



Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/gmcl19>

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Version of record first published: 04 Oct 2006

To cite this article: Z. Li, Z. An, Y. Zheng & K. Feng (1998): Compatibility Study of a Multi-Component Tn Liquid Crystal Mixture and a Multi-Component Cholesteric Liquid Crystal Mixture by Dsc, Molecular Crystals and Liquid Crystals Science and Technology. Section A. Molecular Crystals and Liquid Crystals, 309:1, 15-18

To link to this article: <http://dx.doi.org/10.1080/10587259808045513>

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Compatibility Study of a Multi-Component TN Liquid Crystal Mixture and a Multi-Component Cholesteric Liquid Crystal Mixture by DSC

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(Received 12 October 1995)

The phase transition curves of a multi-component TN liquid crystal mixture (TN88-1) and a multi-component cholesteric liquid crystal mixture (Ch88-2) were plotted by a differential scanning calorimeter. The phase transition temperature and phase transition heat were obtained from the DSC curves. The results show that the components of TN88-1 are compatible and they can form a stable mixture with CB15 chiral liquid crystal. The components of Ch88-2 are not compatible and Poly (MMA–BMA) can greatly improve their compatibility.

Keywords: Differential scanning calorimetry; multi-component LC mixture; compatibility; liquid crystal mixtures; cholesteric

INTRODUCTION

Multi-component liquid crystal mixtures are generally needed to obtain a nematic phase with a wide temperature range. But the components of the mixture must have good compatibility, otherwise the mixture will lose its mesomorphic property after a long period of storage because of phase separation. DSC offers a convenient way to study the compatibility of a multi-component liquid crystal mixture [1,2] and we use it to investigate

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the compatibility of a multi-component TN liquid crystal mixture (TN88-1) and a multi-component cholesteric liquid crystal mixture (Ch88-2).

EXPERIMENTAL

A Perkin-Elmer DSC-2C differential scanning calorimeter was used to study the compatibility of the two multi-component liquid crystal mixtures. The temperature rate was controlled at 5 K/min and the scanning temperature range is from 250°K to 360°K. A 8 ~ 10 mg sample is weighed and three replicates of each sample were tested.

TN88-1 contains five TN liquid crystals: 4-ethyl-4'-cyanobiphenyl, 4'-cyanobiphenyl trans-4-ethylcyclohexanecarboxylate, 4-pentylphenyl 4-methylbenzoate, 4'-pentylphenyl 4-propylbenzoate and 4'-pentylphenyl 4-pentylbenzoate. Ch88-2 contains three cholesteric liquid crystals: cholesteryl nonylate, cholesteryl chloride and cholesteryl oleic carbonate. CB15, (+) - 4-(2-methylbutyl)-4'-cyanobiphenyl, is a chiral liquid crystal. Poly (MMA-BMA) is a copolymer of methyl methacrylate and butyl methacrylate (1:1). All compounds were prepared by our Institute and have a purity greater than 99.5%.

RESULTS AND DISCUSSION

The phase transition curves of TN88-1 and Ch88-2 are showed in Figure 1 and Figure 2. The phase transition temperature (T) and phase transition heat (ΔH) are presented in Table I and Table II.

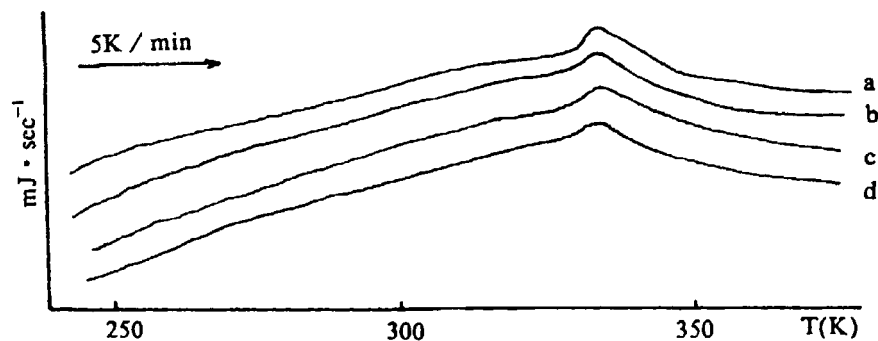


FIGURE 1 DSC curves of the phase transition of TN88-1 (sample, storing time) a. TN88-1, 3 days; b. TN88-1, 30 days; c. TN88-1 + 0.09%CB15, 3 days; d. TN88-1 + 0.09% CB 15, 30 days.

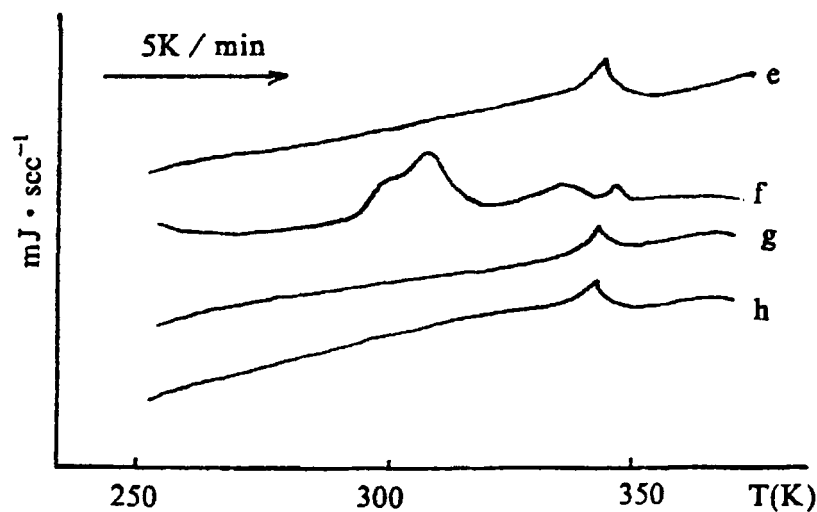


FIGURE 2 DSC curve of the phase transition of Ch88-2 (sample, storing time) e. Ch88-2, 3 days; f. Ch88-2, 30 days; g. 40% Ch88-2 + 60% Poly (MMA-BMA), 3 day; h. 40% Ch88-2 + 60% Poly (MMA-BMA), 30 days.

TABLE I The phase transition temperature and phase transition heat of TN88-1

sample	storing time (day)	$T(K)/\Delta H(J \cdot g^{-1})$
TN88-1	3	331.1/8.01
TN88-1	30	330.9/7.93
TN88-1 + 0.09%CB15	3	330.5/7.85
TN88-1 + 0.09%CB15	30	330.6/7.91

TABLE II The phase transition temperature and phase transition heat of Ch88-2

sample	storing time (day)	$T(K)/\Delta H(J \cdot g^{-1})$		
		T_1	T_2	T_3
Ch88-2	3	—	—	341.1/1.48
Ch88-2	30	304.2/1.26	332.9/1.74	348.0/0.25
40%Ch88-2 + 60%Poly (MMA-BMA)	3	—	—	341.7/1.26
40%Ch88-2 + 60%Poly (MMA-BMA)	30	—	—	341.6/1.27

From Figure 1 and Table I, we can see that each curve has only one phase transition endotherm and has the same phase transition temperature and phase transition heat. It indicates that the five components of TN 88-1 are compatible and they can form a stable mixture with CB15.

From Figure 2 and Table II, we can see that curve *f* has three phase transition endotherms, it indicates that Ch88-2 is unstable during Storing. Curve *g* and *h* have only one phase transition endotherm and have the same phase transition temperature and phase transition heat, it indicates that Poly (MMA-BMA) can greatly improve the compatibility of the components of Ch88-2.

References

- [1] M. Paci *et al.*, *Thermochimica Acta*, **137**, 105 (1988).
- [2] M. Paci *et al.*, *Thermochimica Acta*, **122**, 181 (1987).