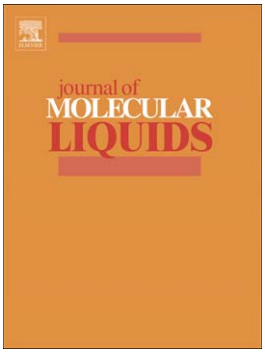

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Asim Debnath, Pradip Kumar Mandal

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Wide range room temperature ferroelectric liquid crystal mixture with microsecond order switching

Asim Debnath and Pradip Kumar Mandal*

Department of Physics, University of North Bengal, Siliguri-734013, India

*Corresponding author. Tel.: +91 353 2776338; fax: +91 353 2699001. E-mail address: mandal_pradip@yahoo.com

Using four pyrimidine compounds as host matrix and a partially fluorinated biphenylyl as dopant a ferroelectric liquid crystal mixture has been formulated which exhibits SmC* phase over 90° from below ambient down to at least 12°C. X-ray, dielectric and electro-optic studies reveal that the mixture possess almost temperature independent high optical tilt, low driving voltage and switching speed around 100 microseconds, thus the mixture will be suitable for display applications.

1. Introduction

Ferroelectric liquid crystals (FLC), especially chiral smectic C (SmC*), gained considerable interest soon after their discovery by Meyer *et al*. [1] in 1975. Various studies have been performed from the standpoints of not only fundamental interest but also of potential applications to electro-optical devices like fast switching flat-panel displays, optical light modulators, optical signal processing and computing [2,3]. Basically broad temperature range from or below ambient temperature and high switching speeds FLCs are desired for these applications. In general, no single FLC compound can satisfy the above requirements. To meet consumer expectations much effort has been made to optimize the physical parameters of FLCs, such as temperature range, spontaneous polarization (P_S), helical pitch (p), switching time (τ), tilt angle (θ) and rotational viscosity (γ_Φ)[4,5]. Multicomponent mixtures are, therefore, formulated to optimize all the required properties for practical applications. In such mixtures chiral dopant is the primary component which controls the switching speed of the mixture. This is due to the induction of P_S in the FLC mixture. Maintaining low viscosity is also critical in order to achieve fast switching mixture, which is attained by formulating appropriate achiral host mixtures. The chiral compound 4′-[3-(nonafluoropentanoyloxy) prop-1-oxy] biphenyl l-4-yl (S) (1-methylheptyloxy) benzoate, (4F3R) meets the criteria of chiral dopant, various properties of which in pure state have been published before [6,7]. A host mixture was also prepared to control the temperature range and tilt angle of the mixture. 4F3R shows high solubility in the host mixture and enhances the width of SmC* phase by decreasing Cr-SmC* transition and induce moderate P_S at low concentration.

2. Experimental

2.1 *Preparation of the mixture*

For creating host mixture we used four achiral phenyl pyrimidine compounds