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Investigation of thermodynamic properties of 4-decyloxybiphenyl-4'-carboxylic acid liquid crystal and preparation of polymer dispersed liquid crystal composite

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INVESTIGATION OF THERMODYNAMIC PROPERTIES OF 4-DECYLOXYBIPHENYL-4'-CARBOXYLIC ACID LIQUID CRYSTAL AND PREPARATION OF POLYMER DISPERSED LIQUID CRYSTAL COMPOSITE

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ABSTRACT

In this study, firstly, retention behavior of solvents on the liquid crystalline material 4-decyloxybiphenyl-4'-carboxylic acid (DBCA) have been studied by inverse gas chromatography (IGC) technique. Liquid crystal (LC) selectivity was investigated using the acetate isomers by the IGC method at temperatures between 333.2 K and 543.2 K. Later on, the interactions of LC with n-octane, n-nonane, n-decane, undecane, dodecane, tridecane, n-propyl benzene, isopropyl benzene, ethylbenzene, chlorobenzene and toluene between 518.2 K and 543.2 K were examined. LC-solvent interaction parameters for Flory-Huggins theory, χ_{12}^{∞} , and equation of state theory, χ_{12}^* , effective exchange energy parameters, X_{eff} , the weight fraction activity coefficient, Ω_1^{∞} , the partial molar heat of mixing at infinite dilution of the solvent, ΔH_1^{∞} , molar heat of vaporization of solvent, ΔH_v and the partial molar heat of sorption of the solvent, $\Delta H_{1,s}$ were obtained.

Secondly, polymer dispersed liquid crystal (PDLC) composite film in composition 20/80 poly(methyl methacrylate) (PMMA):DBCA by weight was synthesized by solvent-induced phase separation method. The mesomorphic behaviour of DBCA and PDLC composite has been investigated by differential scanning calorimetry (DSC) and optical polarizing microscopy (PM).

Key words: Liquid crystal, Thermodynamic interaction parameters, Inverse gas chromatography, Poly(methyl methacrylate), Polymer dispersed liquid crystal composite

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