.1665	1.1671
28.1	1.1713	1.1706	1.1699	1.1706
32.6	1.1740	1.1737	1.1730	1.1736
0.3	1.1480	1.1472	1.1461	1.1471
3.8	1.1509	1.1508	1.1504	1.1507
8.2	1.1550	1.1547	1.1546	1.1548
13.1	1.1596	1.1588	1.1585	1.1590
25.6	1.1687	1.1687	1.1684	1.1686

Table 4.4 continued

$T_{NI}-T$ °C	Density ρ gm/cc			
	λ5461 Å	λ5893 Å	λ6328 Å	Mean
(iii) 4 OMCPC				
-0.2	1.1287	1.1290	1.1288	1.1285
0.8	1.1334	1.1313	1.1330	1.1326
2.7	1.1355	1.1354	1.1346	1.1352
5.7	1.1381	1.1380	1.1378	1.1380
9.0	1.1415	1.1415	1.1406	1.1412
12.6	1.1444	1.1443	1.1440	1.1442
16.2	1.1474	1.1473	1.1468	1.1472
20.1	1.1505	1.1505	1.1496	1.1502
24.5	1.1540	1.1537	1.1535	1.1537
28.9	1.1574	1.1570	1.1562	1.1569
0.6	1.1325	1.1323	1.1320	1.1323
2.3	1.1342	1.1344	1.1340	1.1342
4.6	1.1370	1.1366	1.1360	1.1365
7.6	1.1400	1.1390	1.1386	1.1392
11.4	1.1431	1.1427	1.1419	1.1426
14.8	1.1459	1.1455	1.1448	1.1454
18.1	1.1485	1.1482	1.1480	1.1482
22.9	1.1525	1.1521	1.1515	1.1520
27.6	1.1561	1.1556	1.1553	1.1557
32.4	1.1595	1.1594	1.1584	1.1591
(iv) 8 OMCPC				
-0.6	1.1012	1.1015	1.0999	1.1009
1.2	1.1046	1.1049	1.1040	1.1045
3.9	1.1075	1.1077	1.1068	1.1073
6.7	1.1110	1.1109	1.1095	1.1105
9.2	1.1123	1.1130	1.1123	1.1125
12.4	1.1153	1.1149	1.1149	1.1150
15.9	1.1182	1.1185	1.1175	1.1181
20.3	1.1217	1.1220	1.1216	1.1218
24.6	1.1255	1.1257	1.1241	1.1251
29.4	1.1288	1.1295	1.1277	1.1287
-1.1	1.1006	1.1004	1.0996	1.1002
0.4	1.1034	1.1035	1.1029	1.1033
3.1	1.1065	1.1068	1.1062	1.1065
6.9	1.1100	1.1104	1.1096	1.1100
10.7	1.1138	1.1139	1.1124	1.1134
14.8	1.1171	1.1173	1.1157	1.1167
19.2	1.1205	1.1207	1.1199	1.1204
26.6	1.1271	1.1267	1.1254	1.1264

Table 4.4 continued

$T_{NI}-T$ °C	Density ρ gm/cc			
	λ 5461 Å	λ 5893 Å	λ 6328 Å	Mean
		(v) 9 OMCPC		
-0.3	1.0946	1.0959	1.0946	1.0950
1.0	1.0989	1.0991	1.0981	1.0987
3.8	1.1010	1.1019	1.1005	1.1009
7.6	1.1045	1.1050	1.1038	1.1044
11.2	1.1075	1.1082	1.1071	1.1076
14.5	1.1102	1.1108	1.1096	1.1102
19.0	1.1133	1.1144	1.1129	1.1135
23.7	1.1176	1.1180	1.1168	1.1175
-1.1	1.0953	1.0955	1.0943	1.0950
0.9	1.0989	1.0992	1.0980	1.0987
3.4	1.1011	1.1020	1.1004	1.1012
6.1	1.1038	1.1044	1.1035	1.1039
9.1	1.1062	1.1068	1.1055	1.1062
12.8	1.1094	1.1099	1.1086	1.1093
16.8	1.1124	1.1130	1.1120	1.1125
21.9	1.1160	1.1172	1.1158	1.1163
		(vi) *lo* OMCPC		
1.6	1.0913	1.0919	1.0906	1.0913
3.3	1.0926	1.0934	1.0925	1.0928
6.7	1.0953	1.0963	1.0948	1.0955
9.9	1.0978	1.0992	1.0974	1.0981
13.0	1.1005	1.1011	1.1002	1.1006
15.3	1.1017	1.1029	1.1018	1.1021
0.8	1.0902	1.0920	1.0896	1.0906
2.0	1.0917	1.0920	1.0906	1.0914
7.1	1.0954	1.0966	1.0948	1.0956

Table 4.5: $\Delta\alpha$ and $(\bar{\alpha}/\Delta\alpha)$ of nOMCPC

	2 OMCPC	3 OMCPC	4 OMCPC	8 OMCPC	9 OMCPC	10 OMCPC
$\Delta\alpha$ $\times 10^{24}$ cm^3	33.34	33.26	33.52	33.88	33.80	34.06
$\bar{\alpha}_{5893}/\Delta\alpha$	1.09	1.14	1.18	1.35	1.40	1.43

!Jaw 4.6: *Order* parameter of nOMCPC

$T_{NI}-T$ °C	Order parameter S			
	λ5461 Å	λ5893 Å	λ6328 Å	Mean
		(i) 2 OMCPC		
1.3	0.343	0.345	0.349	0.346
3.8	0.390	0.390	0.389	0.390
7.4	0.425	0.425	0.426	0.425
13.0	0.464	0.462	0.461	0.462
18.0	0.488	0.487	0.486	0.487
23.6	0.510	0.508	0.508	0.509
29.2	0.528	0.526	0.527	0.527
34.0	0.543	0.540	0.540	0.541
40.0	0.556	0.556	0.556	0.556
0.5	0.325	0.324	0.325	0.325
2.7	0.375	0.372	0.370	0.372
6.2	0.414	0.413	0.414	0.414
10.6	0.449	0.446	0.448	0.448
14.9	0.472	0.471	0.472	0.472
20.0	0.496	0.494	0.496	0.495
26.4	0.520	0.518	0.518	0.519
31.7	0.536	0.534	0.534	0.535
37.2	0.550	0.550	0.550	0.550
		(ii) 3 OMCPC		
2.3	0.347	0.350	0.350	0.348
4.2	0.377	0.377	0.376	0.377
6.9	0.403	0.404	0.405	0.404
9.7	0.426	0.426	0.426	0.426
13.9	0.451	0.450	0.451	0.451
18.3	0.472	0.472	0.471	0.472
22.9	0.489	0.489	0.489	0.489
28.1	0.506	0.506	0.506	0.506
32.6	0.520	0.519	0.519	0.519
0.3	0.313	0.308	0.305	0.309
3.8	0.373	0.374	0.375	0.374
8.2	0.415	0.415	0.416	0.415
13.1	0.447	0.447	0.446	0.447
25.6	0.499	0.499	0.500	0.499

Table 4.6 continued

$T_{NI}-T$ °C	Order parameter S			
	λ5461 Å	λ5893 Å	λ6328 Å	Mean
		(iii) 4 OMCPC		
0.8	0.330	0.321	0.330	0.323
2.7	0.369	0.368	0.367	0.368
5.7	0.405	0.406	0.407	0.406
9.0	0.436	0.435	0.436	0.436
12.6	0.458	0.458	0.459	0.458
16.2	0.478	0.478	0.478	0.478
21.1	0.496	0.496	0.497	0.496
24.5	0.513	0.513	0.514	0.513
28.9	0.528	0.528	0.529	0.528
0.6	0.300	0.299	0.301	0.300
2.3	0.351	0.350	0.348	0.350
4.6	0.386	0.386	0.388	0.387
7.6	0.419	0.419	0.419	0.419
11.4	0.447	0.448	0.449	0.448
14.8	0.467	0.468	0.468	0.468
18.1	0.483	0.485	0.486	0.485
22.9	0.506	0.505	0.504	0.505
27.6	0.522	0.523	0.523	0.523
32.4	0.538	0.538	0.538	0.538
		(iv) 8 OMCPC		
1.2	0.349	0.348	0.345	0.347
3.9	0.402	0.402	0.403	0.402
6.7	0.438	0.438	0.438	0.438
9.2	0.459	0.460	0.462	0.460
12.4	0.485	0.485	0.484	0.485
15.9	0.506	0.507	0.507	0.507
20.3	0.529	0.528	0.530	0.529
24.6	0.549	0.548	0.547	0.548
29.4	0.566	0.567	0.566	0.566
0.4	0.310	0.313	0.316	0.313
3.1	0.389	0.391	0.391	0.390
6.9	0.439	0.440	0.439	0.439
10.7	0.472	0.472	0.474	0.473
14.8	0.500	0.500	0.498	0.499
19.2	0.523	0.524	0.525	0.524
26.6	0.556	0.556	0.555	0.556

Table 4.6 continued

$T_{NI}-T$ °C	Order parameter S			
	λ5461 Å	λ5893 Å	λ6328 Å	Mean
	(v) 9 OMCPC			
1.0	0.351	0.346	0.342	0.346
3.8	0.398	0.399	0.399	0.399
7.7	0.442	0.443	0.443	0.443
11.2	0.473	0.471	0.469	0.471
14.5	0.493	0.492	0.492	0.492
19.0	0.517	0.517	0.514	0.516
23.7	0.537	0.537	0.536	0.537
0.9	0.340	0.336	0.332	0.336
3.4	0.390	0.391	0.392	0.391
6.1	0.427	0.428	0.428	0.428
9.1	0.456	0.455	0.455	0.455
12.8	0.483	0.484	0.482	0.483
16.8	0.506	0.507	0.506	0.506
21.9	0.529	0.529	0.530	0.529
	(vi) 10 OMCPC			
1.6	0.352	0.350	0.349	0.350
3.3	0.392	0.395	0.396	0.394
6.7	0.443	0.442	0.441	0.442
9.9	0.472	0.474	0.473	0.473
13.0	0.495	0.496	0.495	0.495
15.3	0.511	0.512	0.512	0.512
0.8	0.323	0.331	0.326	0.327
2.0	0.358	0.356	0.354	0.356
7.1	0.451	0.450	0.450	0.450

Table 4.7: Splay elastic constants of nOMCPC

$T_{NI}-T$ °C	H_c Kgauss	$(k_{11}/\Delta K)_{exp}$ x 10^2 cgs units	$(k_{11}/\Delta K)_{cal}$ x 10^2 cgs units
	(i) 2 OMCPC		
37.4	2.8	1.23	1.21
31.5	2.75	1.14	1.14
26.7	2.7	1.07	1.09
21.9	2.7	1.03	1.02
16.6	2.64	0.94	0.94
12.6	2.59	0.86	0.86
9.3	2.54	0.79	0.79
6.4	2.48	0.71	0.71
3.5	2.40	0.61	0.61
1.7	2.30	0.52	0.52
0.5	2.22	0.44	0.45
x_o = 27.1 μm			
33.3	2.82	1.13	1.17
27.8	2.82	1.10	1.10
23.2	2.80	1.05	1.04
18.5	2.75	0.97	0.97
14.4	2.72	0.91	0.90
11.1	2.68	0.85	0.83
8.4	2.60	0.76	0.77
5.6	2.56	0.70	0.69
3.0	2.43	0.58	0.59
1.4	2.35	0.50	0.50
0.1	2.27	0.42	0.42
x_o = 26.2 μm			

Table 4.7 continued

$T_{NI}-T$ °C	H_c Kgauss	$(k_{11}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{11}/\Delta K)_{cal} \times 10^2$ c.g.s. mite.
	(ii) 3 OMCPC		
28.3	2.72	0.88	0.88
23.5	2.68	0.82	0.83
19.2	2.68	0.80	0.78
15.4	2.64	0.74	0.73
11.1	2.61	0.69	0.66
8.1	2.56	0.63	0.60
5.7	2.48	0.56	0.54
3.8	2.40	0.49	0.48
2.0	2.30	0.42	0.42
0.4	2.15	0.33	0.35
x_o = 25.2 μm			
26.4	2.53	0.84	0.86
20.9	2.50	0.78	0.80
16.4	2.48	0.74	0.74
12.7	2.46	0.69	0.69
10.1	2.40	0.64	0.64
6.9	2.38	0.59	0.57
4.7	2.27	0.51	0.51
2.4	2.17	0.42	0.44
1.0	2.10	0.37	0.38
0.2	2.00	0.32	a.34
x_o = 26.6 μm			
	(iii) 4 OMCPC		
31.3	2.64	1.07	1.06
26.1	2.58	0.99	1.00
22.0	2.53	0.92	0.94
17.9	2.51	0.87	0.87
13.5	2.46	0.80	0.79
9.6	2.40	0.71	[illegible]
6.6	2.35	0.64	0.63
4.5	2.27	0.56	0.56
2.6	2.20	0.49	0.48
1.1	2.1	0.41	0.40
0.1	1.97	0.33	0.33
x_o = 28.7 μm			
24.1	2.56	0.94	0.57
19.6	2.54	0.89	0.50
15.3	2.51	0.83	0.83
12.4	2.46	0.77	0.77
9.1	2.40	0.69	0.70
6.1	2.30	0.59	0.61
3.7	2.23	0.52	0.53
2.0	2.15	0.45	0.45
0.5	2.05	0.36	0.36
x_o = [illegible]			

Table 4.7 continued

$T_{NI}-T$ °C	H_c Kgauss	$(k_{11}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{11}/\Delta K)_{cal} \times 10^2$ c.g.s. units
		(iv) 8 OMCPC	
27.1	2.66	1.26	1.28
22.1	2.63	1.18	1.18
18.0	2.58	1.09	1.09
14.3	2.53	1.01	1.00
10.7	2.43	0.88	0.89
7.5	2.33	0.76	0.79
4.8	2.25	0.66	0.67
3.0	2.15	0.56	0.58
1.2	1.99	0.43	0.45
0.1	1.81	0.31	0.34
x_o = 33.1 μm			
29.8	3.17	1.35	1.34
24.4	3.12	1.25	1.22
20.1	3.05	1.15	1.14
16.1	3.0	1.07	1.04
12.7	2.93	0.97	0.95
8.9	2.85	0.87	0.84
6.1	2.75	0.76	0.73
3.9	2.64	0.65	0.63
2.1	2.48	0.52	0.52
0.4	2.27	0.38	0.37
x_o = 28.4 μm			
26.4	3.0	1.28	1.27
22.4	2.9	1.15	1.19
18.1	2.85	1.07	1.09
14.6	2.80	0.99	1.00
11.1	2.72	0.89	0.90
7.8	2.64	0.79	0.80
5.4	2.56	0.70	0.70
3.1	2.45	0.59	0.58
1.6	2.35	0.49	0.48
0.4	2.2	0.38	0.37
x_o = 29.6 μm			

Table 4.7 continued

$T_{NI}-T$ °C	H_c Kgauss	$(k_{11}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{11}/\Delta K)_{cal} \times 10^2$ c.g.s. units
		(v) 9 OMCPC	
24.9	3.0	1.31	1.27
21.2	2.92	1.20	1.18
18.1	2.85	1.11	1.10
15.3	2.80	1.04	1.03
12.0	2.70	0.93	0.94
9.4	2.60	0.83	0.85
7.2	2.56	0.76	0.76
4.3	2.43	0.64	0.63
2.1	2.28	0.50	0.49
0.6	2.02	0.36	0.39
x_o = 31.0 μm			
27.4	3.07	1.30	1.34
21.4	3.0	1.17	1.19
17.2	2.95	1.09	1.08
13.6	2.87	0.99	0.99
10.2	2.77	0.88	0.88
7.1	2.64	0.75	0.76
4.5	2.54	0.65	0.64
2.5	2.45	0.55	0.52
1.2	2.25	0.43	0.43
0.3	2.12	0.36	0.37
x_o = 29.8 μm			
		(vi) 10 OMCPC	
15.6	3.43	1.26	1.26
14.5	3.41	1.23	1.21
11.9	3.31	1.11	1.11
9.5	3.22	1.01	1.01
7.0	3.05	0.86	0.90
3.9	2.90	0.70	0.71
1.8	2.66	0.52	0.52
0.3	2.43	0.37	0.36
x_o = 28.0 μm			
14.9	3.43	1.24	1.23
13.1	3.36	1.16	1.16
10.3	3.29	1.07	1.05
8.1	3.12	0.92	0.95
5.2	2.97	0.77	0.79
2.7	2.82	0.62	0.60
0.5	2.48	0.40	0.38
x_o = 27.9 μm			

Table 4.8: Twist elastic constants of nOMCPC

$T_{NI}-T$ °C	H_c Kgauss	$(k_{22}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{22}/\Delta K)_{cal} \times 10^2$ c.g.s. units
		(i) 2 OMCPC	
24.8	2.3	0.56	0.55
19.5	2025	0.51	0.51
15.2	2.2	0.47	0.47
10.4	2.15	0.42	0.42
8.1	2.1	0.38	0.40
5.3	2.07	0.35	0.35
3.5	1.97	0.30	0.31
0.7	1.89	0.24	0.24
x_o = 23.1 μm			
27.4	3.27	0.57	0.57
21.8	3.22	0.53	0.53
16.4	3.17	0.49	0.49
10.6	3.12	0.44	0.43
7.4	3.02	0.39	0.35
4.2	2.87	0.33	0.33
1.5	2.80	0.28	0.26
0.4	2.67	0.23	0.23
x_6 = 16.3 μm			
		(is) 3 OMCPC	
25.2	2.12	0.45	0.45
20.9	2.1	0.42	0.43
15.3	2.07	0.39	0.39
10.8	2.02	0.35	0.35
6.6	1.97	0.31	0.30
3.8	1.91	0.27	0.26
1.8	1.81	0.22	0.22
0.4	1.66	0.17	0.18
x_o = 23.3 μm			
21.7	1.77	0.43	0.43
16.8	1.74	0.40	0.40
11.6	1.69	0.35	0.35
7.7	1.66	0.32	0.31
4.3	1.61	0.27	0.26
2.0	1.53	0.22	0.22
0.7	1.41	0.18	0.19
x_o = 27.7 μm			

Fable 4.8 continued

$T_{NI}-T$ °C	H_c Kgauss	$(k_{22}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{22}/\Delta K)_{cal} \times 10^2$ c.g.s. units
		(iii) 4 OMCPC	
30.1	2.23	0.54	0.52
21.4	2.15	0.47	0.47
16.5	2.10	0.43	0.44
11.6	2.07	0.39	0.40
8.6	2.05	0.36	0.37
6.2	2.02	0.33	0.33
3.2	1.97	0.29	0.28
1.5	1.87	0.24	0.24
x_o = 24.2 μm			
24.6	2.25	0.48	0.49
19.0	2.23	0.45	0.46
14.4	2.2	0.42	0.42
9.6	2.17	0.38	0.38
6.9	2.15	0.35	0.34
4.3	2.12	0.32	0.30
2.1	2.07	0.28	0.26
0.3	1.87	0.19	0.21
x_o = 23.1 μm			
		(iv) 8 OMCPC	
25.6	2.2	0.53	0.52
21.2	2.15	0.48	0.49
17.0	2.12	0.45	0.46
14.2	2.10	0.43	0.43
11.4	2.07	0.40	0.40
7.4	2.0	0.35	0.35
6.1	1.97	0.33	0.33
2.8	1.87	0.26	0.27
1.4	1.77	0.21	0.21
x_o = 26.0 μm			
27.0	2.48	0.53	0.53
22.4	2.46	0.51	0.50
18.4	2.41	0.47	0.47
14.4	2.38	0.43	0.43
10.5	2.33	0.39	0.39
7.3	2.28	0.35	0.35
4.7	2.2	0.31	0.31
2.0	2.12	0.25	0.24
0.5	2.0	0.20	0.19
x_o = 23.1 μm			

Tabla 4.8 continued

$T_{NI}-T$ °C	H_c Kgauss	$(k_{22}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{22}/\Delta K)_{cal} \times 10^2$ c.g.s. units
		(v) 9 OMCPC	
26.5	2.38	0.49	0.51
22.7	2.35	0.46	0.47
18.6	2.30	0.43	0.43
15.0	2.23	0.39	0.39
12.1	2.17	0.35	0.36
9.4	2.07	0.31	0.33
6.4	1.97	0.26	0.28
4.0	1.87	0.22	0.23
2.3	1.81	0.19	0.19
0.5	1.71	0.16	0.16
x_o = 23.8 μm			
27.0	2.48	0.52	0.51
23.4	2.40	0.48	0.48
19.1	2.35	0.44	0.42
15.5	2.33	0.41	0.40
12.3	2.25	0.37	0.36
9.9	2.20	0.34	0.33
7.3	2.13	0.31	0.29
3.8	1.97	0.24	0.23
1.9	1.87	0.19	0.18
0.4	1.77	0.16	0.14
x_o = 23.5 μm			
		(vi) 10 OMCPC	
16.0	2.87	0.61	
15.8	2.77	0.57	
15.3	2.63	0.51	
14.7	2.53	0.47	
14.3	2.48	0.44	
12.1	2.33	0.38	
10.0	2.28	0.35	
7.2	2.17	0.30	
4.6	2.07	0.26	
1.9	1.97	0.20	
x_o = 23.3 μm			
15.9	2.80	0.57	
15.2	2.68	0.52	
14.3	2.59	0.48	
12.3	2.49	0.43	
10.6	2.43	0.40	
8.4	2.17	0.30	
6.4	2.17	0.29	
4.2	2.07	0.24	
1.9	1.87	0.17	
0.8	1.77	0.14	
x_o = 23.0 μm			

Table 4.9 continued

(ii) 3 OMCPC

$T_{NI}-T$ °C	H_c Kgauss	$(k_{33}/K)_{exp}$ c.g.s. units	$(k_{33}/K)_{cal}$ c.g.s. units $\times 10^2$
33.8	3.73	1.63	1.62
29.3	3.64	1.51	1.51
26.1	3.59	1.44	1.44
22.6	3.52	1.34	1.35
19.6	3.45	1.26	1.28
16.5	3.38	1.17	1.18
14.1	3.34	1.12	1.11
11.5	3.26	1.03	1.02
9.0	3.17	0.93	0.93
7.2	3.10	0.86	0.86
5.5	3.0	0.76	0.77
4.0	2.9	0.69	0.68
2.8	2.82	0.62	0.61
1.8	2.70	0.54	0.54
0.4	2.5	0.43	0.43
0.2	2.38	0.38	0.42
x_o = 24.6 µm			
27.5	3.66	1.46	1.47
23.8	3.61	1.38	1.38
20.4	3.55	1.30	1.29
16.9	3.50	1.22	1.20
13.7	3.36	1.09	1.10
10.9	3.27	0.99	1.01
9.2	3.22	0.94	0.94
6.8	3.14	0.85	0.84
6.1	3.10	0.81	0.80
4.3	3.0	0.72	0.70
3.2	2.9	0.65	0.64
2.1	2.77	0.56	0.56
0.9	2.61	0.47	0.47
0.5	2.56	0.44	0.44
x_o = 24.2 µm			

Table 4.9: Bend elastic constants of nOMCPC

(i) 2 OMCPC

$T_{NI}-T$ °C	H_c Kgauss	$(k_{33}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{33}/\Delta K)_{cal} \times 10^2$ c.g.s. units
34.9	3.75	2.32	2.31
30.2	3.66	2.14	2.16
27.8	3.62	2.07	2.08
25.6	3.57	1.98	2.01
19.9	3.46	1.78	1.80
17.7	3.36	1.64	1.70
15.0	3.22	1.47	1.58
12.5	3.20	1.40	1.46
10.2	3.13	1.30	1.34
7.9	3.0	1.15	1.21
5.8	2.93	1.05	1.07
4.2	2.80	0.91	0.94
2.0	2.68	0.76	0.74
0.3	2.46	0.57	0.54

x_o = 28 μm

39.8	4.3	2.50	2.48
36.9	4.28	2.43	2.38
33.9	4.21	2.31	2.28
31.2	4.16	2.22	2.19
28.3	4.07	2.09	2.09
25.4	4.01	1.99	2.00
22.3	3.96	1.90	1.89
19.3	3.89	1.78	1.77
16.6	3.82	1.67	1.65
14.2	3.73	1.55	1.54
11.9	3.64	1.44	1.42
9.3	3.55	1.32	1.29
6.7	3.43	1.17	1.13
4.1	3.27	0.99	0.94
2.0	3.07	0.80	0.74
0.5	2.82	0.61	0.56

x_o = 25 μm

Table 4.9 continued

(iii) 4 OMCPC

$T_{NI}-T$ °C	Kgauss	$(k_{33}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{33}/\Delta K)_{cal} \times 10^2$ c.g.s. units
27.8	3.57	1.52	1.56
24.7	3.57	1.48	1.48
21.6	3.52	1.41	1.40
19.0	3.48	1.34	1.32
16.8	3.38	1.24	1.25
13.9	3.31	1.15	1.15
11.8	3.24	1.07	1.08
9.5	3.12	0.95	0.98
8.5	3.04	0.89	0.94
5.9	2.95	0.78	0.81
4.3	2.84	0.69	0.72
2.5	2.70	0.58	0.60
1.1	2.53	0.47	0.48
0.1	2.35	0.36	0.37
x_o = 25.5 μm			
25.4	3.71	1.49	1.50
22.1	3.71	1.45	1.41
18.0	3.59	1.30	1.29
14.8	3.52	1.21	1.18
12.4	3.45	1.13	1.10
9.9	3.34	1.01	1.00
7.3	3.24	0.90	0.88
5.1	3.07	0.77	0.76
3.6	2.97	0.68	0.67
2.6	2.92	0.63	0.60
1.5	2.80	0.54	0.52
0.4	2.54	0.41	0.41
x_o = 24.5 μm			

Table 4.9 continued

(iv) 8 OMCPC

$T_{NI}-T$ °C	H_c Kgauss	$(k_{33}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{33}/\Delta K)_{cal} \times 10^2$ c.g.s. units
26.5	3.98	1.94	1.95
23.9	3.92	1.84	1.84
20.7	3.83	1.71	1.71
17.9	3.70	1.55	1.60
15.3	3.64	1.46	1.48
12.8	3.52	1.32	1.36
10.3	3.38	1.17	1.22
8.5	3.34	1.11	1.13
6.4	3.20	0.97	1.00
5.2	3.14	0.90	0.91
3.5	3.0	0.78	0.77
2.3	2.85	0.66	0.66
1.0	2.61	0.50	0.51
0.3	2.48	0.42	0.43
0.2	2.45	0.40	0.38
x_o = 27.5 µm			
28.1	4.03	2.06	2.00
25.7	3.94	1.93	1.91
23.1	3.87	1.82	1.81
20.3	3.8	1.72	1.70
17.9	3.73	1.61	1.60
15.5	3.64	1.50	1.49
13.0	3.52	1.35	1.37
10.9	3.45	1.26	1.26
8.7	3.34	1.14	1.14
6.8	3.24	1.03	1.03
5.0	3.14	0.91	0.90
3.7	3.05	0.82	0.79
2.4	2.87	0.68	0.66
1.1	2.68	0.55	0.52
0.2	2.40	0.39	0.38
x_o = 27.8 µm			

Table 4.7 continued

(v) 9 OMCPC

$T_{NI}-T$ °C	H_o Kgauss	$(k_{33}/\Delta K)_{exp} \times 10^2$ c.g.s. units	$(k_{33}/\Delta K)_{cal} \times 10^2$ c.g.s. units
25.9	4.41	1.71	1.69
23.6	4.35	1.63	1.61
21.3	4.26	1.53	1.52
18.9	4.19	1.45	1.43
16.5	4.10	1.35	1.35
14.3	3.98	1.24	1.26
11.8	3.89	1.15	1.16
10.0	3.82	1.08	1.08
8.3	3.71	0.99	0.98
6.8	3.64	0.92	0.90
5.3	3.50	0.81	0.81
3.9	3.36	0.72	0.71
2.3	3.22	0.61	0.58
1.1	3.00	0.49	0.48
0.5	2.82	0.42	0.43
0.2	2.71	0.38	0.40

x_o = 24 μm

24.2	4.33	1.62	1.62
21.5	4.21	1.50	1.53
18.6	4.15	1.42	1.42
16.4	4.10	1.35	1.34
14.1	3.94	1.22	1.26
11.3	3.80	1.09	1.14
8.9	3.71	1.00	1.02
6.8	3.60	0.90	0.90
5.3	3.48	0.81	0.81
3.6	3.36	0.71	0.69
1.9	3.20	0.59	0.55
0.6	2.85	0.43	0.43
0.2	2.75	0.39	0.40

x_o = 24 μm

Table 4.9 continued

(vi) 10 OMCPC

$T_{NI} - T$ °C	H_c Kgauss	$(k_{33}/\Delta K) \times 10^2$ c.g.s. units
14.7	2.56	2.54
14.2	2.35	2.12
13.5	2.25	1.93
12.3	2.00	1.49
11.5	1.97	1.43
10.4	1.92	1.34
8.4	1.79	1.12
6.7	1.69	0.95
5.4	1.66	0.89
2.9	1.56	0.69
1.5	1.43	0.52
0.6	1.18	0.31

x_o = 53.7 μm

14.6	2.56	2.22
13.9	2.33	1.82
11.5	2.00	1.29
10.4	1.92	1.17
8.8	1.81	1.01
7.3	1.74	0.90
5.9	1.69	0.81
4.2	1.64	0.72
2.8	1.56	0.60
1.1	1.41	0.43

x_o = 50.2 μm

Table 4.10: Experimental data fitted to the equation

$$\frac{k_{ii}}{\Delta K} = CS^x$$

	$\frac{k_{11}}{\Delta K}$		$\frac{k_{22}}{\Delta K}$		$\frac{k_{33}}{\Delta K}$	
	C	X	C	x	C	x
2 OMCPC	3.77	1.90	2.00	1.92	12.46	2.76
3 OMCPC	3.27	1.92	1.76	1.95	8.42	2.55
4 OMCPC	3.64	1.58	1.50	1.67	7.94	2.52
8 OMCPC	4.65	2.20	1.60	1.87	4.70	2.73
9 OMCPC	5.74	2.45	2.23	2.47	9.05	2.77
10 OMCPC	6.36	2.43	-	-	-	

Table 4.11: Ratios of elastic constants

$T_{NI}-T$	2 OMCPC k_{11}/k_{22}	2 OMCPC k_{33}/k_{11}	2 OMCPC k_{33}/k_{22}	3 OMCPC k_{11}/k_{22}	3 OMCPC k_{33}/k_{11}	3 OMCPC k_{33}/k_{22}
1	1.88	1.33	2.51	1.95	1.18	2.31
3	1.90	1.46	2.77	1.96	1.35	2.64
5	1.89	1.55	2.91	1.89	1.38	2.61
10	1.95	1.62	3.16	1.86	1.53	2.84
15	2.00	1.72	3.43	1.87	1.63	3.04
20	1.96	1.78	3.49	1.88	1.67	3.13
25	1.93	1.84	3.55	1.89	1.69	3.19
	4 OMCPC			**8 OMCPC**		
1	1.78	1.13	2.00	2.0	1.29	2.590
3	1.82	1.24	2.25	2.11	1.34	2.83
5	1.81	1.28	2.32	2.16	1.34	2.90
10	1.89	1.41	2.67	2.32	1.36	3.16
15	1.91	1.48	2.82	2.34	1.42	3.33
20	1.96	1.50	2.93	2.35	1.48	3.48
25	1.98	1.53	3.02	2.38	1.52	3.62
	9 OMCPC			**10 OMCPC**		
1	2.56	1.17	3.00	2.63	1.14	3.0
3	2.67	1.20	3.19	2.95	1.08	3.19
5	2.55	1.23	3.14	2.98	1.05	3.14
10	2.62	1.26	3.29	3.10	1.15	3.58
15	2.62	1.25	3.28			
20	2.64	1.27	3.34			
25	2.59	1.30	3.35			