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New azo-benzothiazole based liquid crystals: synthesis and study of the effect of lateral substituents on their liquid crystalline behaviour

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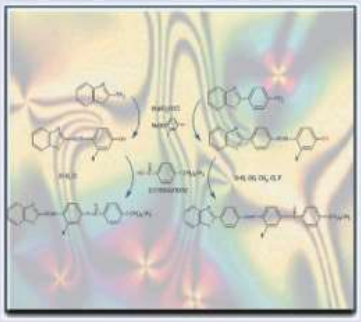
ABSTRACT

New azo-phenylbenzothiazole moiety-based liquid crystals with diverse substituents/groups (H, OH, CH_3, Cl, F) at position-3 of the central benzene ring were prepared and characterised.

All synthesised compounds were characterised using H-NMR and FT-IR spectroscopy, mass spectrometry and elemental analysis. Thermal properties of mesophase of these liquid crystal compounds were studied to reveal that they all exhibited an enantiotropic nematic phase except for the compound bearing an OH group, i.e. EB_1-OH.

Two new azo-benzothiazole analogous, where the azo group is directly attached to the thiazole ring, were synthesised. The mesomorphic properties of the azo-phenylbenzothiazole liquid crystalline compounds were compared with these compounds to evaluate the effect of the nature of the lateral substituents on their mesomorphic properties.



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Introduction

Thermotropic liquid crystal (LC) molecules comprise a core, usually consisting of an aromatic ring connected to various linking groups such as ester (–COO–), azomethine (–C = N–) and azo (–N = N–). The type of linking groups in liquid crystalline compounds plays a vital role and these groups in the mesogenic core are able to alter the stereochemistry of the molecule allowing it to produce multifunctional mesophase materials with improved properties [1]. The linking group can additionally increase the overall molecular length and the polarisable anisotropy of mesogen, which in turn confers a favourable geometry for the molecule [1]. In particular, azo linkage-based liquid crystals are an important class and are highly topical because they are photolytically active and are described as photoresponsive materials [2–5]. Similarly, thioether linkage compounds have attracted significant attention for their scientific interest as well as applications [6–10]. In this regard, a large number of research groups have been working on azo-ester linked liquid crystal materials aiming to study the effect of varying different parameters on the thermal and mesomorphic behaviours *viz*., alkyl chain length, terminal groups and lateral substituents [11–22].

It is well known that any substituent or group positioned at an angle to the side of a molecule will affect the molecular packing and therefore reduce liquid crystal phase stability. This type of disruptive effect usually occurs through lateral substitution. This lateral

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