Indian greenstone belts, the available data from Rajasthan point out some glaring contrasts, some of which are: (i) paucity of ultramafic rocks; (ii) total absence of conglomerate and coarse clastic rocks; and (iii) no known metal mineralization of Archaean age, except for some localised occurrences of barite deposits.

These differences may be critical to the recognition of greenstone belt evolutionary process[12] in this part of the Indian shield. At the present state of our knowledge it is difficult to reconstruct the geometry and areal extent of the greenstone belts. What we see today are the extensive dismembered patches of greenstone rocks amidst the sea of granitoid rocks.

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RESEARCH COMMUNICATIONS

Optical studies of two smectic liquid crystals

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The temperature variations of refractive index, density and order parameter of the compounds 2-4(4'-cyanophenyl)-5-*n*-heptyl-1,3-dioxane (PDX) and 4-*n*'-pentylcyclohexyl-(4-*n*-pentylcyclohexane)-1-carboxylate (OS) are reported in the smectic and isotropic phases. The principal molecular polarizabilities (α_e, α_o) and the order parameters S have been evaluated using the anisotropic internal field model (Neugebauer's approach). The theoretical estimates of the mean and principal molecular polarizabilities using the modified Lippincott-δ-function potential model are in close agreement with the values evaluated from the experimental results.

THE order parameter of a liquid crystal is one of the most important parameters which determines its physical properties and therefore any tensorial property such as refractive index, magnetic and electric susceptibility, elastic constant, etc., can in principle be used to determine the order parameter of liquid crystals[1,2]. Presently, refractive index has been selected as a macroscopic property to represent the degree of ordering. The materials which have been studied are essentially those containing benzene groups in the central rigid core. In view of the fact that measurements

carried out on liquid crystals with different rigid cores could yield valuable information on the influence of molecular structure on optical properties and order, we present here the refractive index and density measurements on 2-(4'-cyanophenyl)-5-*n*-heptyl-1,3-dioxane (PDX) and 4-*n*'-pentylcyclohexyl-(4-*n*-pentylcyclohexane)-1-carboxylate (OS) containing dioxane and cyclohexane groups in the central rigid core respectively.

The materials obtained from E. Merck, Darmstadt were recrystallized before use. The transition temperatures obtained from differential scanning calorimetric (DSC) studies are given below:
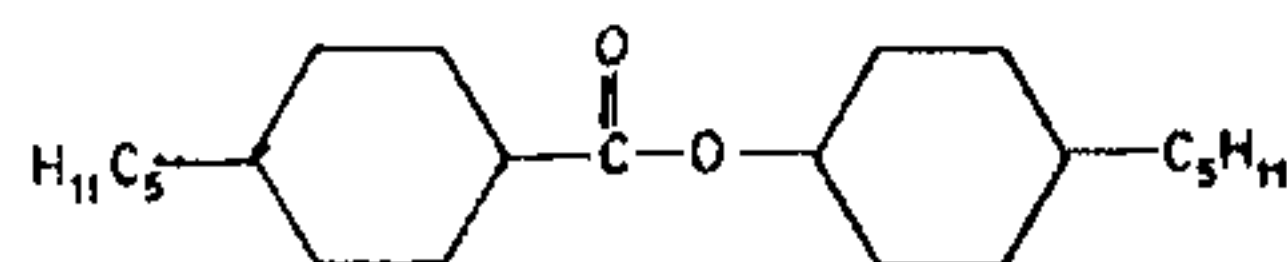
1. *2-(4'-Cyanophenyl)-5-n-heptyl-1,3-dioxane*
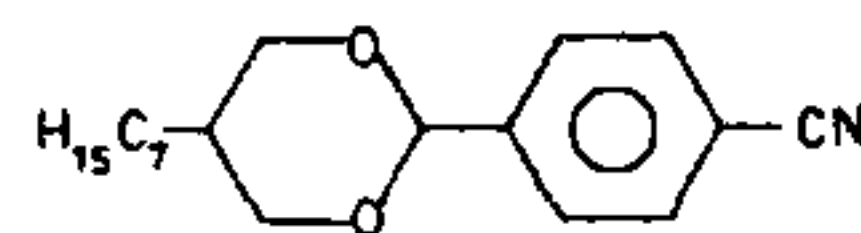
Heating: Crystal to smectic, 53.0°
Smectic to isotropic, 55.0°

Cooling: Isotropic to smectic, 55.0°
Smectic to crystal, 42.0° (supercooling was observed).

2. *4-n'-Pentylcyclohexyl-(4-n-pentylcyclohexane)-1-carboxylate*

Heating: Crystal to smectic, 51.0°
Smectic to isotropic, 71.0°

Cooling: Isotropic to smectic, 71.0°
Smectic to crystal, 42.0° (supercooling was observed).

The refractive indices n_e and n_o in the smectic phase and n_i in the isotropic phase at different temperatures were measured using Abbe refractometer. The glass prisms of the refractometer were rubbed with cotton along the axis of the prism several times. Melted samples were introduced into the prism. The layer planes are aligned parallel to the supporting surface of the prism. The temperature was controlled by hot-water bath and was measured to an accuracy of 0.1°C. The Abbe refractometer was calibrated using water, benzene and toluene.

The densities of the liquid crystalline and isotropic phases of the materials were measured by studying the volume expansion of a known weight of the sample taken in a fine capillary with uniform cross section and applying corrections for the volume expansion of the container. The accuracy of the measurements was ± 0.005 g cm^{-3}.

The plots of the temperature variation of refractive indices and densities for the two samples are given in Figures 1 and 2. The order parameters have been evaluated using anisotropic internal field model (Neugebauer's approach)[3,4]. The theoretical estimates of the mean and principal molecular polarizabilities have been evaluated using the modified Lippincott-δ-function potential model[5-7]. The mean polarizability values are in close agreement with those evaluated from experimental studies.

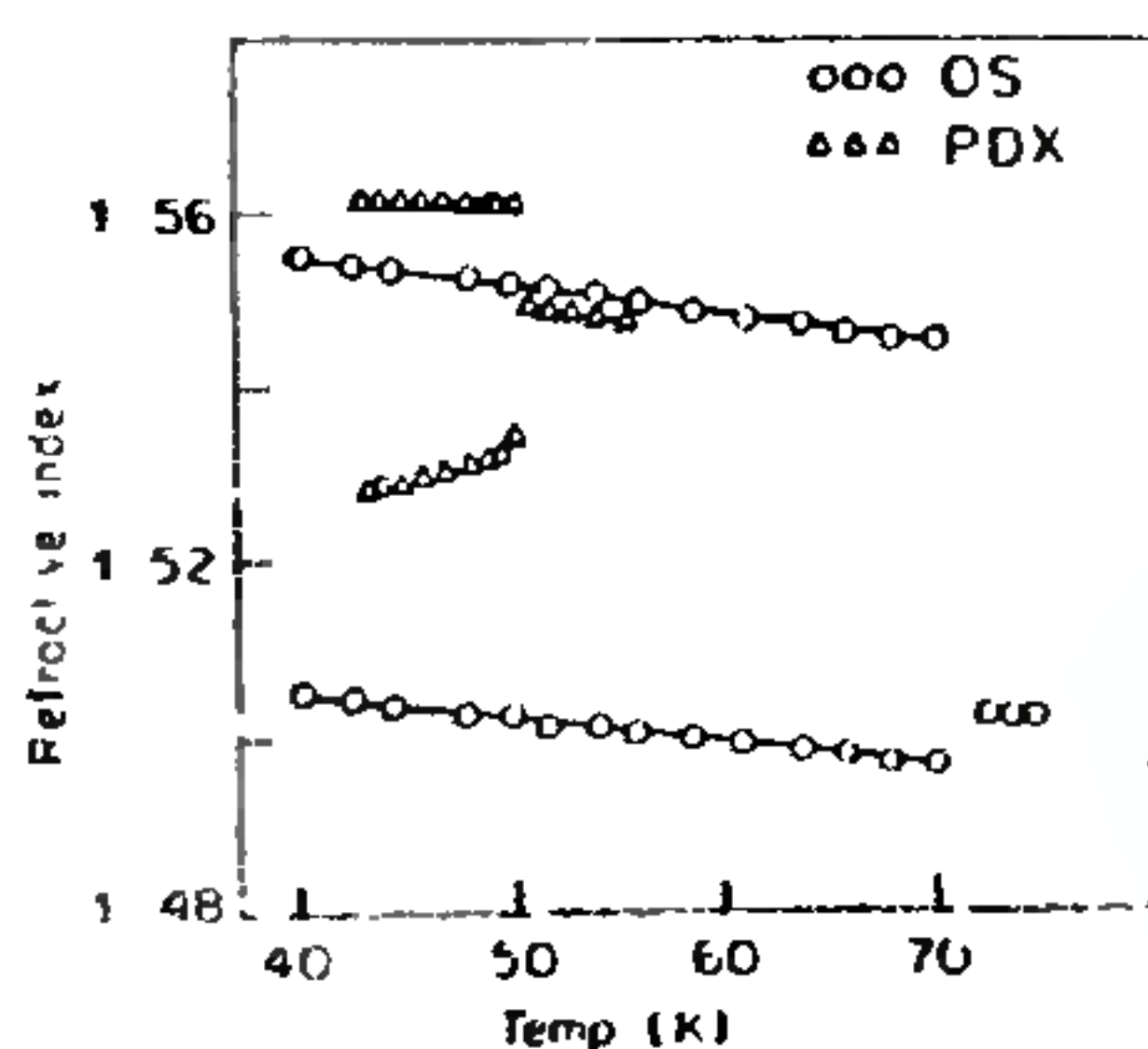| Compound	α	
	Theory	Experimental
PDX	36.1219	34.757
OS	46.4800	46.437

Figure 1. Temperature variation of refractive indices for 2-(4'-cyanophenyl)-5-n-heptyl-1,3-dioxane and 4-n-pentylcyclohexyl-(4-n-pentylcyclohexane)-1-carboxylate
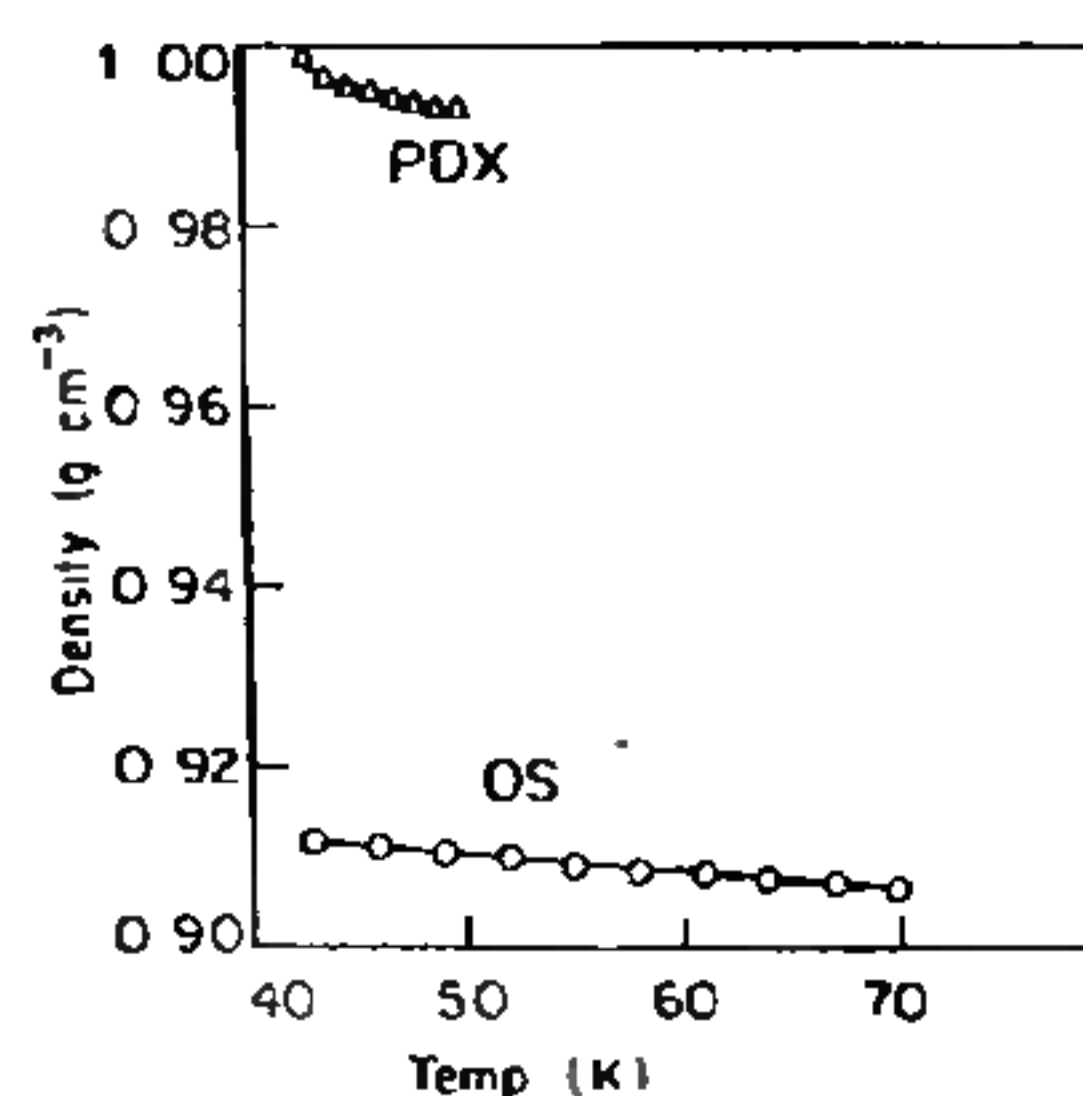
Figure 2. Temperature variation of densities for 2-(4'-cyanophenyl)-5-n-heptyl-1,3-dioxane and 4-n'-pentylcyclohexyl-(4-n-pentylcyclohexane)-1-carboxylate.

The temperature variation of order parameters for the two materials are given in Figure 3. The order parameters in the case of OS with cyclohexane rigid cores are higher than those of PDX with dioxane group. The optical textures of different phases observed with Leitz orthoplan polarizing microscope are shown
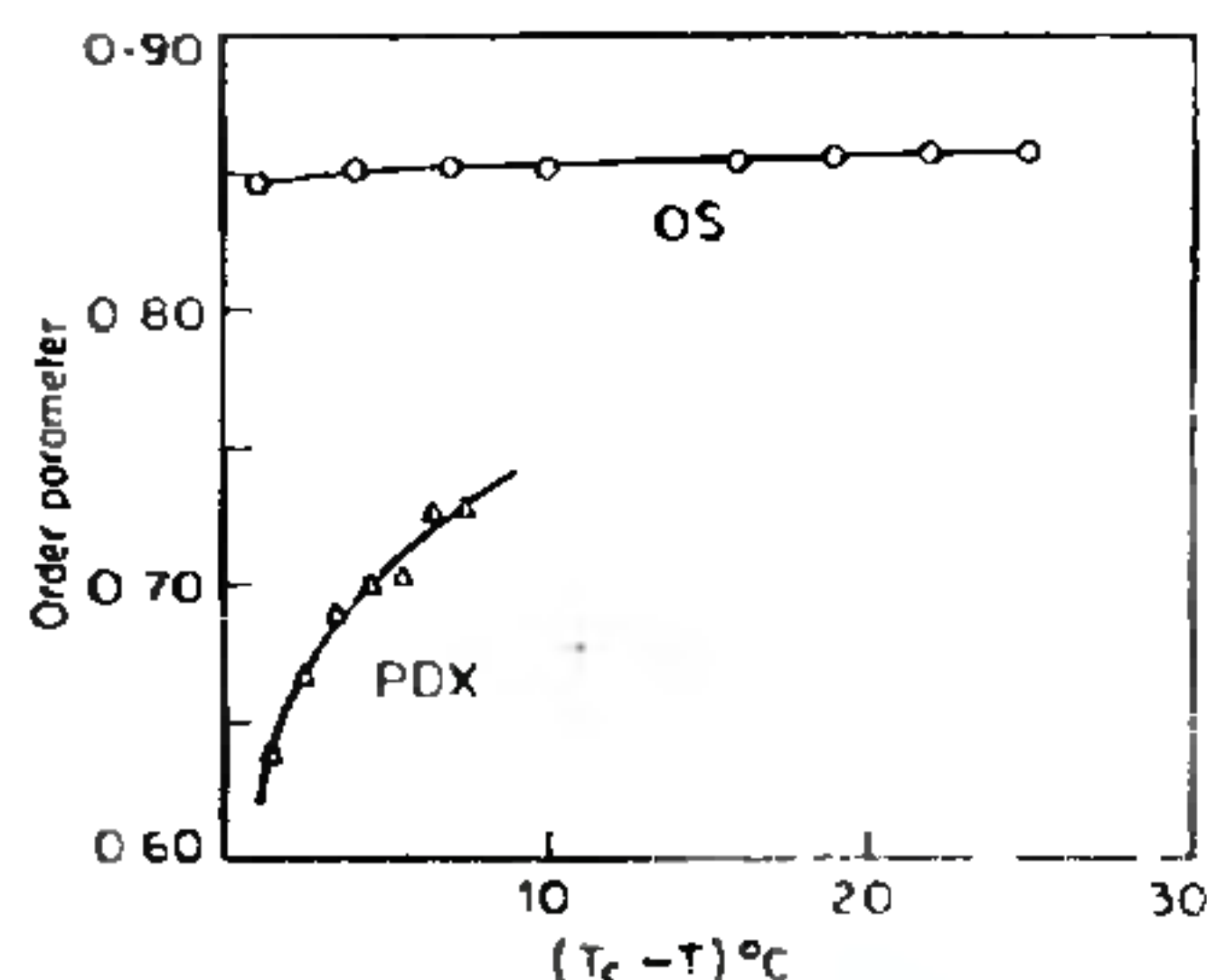
Figure 3. Temperature variation of S factor for 2-(4'-cyanophenyl)-5-n-heptyl-1,3-dioxane and 4-n'-pentylcyclohexyl-(4-n-pentylcyclohexane)-1-carboxylate.
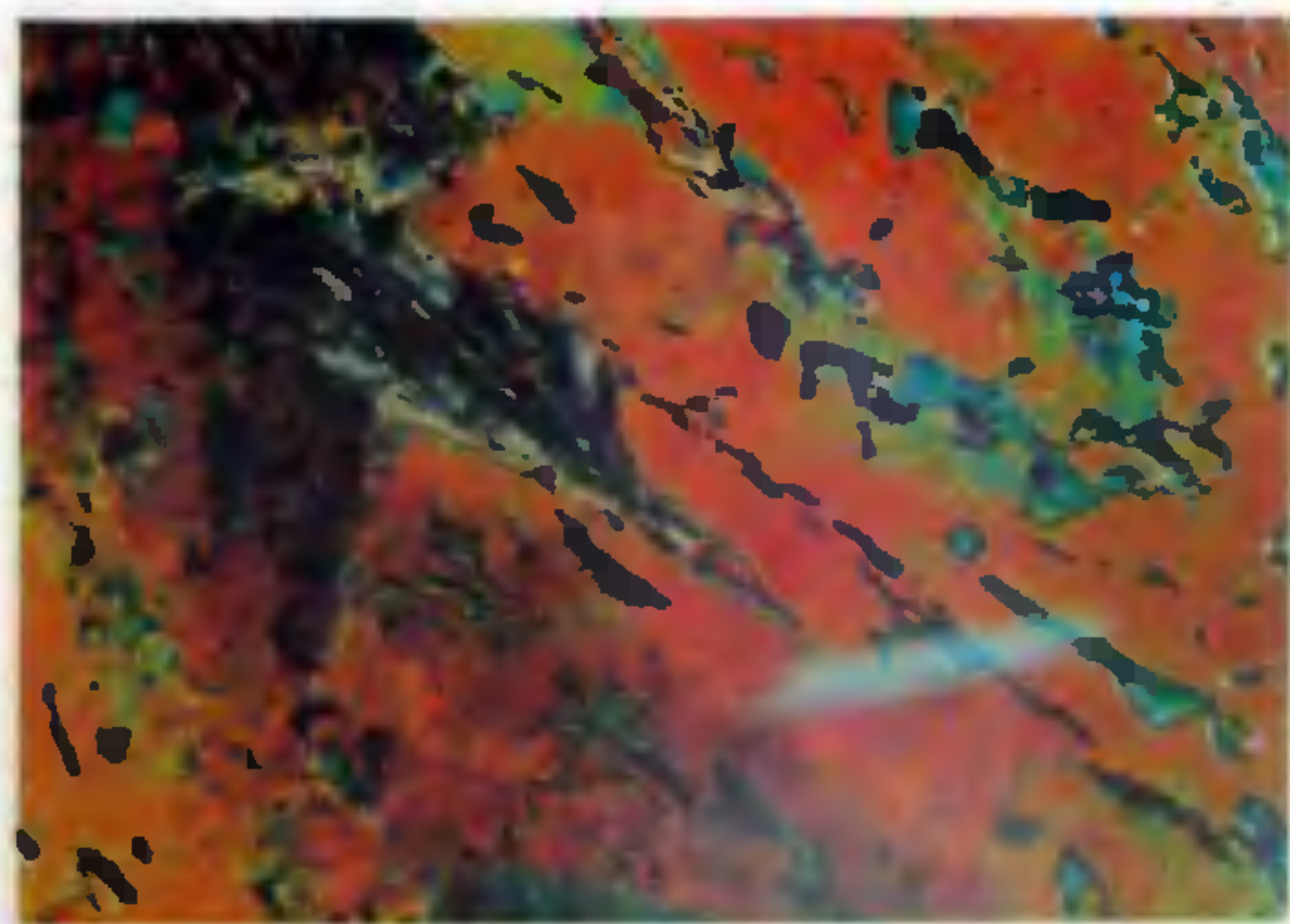
Figure 4. Optical textures of 4-n'-pentylcyclohexyl-(4-n-pentylcyclohexane)-1-carboxylate
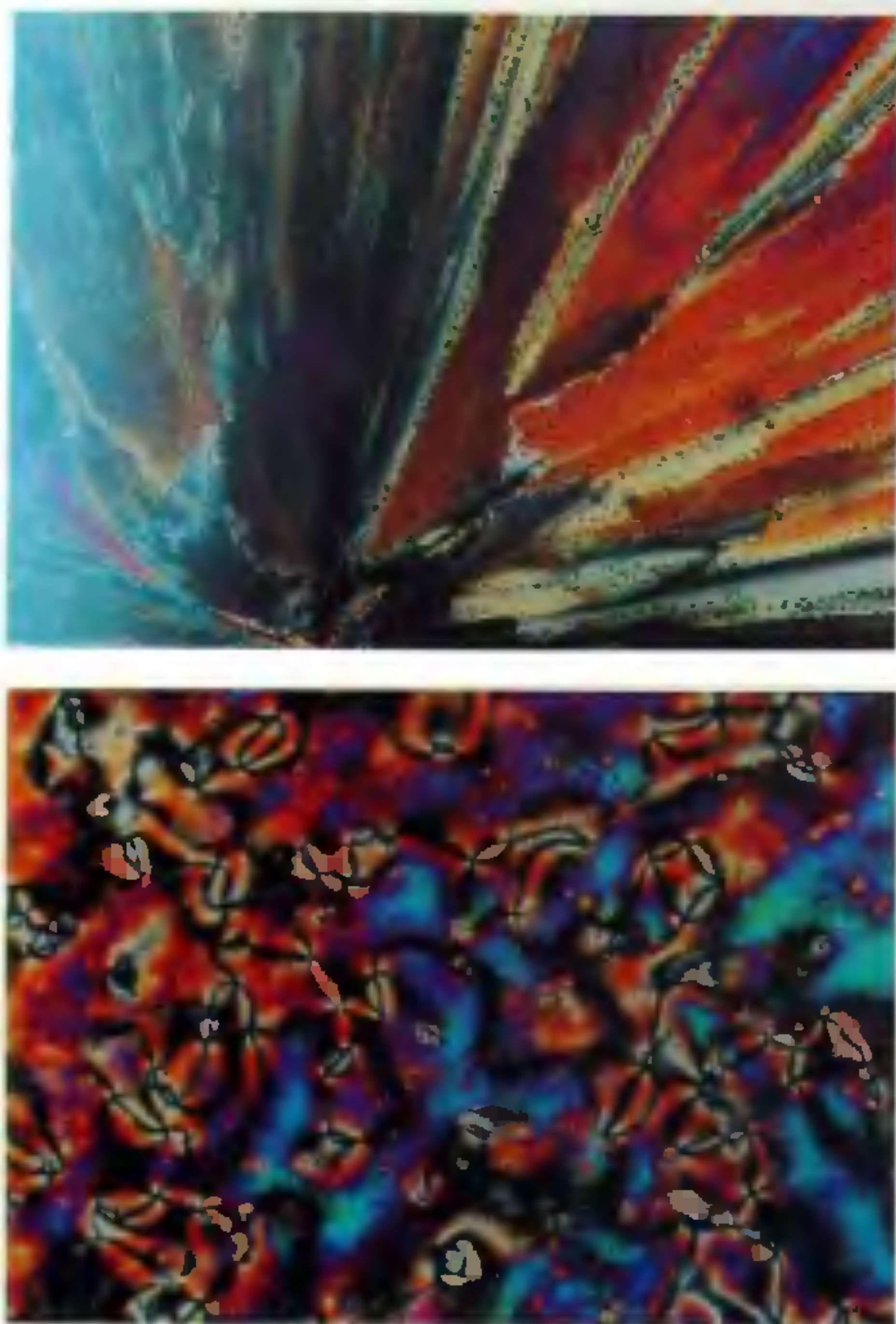
91

Figure 5. *a* and *b* Optical textures of 2-(4'-cyanophenyl)-5-*n*-heptyl-1,3-dioxane at different temperatures.

in Figures 4 and *5a* and *b*. The compound OS exhibits a highly ordered smectic B phase, as seen from the mosaic (oblong platelets) texture shown in the figure on the cover. It is evident from Figure *5b* that the compound PDX exhibits a schlieren texture, which is a characteristic of smectic C phase. The compound PDX is biaxial in nature. The molecular packing obtained by crystal structure analysis of the compound PDX supports the existence of smectic C phase[8].

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Production and characterization of monoclonal antibodies to foot-and-mouth disease virus subtype A22

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Monoclonal antibodies (MAbs) were produced by fusion of mouse myeloma cells and splenocytes of BALB/c mice immunized by infection with live purified (146S particles) foot-and-mouth disease virus subtype A22 or by inoculation with inactivated 146S particles. Different experimental protocols such as varying methods of hyperimmunization of mice, propagation of hybridomas and cell fusion parameters were critically examined. The use of splenocytes collected from each individual mouse separately for fusion entailed higher yields of positive hybridomas, than when splenocytes collected from more than one mouse were pooled. Further, immunization by one injection with live virus and intrasplenic final booster inoculation enabled the production of higher number of positive hybridomas. It was also noted that hybridomas could be propagated with ease and maintained equally well in media supplemented with colostrum-deprived newborn calf serum or horse serum as those containing foetal calf serum (FCS). The four virus-specific MAbs produced were characterized by various tests. In particular, they were tested for their capacity to neutralize viral infectivity and capacity to bind to isolated viral proteins (VP1, VP2, VP3). In enzyme immunotransfer blot assay (EITB), there was evidence that one of the four MAbs recognized an epitope on two separated viral proteins. The other three MAbs recognized conformation-independent epitopes on separated VP1.

PROTECTION of domestic animals against foot-and-mouth disease virus (FMDV) is directly related to the presence in their sera of type-specific antibodies capable of neutralizing virus infectivity[1]. The intact virion is composed of 60 copies each of the four structural capsid proteins designated VP1 to VP4 (ref. 2). Evidence from several lines of investigation centering on the analysis of the isolated capsid proteins and the protease treatment of VP1 molecule[3] has suggested that the latter is the major immunogenic protein in the virion and is the most exposed on viral surface. Immunization of animals with isolated VP1 and its