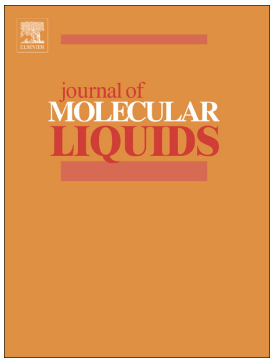

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Visco-elastic properties of multi-component mixtures of hockey stick-shaped liquid crystal compounds

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Measurements of optical birefringence (Δn), permittivity ($\varepsilon_{\parallel}$, $\varepsilon_{\perp}$), splay elastic modulus (K_{11}) and rotational viscosity (γ_1) have been carried out on the nematic (*N*) phase of a few multi-component liquid crystal mixtures having the hockey stick-shaped 4-(3-*n*-alkyloxy-2-methyl-phenyliminomethyl)phenyl 4-*n*-alkyloxycinnamate compounds. Three eutectic mixtures (tri-, tetra- and penta-component) were prepared using the Le Chatelier, Schröder and Van Laar (CSL) equation. The nematic range in all the investigated mixtures has been found to be relatively greater than that in most of the pure components. The Δn values have been found to be comparatively smaller than those for the constituent compounds. A temperature dependent inversion in the static dielectric anisotropy ($\Delta\varepsilon = \varepsilon_{\parallel} - \varepsilon_{\perp}$) has been observed for all the mixtures on entering the anticlinic smectic-*C* (Sm-C_a) phase. No trace of pretransitional divergence has been detected in the temperature dependence of K_{11} in vicinity of the nematic to lower smectic-*C* transition. At a fixed reduced temperature, the γ_1 values are either slightly higher or close to those of the pure compounds. The outcomes are explained in the framework of influence of molecular structure on the phase behaviour of multi-component mesogenic system.

Keywords: hockey stick-shaped liquid crystal, multi-component mixture, optical birefringence, permittivity, splay elastic modulus, rotational viscosity

1. Introduction

The aspects of the molecular structure and conformational perspectives appear to be of fundamental importance in deciding the mesogenic behaviour of liquid crystalline compounds. During past few decades a number of exotic shaped liquid crystal molecules encompassing a rich variety of phase topologies with unusual molecular ordering and layer frustrations have been synthesised and studied extensively. Such exotic phases, residing chiefly at the interface of the calamitic and columnar mesophases, are not only important for the understanding of molecular behaviour from the view point of basic sciences but they are also crucial because some of them are of great potential for technological relevance's as well. Among them the bent-core or banana-shaped compounds have appeared as a field of considerable interest in soft matter research. Revelations of the exceptional structure induced mesomorphic behaviour and unconventional phase sequences in those non-linear molecules have unveiled a stimulating new horizon in the science of thermotropic liquid crystals (LCs). Exceptional findings, including the observation of supramolecular structure, ferroelectricity and spontaneous chiral symmetry breaking in such smectogenic fluids despite the absence of any trace of inherent molecular chirality, has released a tremendous impact on the general field of soft condensed matter. Such group of remarkable

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