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RESEARCH ARTICLE

LIQUID CRYSTALS TRANSITION TEMPERATURE OF 4-N-ALKOXY-2,3,5,6-TETRAMETHYLPHENYL-4-NITROAZOBENZENE.

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Corresponding Author*Hasan Sabeeh Jabur.****Abstract**

The liquid crystal transition temperatures of the homologous series of 4-n-alkoxy 2,3,5,6-tetramethyl phenyl-4'-nitroazobenzenes, where n:2-B were studied.

It was found that the crystal phase (Cr) changed to the smectic phase (S) and with increasing temperature the late phase changed to the isotropic liquid phase (I). The classification of these different modification was done by the texture observations of the substance with the aid of hot stage polarizing microscope. The conductivity of these mesogens were measured, and it was found to be increased with increasing number of carbon atoms in the terminal alkyl group.

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Introduction:-

The effects of central groups, terminal groups, aromatic rings, broadening groups and substituted groups on the properties of liquid crystals in homologous series, especially phase-transition, had been studied extensively using different techniques^[1-5]. It was found that liquid crystal phase is more sensitive to molecular geometry and that could be explained due to its more ordered structure on the surface. The variable temperature experiments which compare retention time in HPLC during heating and cooling provide a good support for this conclusion.

Recent review about phase transition in liquid crystals was reported by Singh [7] he reported. that mesogenic materials can exhibit a multitude of transitions involving new phases and a survey of existing computer simulation studies of the isotropic to nematic transition, the nematic to smectic A transition, the smectic A to hexatic S_g transition, the smectic A to reentrant nematic transition and transition to the discotic phase.

Our study concerns with the phase transitions in liquid crystals of homologous series prepared by us using micro heating stage polarizing optical microscope, the conductivity of the mesogens solution was measured as well.

Experimental:-

The studied liquid crystals were investigated by the published methods^[1-2] with the help of micro heating stage polarizing microscope type BH₂ supplied by Olympus, with a camera for photo micrographic system supplied by Olympus model PM-10AD.

A modification to this system for the micro heating stage was done by connecting the thermometer to a special temperature regulator. The connected thermometer was calibrated by normal ways.

Melting transition temperatures for the prepared liquid crystals were recorded by putting 1mg of the mesogen on a solid glass covered with a thin glass, the sample was then heated on the micro heating stage. The classification of

different modification was done by the texture observations of individual liquid crystal with aid of polarizing microscope.

The electrical conductivity of the prepared mesogens solution was measured for the liquid crystals solution in carbon tetrachloride at 31°C.

Results and Discussion:-

Table(1) shows the transition temperatures between different phases for the prepared liquid crystals. The transition temperature from the crystal phase to smectic phase (Cr → S) was recorded for the prepared liquid crystals with $n \geq 4$.

Table 1:- Transition temperature for the prepared liquid crystals

No. of Carbon	$T_{crS} \xrightarrow{C^o}$	$T_s \xrightarrow{S} C^o$
2*	-	155-156
3*	-	130-132
4	114-116	124-126
5	106-108	120-122
6	72-74	90-92
7	60-62	84-86
8	54-56	80-82

However the transition temperature from smectic to isotropic phase (S → I) was observed also. It was noticed that for liquid crystal where $n=2$ and 3 the phase transferred directly from the crystal phase to isotropic phase.

The microscopic observations showed that all liquid crystals for the prepared mesogens (where $n \geq 4$) was in smectic phase with fine arrangement and showed a high viscosity. No nematic phases were observed in this study and this could be explained due to the side attractions which favored the formation of smectic phase more than the terminal attraction which favored in nematic phase. These findings are in a good agreement with that previously studied^[9,10]. It was found the transition temperature decreases with increasing the chain length of the alkoxy group, this result is in agreement with that obtained by Hoppke et al^[6]. The electrical conductivity on the other hand of these mesogen solution was found to be increase with increasing number of carbon atoms in the side alkoxy chain.

The results are illustrated in Table (2). This could be explained due to the increasing of polarity charge at the oxygen atom of alkoxy groups with that of the nitro group.

Table 2:- Electrical Conductivity of prepared mesogen.
(4-n-alkoxy-2,3,5,6-tetramethylphenyl-4-nitroazobenzene)

No. of Carbon atom	Conductivity cm^{-1}
0	0738
2	1.201
3	2.029
4	2.741
5	3.038
6	3.110
7	3.230
8	3.435

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