Published Research Paper-I

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ABSTRACT
Titled novel homologous series of mesogenic character viz. α-4-[4’-n-Alkoxy-Cinnamoyloxy] Benzoyl-β-3’Nitrophenyl ethylenes is synthesized and studied with a view to understand its liquid crystal (LC) properties. There are seven homologues from n-pentyl to n-hexadecyl derivatives of the series which are mesogenic. Rest of the homologues are nonmesogenic. n-pentyl to n-decyl homologues are polymesogenic, n-Dodecyl ,n-tetradecyl and n-hexadecyl derivatives of the series are only nematogenic without exhibition of smectic character. All mesogenic homologues are enantiotropically, smectogenic and/or nemetogenic. Transition and melting temperatures are observed on polarising microscope with heating stage. Phase diagram drawn on the basis of microscopic observations. The novel series is predominantly nematogenic and partly smectogenic with middleordered melting type. Analytical data support the structures of molecules. Mesogenic properties of titled series are compared with structurally similar other homologous series.

KEY WORDS: Liquid Crystal, Mesomorphic, Mesogenic, Smectic, Nematic.

Published Research Paper-II
Study of Ethylene Derivatives of Liquid Crystals by New Homologous Series: \( \alpha \)-4(-4’-n-Alkoxy Cinnamoyloxy) phenyl \( \beta \)-4”-Nitrobenzoyl Ethylenes. 
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**ABSTRACT**

Titled new homologous series of liquid crystal (LC) consists of eleven homologues. Methyl to butyl and dodecyl to hexadecyl derivatives of the series are nonliquid crystals while pentyl to decyl derivatives are polymesomorphic i.e. Smectic and nematic mesophases are displayed one after another in enantiotropic manner. Phase behavior is shown in phase diagram. Texture of the smectic and nematic mesophases are focal conic of smectic-A type and schlieren or threaded type respectively. Analytical data support the molecular structures of homologues. Transition and melting temperatures were determined by hot stage polarising microscope. Average thermal stability for smectic (132.25°C) and nematic (171.50°C) and other liquid crystal properties of present series:1 are compared with other structurally similar homologous series.

**Keywords:** Liquid crystal, mesomorphic, Smectic, Nematic, Mesophase.
A Novel Mesomorphic Homologous Series of Ethylene Derivatives $\alpha$-4-(4-$n$-Alkoxy benzoyloxy) Benzoyl $\beta$-3—-Nitro Phenyl Ethylenes

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ABSTRACT:
A novel homologous series of 11 ethylene derivatives has been synthesized and evaluated. The methoxy to pentyloxy homologues are nonmesomorphic, whereas the hexyloxy to dodecyloxy derivatives are enantiotropically smectogenic and enantiotropically nematogenic in character. The tetradecyloxy and hexadecyloxy homologues exhibit only nematogenic character without showing of any smectogenic character. An odd–even effect is not observed in either of the transition curves from a phase diagram. The average smectic and nematic thermal stabilities are 126.7°C and 148.6°C, respectively. The liquid crystal properties of the novel series are compared with other structurally similar compounds. The texture of the nematic phase is a threaded or Schlieren type, and that of smectic phase shows the smectic A type as determined by optical polarizing microscopy. Analytical data support the molecular structures in all cases. The novel series is predominantly nematogenic and partly smectogenic with mesophase temperature ranges between 12°C and 63°C.

Keywords Mesomorphism; nematic; smectic
Synthesis and Study of Liquid Crystal Properties of Novel Homologous Series: $\alpha$-4-[-4$_n$-Alkoxy benzoyloxy] Phenyl $\beta$-4$_n$-Nitro benzoyl Ethylenes

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ABSTRACT:
The synthesis and mesomorphic properties of a novel homologous series entitled $\alpha$-4-[-4$_n$-Alkoxy benzoyloxy] phenyl $\beta$-4$_n$-nitro benzoyl ethylenes are reported. All the 11 members of the series except the methoxy and ethoxy derivatives are mesogenic. The propyloxy to pentyloxy and the hexadecyloxy homologues are only enantiotropically nematogenic and the rest of the mesogenic homologues are enantiotropically smectogenic in addition to nematogenic in character. A phase diagram shows the phase behavior through transition curves is of a normal type. An odd–even effect is observed for the nematic-isotropic transition curve. Analytical and spectral data support the molecular structure of the materials. Transition temperatures and other liquid crystal (LC) properties including average thermal stabilities for smectic and nematic were determined by optical polarizing microscopy. Average thermal stability for smectic and nematic are 125.6°C and 154.6°C, respectively. Smectogenic and nematogenic phase ranges vary between 19°C to 35°C and 14°C to 50°C, respectively. The LC properties of the novel series are compared with two other structurally similar homologous series. The textures of the nematic phase are threaded or schlieren type and those of the smectic phase is of the type A or C.

Keywords Liquid crystals; mesogen; mesomorphic; nematic; smectic
Study of the Effect of Molecular Structure on Mesomorphic Properties Through a Novel Homologous Series $\alpha$-3-[4-$n$-Alkoxy cinnamoyloxy] Phenyl-$\beta$-4_-nitro Benzoyl Ethylenes.

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ABSTRACT:
Eleven members of a novel homologous series $\alpha$-3-[4-$n$-Alkoxy Cinnamoyloxy] phenyl-$\beta$-4_-nitro benzoyl ethylene are synthesized and evaluated for their mesomorphic properties. Seven members of the series are enantiotropically nematogenic without exhibition of smectogenic character, and the other four members are non-mesomorphic in character. Mesomorphic behavior from a phase diagram for solid to nematic and for nematic to isotropic transitions shows the normal behavior. The nematic to isotropic transition curve shows an odd–even effect. Analytical data support the structures of molecules. Nematogenic phase length ranges from 30°C to 62°C. Nematic-isotropic thermal stability is 175.7°C. The mesomorphic properties of the series are compared with the structurally similar isomeric series. Thus, the series is predominantly mesomorphic (nematogenic) and partly non-mesomorphic with middle-order melting points. Transition temperatures and other liquid crystal properties were determined by optical polarizing microscopy with a heating stage.

Keywords Enantiotropy; liquid crystal; mesomorphism; nematic; smectic
The titled homologous series consists of 11 members. The methyl and ethyl homologues are nonmesomorphic because of very high melting points, however, the propyl to hexadecyl derivatives are enantiotropic nematic with absence of smectogenic. The texture of nematic mesophase is threaded or Schlieren. The nematic-isotropic transition curve of the phase diagram behaves in a normal manner with the exhibition of an odd–even effect. The transition temperatures of the series and liquid crystal properties are observed through optical polarizing microscopy and a hot stage. The novel materials were characterized by elemental analysis, infrared, and $^1$H NMR spectroscopy. Analytical data support the molecular structures. The liquid crystal properties of the novel series are compared with structurally similar homologous series. The novel series is entirely nematogenic with absence of smectic character and of a middle-ordered melting type. The nematic-isotropic thermal stability varies between around 120°C and 180°C.

**Keywords** Anisotropic; liquid crystal; mesomorphic; nematic; smectic
Synthesis and Evaluation of a Novel Liquid Crystalline Homologous Series: α-4-[4-n-Alkoxy Cinnamoyloxy] Benzyol-β-3,4-Dimethoxy Phenyl Ethylenes

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The synthesis and evaluation of a novel series of 12 homologues is presented. Enantiotropic nematogenic mesomorphism is exhibited from the pentyl to hexadecyl homologues. The other homologues are not liquid crystalline. Smectic mesomorphism is absent in all homologues. Transition temperatures were determined using an optical polarizing microscope equipped with a heating stage. The transition curves of a phase diagram behave in a normal manner. An odd–even effect is observed for the N-I transition curve. The textures of the nematic phase are of the threaded or Schlieren type. Mesomorphic–isotropic transition temperatures range from 152°C to 178°C. The nematogenic phase length varies between 24°C and 51°C. The nematic thermal stability is 163.1°C. Thus, the novel homologous series is entirely nematogenic without the exhibition of smectogenic character, and is of a middle ordered melting type. Analytical and spectral data support the molecular structures. Liquid crystal (LC) properties of the novel series are compared with structurally similar homologous series.

**Keywords** Liquid crystal; mesomorphism; nematic; smectic; thermotropic.
Study of Liquid Crystalline State and Evaluation of its Properties Through a Novel Homologous Series

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A novel homologous series $\alpha$-4-[4-$n$-alkoxy benzoyloxy] benzoyl-$\beta$-3,4-dimethoxy phenyl ethylenes has been synthesized and studied for liquid crystal (LC) properties to understand and establish the relation between molecular structure and liquid crystalline behavior. Twelve members of series were synthesized. All the members except first member of the series are mesomorphic. The hexyloxy to tetradecyloxy homologues are smectogenic and nematogenic in character. The ethoxy to pentyloxy and the hexadecyloxy homologues exhibit only nematogenic character with the absence of smectogenic mesophase formation. An odd–even effect is observed for the smectic-nematic and the nematic-isotropic transition curves in the phase diagram. The smectic mesophase showed as either the SmA or SmC. The nematic mesophase shows a threaded or Schlieren type texture. Spectral and analytical data confirms the molecular structures of the homologues. The thermal stabilities for the smectic and the nematic are 115.6$^\circ$C and 156.6$^\circ$C. The smectogenic and nematogenic mesophase length vary from 7$^\circ$C to 28$^\circ$C and from 7$^\circ$C to 52$^\circ$C respectively. The transition temperatures were observed through an optical polarizing microscope equipped with heating stage. Thus, the presently investigated novel homologous series is predominantly nematogenic and partly smectogenic with a middle ordered melting type and a considerable mesophase length. The LC properties of the novel series are compared with structurally similar homologous series.

**Keywords** Anisotropic liquid; liquid crystal; mesomorphism; nematic; smectic