

PREFACE

The present dissertation entitled *“INVESTIGATION ON SOME ACHIRAL AND CHIRAL MESOGENIC SYSTEMS BY DIFFERENT EXPERIMENTAL TECHNIQUES”* is submitted to fulfill the requirements for the degree of Doctor of Philosophy (Science) of University of North Bengal. The work in this thesis was initiated from an attempt to investigate the different physical properties of new mesogenic materials which are expected to be useful in various important applications including display. These studies have been mainly carried out in Liquid Crystal Research Laboratory, Department of Physics, University of North Bengal under the supervision of Prof. Pradip Kumar Mandal, Department of Physics, University of North Bengal. The thesis consists of seven chapters.

A brief introduction to different kinds of liquid crystals and list of investigated compounds are given in **Chapter 1**.

Chapter 2 contains the theoretical backgrounds of the experimental techniques used for studying the liquid crystal materials. Experimental results have been described in the following four chapters.

Physical properties of nine achiral fluorobenzene derivatives (**3ccp-f**, **3ccp-ff**, **3ccp-fff**, **5ccp-f**, **5ccp-ff**, **5ccp-fff**, **3cpp-ff**, **5cpp-ff**, **5cpp-fff**) were investigated by optical polarising microscopy, differential scanning calorimetry, X-ray diffraction and optical birefringence techniques; and the influence of molecular core structure, chain length and fluorination on their physical properties have been reported in **Chapter 3**.

Crystal and molecular structures of two fluorobenzene compounds (**3ccp-ff**, **3ccp-fff**), one isothiocyantobenzene based compound (**11CHBT**) and one four ring cyano compound (**7CBB**) have been determined from single crystals X-ray diffractometer data and an attempt has been made to find the effect of the molecular geometry and packing in the crystalline state on its phase behaviour and different physical properties. These results have been presented in **Chapter 4**.

In **chapter 5** results of investigation on the partially fluorinated chiral compound, (S)-4''-(6-perfluoropentanyloxyhexyl-1-oxy)-2', - 3'-difluoro - 4 - (1-methylheptyloxycarbonyl)-[1,1':4',1''] - terphenyl [**5F6T(2',3'F)**], which exhibits antiferroelectric, ferroelectric and paraelectric phases, have been presented.

Using two different types of host mixtures and three different types of dopants six multi-component room temperature FLC mixtures (**LAHS1** to **LAHS6**) have been formulated and characterized. Rigidity of the core structure, nature of chirality and extent of fluorination of the constituent molecules are found to have pronounced effect on their properties and have been described in **Chapter 6**.

Conclusions of all the experimental results have been summarized in **Chapter 7**.

A list of selected books and monographs on liquid crystals has been put in **Appendix A**. All of the results incorporated in this dissertation have already been published in different international scientific journals, a list of which is given in **Appendix B**.

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