Molecular Crystals and Liquid Crystals , Volume 608, 2015 - Issue 1

ISSN: 1565-5287

Dependence of Molecular Structure on Mesomorphic Behavior with Special Reference to Central Bridge

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Abstract

A novel homologous series of liquid crystalline 4-(4′-n-alkoxy cinnamoyloxy)-4″-methoxy benzyl cinnamates was synthesized and studied with a view to understand and establish the effects of molecular structure on liquid crystal behavior. The series consists of eleven members of the series. None of the homologue derivatives are either nonliquid crystal or smectogenic, i.e. all the eleven members of the novel homologous series are enantiotropcially nematogenic only. Transition and melting temperatures as well as textures of the nematic mesophase were determined on an optical polarizing microscope equipped with a heating stage. The transition curves of the phase diagram show phase behavior in a normal expected manner. An odd-even effect is observed for the nematic-isotropic transition curve. The textures of the nematic mesophase are threaded or Schlieren as determined a by miscibility method. Analytical and spectral data confirm the molecular structures of the homologues. The average thermal stability for nematic is 213.8°C. The isotropic temperatures vary between 190°C and 240°C. The nematogenic mesophase length varies from 17°C to 102°C. Thus, the novel homologous series is entirely nematogenic without the exhibition of smectogenic character. The liquid crystal (LC) properties of the present novel series are compared with structurally similar other known homologous series.

Keywords: Enantiotropy, liquid crystal, nematic, smectic, thrmotropic