Preface

"All of science is nothing more than the refinement of everyday thinking."

Albert Einstein

In this thesis, an extensive study on the design, synthesis, mesomorphism and photo physical studies of novel achiral bent-core dimers and achiral bent-core liquid crystals based on four benzene rings are presented. In addition, the influences of substituents on these materials are highlighted to explore some general structure–property relationships. The organized body of thesis is as follows:

Chapter 1 describes the general introduction of different liquid crystalline system along with the brief history about these materials. This chapter also includes various liquid crystalline phases.

Chapter 2 contains review of literature about Oligo derived bent-core liquid crystals of different molecular structures reported was discussed. This chapter gives an idea about the existing research work in this area.

Chapter 3 describes the synthetic steps for efficient and elegant route towards the successful synthesis of the desired compound. Chemical characterization methods with spectral data of the synthesized compound and procedure involved for the synthesis are mentioned. Brief outline methods (viz., polarising optical microscopy and differential scanning calorimetry) involved for studying the phase behaviours and other associated physical properties of liquid crystals are also discussed.

Chapter 4A deals with the designed and synthesis novel azo functionalized dimers derived from achiral four ring unsymmetrical bent core mesogens with alkylene spacer. The four-ring bent-core units are attached end to end with alkylene spacer. The presence of lateral methyl substitution on outer phenyl ring decreases the melting temperature and clearing temperature and the nematic phase become supercooled to room temperature.
Chapter 4B discussed the novel achiral four ring unsymmetrical bent-core liquid crystals derived from 3-amino-2-methylbenzoic acid with linking group imine, ester and photochromic azo designed, synthesized and characterized. All the compounds exhibit wide thermal range of enantiotropic nematic phase. The compounds exhibit photochromic behavior due to presence of azo group in the molecule.

Chapter 4C deals the synthesis of designed four-ring bent-shaped molecules with linking moieties imine, ester and azo along with methyl substituent in the peripheral phenyl ring was successfully accomplished and characterized. Mesomorphobic phase range of the homologous series exposed majority of the compounds exhibit enantiotropic wide nematic phase till room temperature. The lateral substitution of methyl group in peripheral phenyl rings reduced the melting as well as clearing temperatures from its parent un-substituted compounds (as presented in chapter 4B).

Chapter 4D Cu (II) complexes of the azo functionalized four ring unsymmetrical bent-core compounds and substituted four ring unsymmetrical bent-core compounds was successfully synthesized and characterized. All the unsubstituted ligands exhibit wide range of enantiotropic nematic phase but upon complexes shows enantiotropic as well as monotropic nematic phase. In case of substituted compounds, Cu (II) complexes exhibit only monotropic nematic phase.