This article was downloaded by: [Tomsk State University of Control Systems and Radio]

On: 19 February 2013, At: 10:45

Publisher: Taylor & Francis

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered

office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Molecular Crystals and Liquid Crystals Incorporating Nonlinear Optics

Publication details, including instructions for authors and subscription information:

http://www.tandfonline.com/loi/gmcl17

# Behaviour of the Smetic C Phase in Bicomponent Mixtures

Jaroław Szulc <sup>a</sup> , Roman Dābrowski <sup>a</sup> , Bożenna Sosnowska <sup>a</sup> , Jan Przedmojski <sup>b</sup> & Jolanta Rutkowska <sup>a</sup>

<sup>a</sup> Military Technical academy, 01-489, Warsaw 49, Poland

To cite this article: Jaroław Szulc, Roman Dăbrowski, Bożenna Sosnowska, Jan Przedmojski & Jolanta Rutkowska (1990): Behaviour of the Smetic C Phase in Bicomponent Mixtures, Molecular Crystals and Liquid Crystals Incorporating Nonlinear Optics, 191:1, 301-305

To link to this article: <a href="http://dx.doi.org/10.1080/00268949008038609">http://dx.doi.org/10.1080/00268949008038609</a>

#### PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <a href="http://www.tandfonline.com/page/terms-and-conditions">http://www.tandfonline.com/page/terms-and-conditions</a>

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae, and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand, or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

<sup>&</sup>lt;sup>b</sup> Warsam Technical University, 00-662, Poland Version of record first published: 22 Sep 2006.

Mol. Cryst. Liq. Cryst. 1990, Vol. 191, pp. 301-305 Reprints available directly from the publisher Photocopying permitted by license only © 1990 Gordon and Breach Science Publishers S.A. Printed in the United States of America

### BEHAVIOUR OF THE SMECTIC C PHASE IN BICOMPONENT MIXTURES

JAROSŁAW SZULC<sup>\*</sup> ROMAN DĄBROWSKI<sup>\*</sup>, BOŻĘNNA SOSNOWSKA<sup>\*</sup>, JAN PRZEDMOJSKI<sup>\*</sup>, JOLANTA RUTKOWSKA<sup>\*</sup> "Military Technical Academy, O1-489 Warsaw 49, Poland Warsaw Technical University, O0-662, Poland

Abstract Phase diagrams of binary sustems crystalline components with liquid containing smectic C phases have been investigated. It has been difference that of tilt angles the components is important but not the decisive factor which determines the thermostability of the smectic C phase of the mixtures.

#### INTRODUCTION

Our aim was to find simple relationships between the molecular length and the tilt angle of single compounds and the shape of their miscibility diagram.

#### EXPERIMENT

Following are the formulae of the used compounds and their phase transition temperatures ( in  $^{\circ}$ C ) together with the lengths(in nm) of their molecules in their most extended conformations calculated using known bond lengths and bond angles. In some cases, when it was possible to make X-ray investigations according to the method presented in  $^{1}$ , tilt angles  $\oplus$  at temperatures 10° distant from the transition point  $S_{C}-S_{A}$  are also given. Tilt angles were calculated as  $\cos^{-1}(d_{C}/d_{A})$  where  $d_{C}$  is the smectic layer thickness at the temperature 10° below

the transition point  $S_C^-S_A^-$  and  $d_A^-$  is the smectic layer thickness at the transition point. For compound 1, which has no smectic A phase,  $d_A^-$  was evaluated as the sum of  $d_A^-$  for compound 6 and the length of  $-C_2H_4^-$  group.

$$H_{1}gCgO - (N-N) = (N-N) - (N-N) -$$

$$H_{21}C_{100}$$
  $-C_{00}$   $-C_{00}$ 

The phase diagrams shown in figure 1 were made by thermooptically measuring phase transition temperatures of binary mixtures. Tilt angle measurments as a function of temperature for compounds 2,7,8 shown in figure 2 were made by the electro-optical method using 5  $\mu$ m cell.

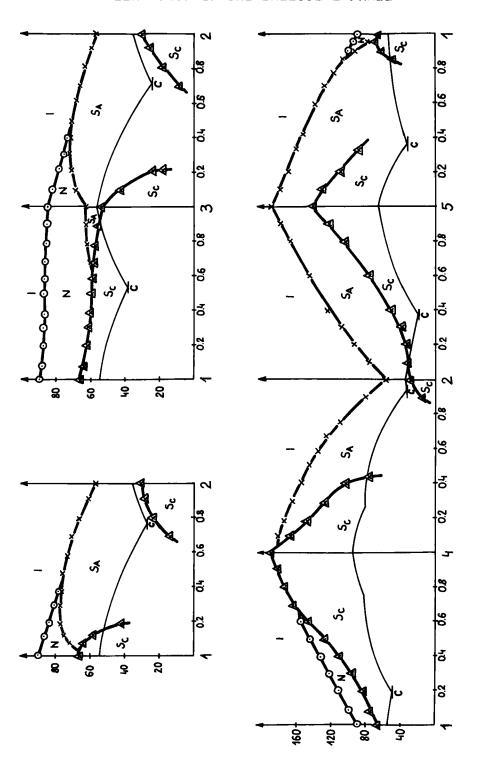


FIGURE 1 Phase diagrams

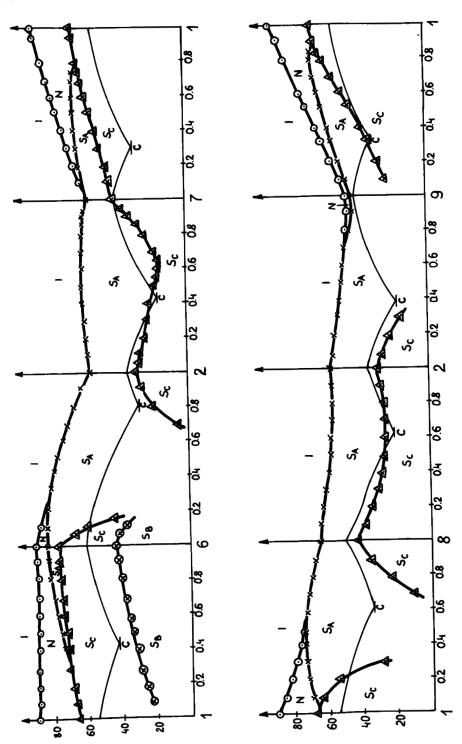


FIGURE 1 continued

#### DISCUSSION

Compounds 1 and 2 were chosen components basic of investigated binary mixtures. because theu differ tilt in angle. It is easily seen that all compounds with the exception:of compound 7 may be exlusive to two assigned groups. The first group form compounds 3,4,6 and 9 which on

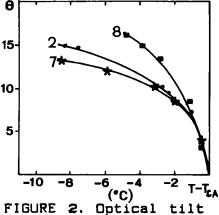


FIGURE 2. Optical tilt angles vs temperature

phase diagram give a continuous line: connecting the upper limit of smectic C phase with compound 2 giving gap in the central region of concentration. While the second group formscompounds 5 and 8 giving a continuous line with compound 2 and a gap with compound 1. This importance of uniformity of tilt angles in indicates the behaviour of the regarding smectic C phase in bicomponent mixtures. The example of compound 7 shows, however. that the difference of tilt angles components is not the decisive factor which determines of the smectic thermostability C phase No direct correlation between the ratio molecular lenght (all the molecules are nearly the same size) and the phenomenon of destabilizatin of smectic C phase could be found.

It seems that ivestigated phenomenon is too complicated to be explained taking only isolated factors into consideration. More detailed investigation is needed.

#### REFERENCES

- R.Dabrowski, J.Przedmojski, K.Czupryński, B.Sosnowska, Mol. Cryst. Liq. Cryst., 151, 243 (1987).
- 2.U.A.Baikalov, L.A.Beresnev, L.M.Blinov, Mol. Cryst. Liq. Cryst., 127, 397, (1985).