

# **Synthesis and Characterization of Some Non-conventional Discotic Liquid Crystals**

By

**Satyam Kumar Gupta**

**Thesis submitted to Jawaharlal Nehru University, New Delhi for the award  
of the degree of**

**Doctor of Philosophy**



**Raman Research Institute**

**Bangalore-560080**

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# Raman Research Institute

## CERTIFICATE

This is to certify that the thesis entitled “**Synthesis and Characterization of Some Non-conventional Discotic Liquid Crystals**” submitted by **Mr. Satyam Kumar Gupta**, for the award of the degree of **DOCTOR OF PHILOSOPHY** of Jawaharlal Nehru University, New Delhi, is his original experimental investigation and conclusions. The subject matter of this thesis has not been previously published or submitted to any other university for the award of any other degree or diploma.

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## DECLARATION

I hereby declare that the entire work embodied in this thesis is the result of the experimental investigation carried out by me independently at Raman Research Institute, Bangalore, under the guidance and supervision of Prof. Sandeep Kumar. The experimental work and conclusions presented in this thesis work have not been previously submitted and no part of this thesis work has formed the basis for the award of any other degree, diploma, fellowship or any other similar title.

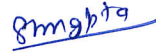


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यथैधांसि समिद्धोऽग्निर्भस्मसात्कुरुतेऽर्जुन ।  
ज्ञानाग्निः सर्वकर्माणि भस्मसात्कुरुते तथा ॥

*yathaidhamsi samiddho'gnir  
bhasma-sat kurute 'rjuna  
jnanagnih sarva-karmani  
bhasma-sat kurute tatha*

हे अर्जुन! जैसे प्रज्वलित अग्नि ईंधनों को भस्ममय कर देता है, वैसे ही  
ज्ञानरूप अग्नि सम्पूर्ण कर्मों को भस्ममय कर देता है

O Arjuna, just as the blazing fire reduces firewood to ashes, so does the fire of  
knowledge burn to ashes all reactions to material activities.

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## **CHAPTER 6: Summary**

## List of abbreviations used in this Thesis

LC	Liquid Crystal	DNA	Deoxyribonucleic Acid
LCD	Liquid Crystal Display	N	Nematic
Sm	Smectic	N <sub>b</sub>	Discotic Nematic
Col	Columnar	N*	Chiral Nematic
1D	One Dimensional	TGB	Twist Grain Boundary
P <sub>s</sub>	Spontaneous Polarization	N <sub>b</sub>	Biaxial Nematic
2D	Two Dimensional	N <sub>D</sub> *	Chiral Discotic Nematic
N <sub>col</sub>	Columnar Nematic	N <sub>L</sub>	Nematic Lateral
Col <sub>h</sub>	Columnar Hexagonal	Col <sub>p</sub>	Columnar Plastic
Col <sub>r</sub>	Columnar Rectangular	Col <sub>ob</sub>	Columnar Oblique
Col <sub>L</sub>	Columnar Lamellar	Col <sub>tet</sub>	Columnar Tetragonal
H	Helical	UV	Ultraviolet
DLC	Discotic Liquid Crystal	POM	Polarizing Optical Microscopy
XRD	X-ray Diffraction	DSC	Differential Scanning Calorimetry
CT	Charge Transport	LED	Light Emitting Diode
FET	Field Effect Transistor	TOF	Time of Flight
NMR	Nuclear Magnetic Resonance	HBC	Hexabenzocoronene
PAH	Polyaromatic Hydrocarbon	TP	Triphenylene
LB	Langmuir Blodget	TN	Twisted Nematic
STN	Super Twisted Nematic	NMP	N-Methyl Pyrrolidinone
TNF	Trinitrofluorenone	ITO	Indium Tin Oxide
AFM	Atomic Force Microscope	STM	Scanning Tunneling Microscope
CNT	Carbon Nanotube	DC	Direct Current
AC	Alternating Current	Cr	Crystalline

**HOPG** Highly Oriented Pyrolytic Graphite

**I** Isotropic

**MW** Microwave

**DMSO** Dimethyl Sulphoxide

**MEK** Methyl Ethyl Ketone

**DMF** Dimethylformamide

**ppm** parts per million

**TCQ** Tricycloquazoline

**AR** Analytical Reagent

**TLC** Thin Layer Chromatography

**Cat-B-Br** Catechol B-Bromoborane

**HPLC** High Pressure Liquid Chromatography

**PR-TRMC** Pulse Radiolysis Time Resolved Microwave Conductivity

**ILCC** International Liquid Crystal Conference