

*Investigations on the Synthesis and
Structure-Property Relationships of Novel
Mesogenic Bent-Core Compounds*

By

S. Radhika

Thesis submitted to the Jawaharlal Nehru University
for the award of the degree of

Doctor of Philosophy



*Raman Research Institute
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CERTIFICATE

This is to certify that the thesis entitled **“Investigations on the synthesis and structure-property relationships of novel mesogenic bent-core compounds”** submitted by Radhika S. for the award of the degree of **DOCTOR OF PHILOSOPHY** of the Jawaharlal Nehru University is her original work. This has not been published or submitted to any other University for any other degree or diploma.

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DECLARATION

I hereby declare that the work reported in this thesis is entirely original. This thesis is composed independently by me at the Raman Research Institute under the supervision of Prof. B. K. Sadashiva. I further declare that the subject matter presented in this thesis has not previously formed the basis for the award of any degree, diploma, membership, associateship, fellowship or any other similar title of any university or institution.

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List of abbreviations and symbols used in the thesis

BC	bent-core
B ₁	columnar phase with a rectangular lattice
B ₂	tilted layered phase with polar properties
B _{2x}	variant of B ₇ phase
B _{2'} , B _{2''}	variants of a B ₂ phase
B ₃	soft crystalline or hexatic mesophase
B ₄	soft crystalline mesophase with supramolecular chirality
B ₅	smectic monolayer phase with in-plane order
B _{5A}	antiferroelectric B ₅ phase
B _{5F}	ferroelectric B ₅ phase
B ₆	intercalated smectic B-phase
B ₇	non-switchable mesophase with a two-dimensional lattice
B _{7'}	variant of a switchable B ₇ phase with a layered structure
B _{7AF1}	novel antiferroelectric B ₇ sub-phase 1
B _{7AF2}	novel antiferroelectric B ₇ sub-phase 2
B _{7bis}	ferroelectric B ₇ phase
B _{7A}	antiferroelectric B ₇ phase
B ₈	smectic bilayer phase with double tilted molecules
Cr	crystalline phase
Col _r	columnar phase with a rectangular lattice
Col _r P _A	polar columnar phase with a rectangular lattice and exhibiting antiferroelectric behaviour
Col _{ob} P _A	polar columnar phase with an oblique lattice showing antiferroelectric characteristics
Col _{ob} P _F	polar columnar phase with an oblique lattice showing ferroelectric characteristics
Col _{ob} P _x	polar columnar phase with an oblique lattice
Col _{ob}	columnar phase with an oblique lattice
CDCl ₃	deuteriochloroform

CD ₃ COCD ₃	deuterioacetone
d	doublet
dd	doublet of doublet
dc	direct current
ac	alternating current
DCC	<i>N,N'</i> -dicyclohexylcarbodiimide
DMAP	4-(<i>N,N</i> -dimethylamino)pyridine
DMSO-d ₆	deuteriodimethyl sulfoxide
D ₂ O	deuterium oxide
DSC	differential scanning calorimeter
DC	dark conglomerate phase with smectic ordering
h	hour
I	isotropic phase
IR	infrared
ITO	indium tin oxide
m	multiplet
min	minutes
N	nematic phase
<i>n</i>	normal
NMR	nuclear magnetic resonance
ppm	parts per million
quin	quintet
SmA	smectic A phase
SmA'	variant of smectic A phase
SmA _d	partial bilayer uniaxial smectic A phase
SmA _{db}	partial bilayer biaxial smectic A phase
SmA _{db} P _A	partial bilayer biaxial antiferroelectric smectic A phase
SmA _d P _R	random polarized partial bilayer uniaxial smectic A phase
SmC	synclitic smectic C phase
SmC _a	anticlinitic smectic C phase
SmCP _A	polar smectic C phase with antiferroelectric properties

SmCP _F	polar smectic C phase with ferroelectric properties
SmC _s P _A	polar smectic C phase with synclitic tilt in adjacent layers and antiferroelectric characteristics
SmC' _s P _A	variant of antiferroelectric smectic C phase with synclitic tilt in adjacent layers
SmC _s P _F	polar smectic C phase with synclitic tilt in adjacent layers and ferroelectric characteristics
SmC _a P _A	polar smectic C phase with anticlitic tilt in adjacent layers and antiferroelectric characteristics
SmC _a P _F	polar smectic C phase with anticlitic tilt in adjacent layers and antiferroelectric characteristics
s	singlet
t	triplet
TLC	thin layer chromatography
TMS	tetramethylsilane
XRD	X-ray diffraction
Z	zigzag-shaped
•	phase exists
-	phase does not exist
()	monotropic transition
*	compound has a crystal-crystal transition and the enthalpy is the sum of all previous transitions
♠	mesophase observed only under microscope and not seen in DSC; enthalpy value could not be determined as the sample crystallizes immediately

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