Dr. Syed Salman Ahmad Warsi
Associate Professor, Department of Physics, Integral University, Lucknow

Dr. Syed Salman Ahmad Warsi is an accomplished physicist, academician, and educator with extensive expertise in condensed matter physics. He currently serves as an Associate Professor in the Department of Physics at Integral University, Lucknow, and brings more than 25 years of experience in teaching, research, and academic mentorship.

Throughout his academic career, Dr. Warsi has taught undergraduate and postgraduate students, making significant contributions to physics education through his dedicated teaching and research guidance. He has successfully supervised numerous B.Sc. and M.Sc. dissertations and projects and is actively involved in mentoring doctoral scholars pursuing Ph.D. research in Physics.

His research interests include liquid-crystal systems, nanoscale materials, and contemporary topics in condensed matter physics. Dr. Warsi has published several peer-reviewed research papers in reputed journals and continues to contribute actively to scientific research and academic development.

In addition to his research contributions, Dr. Warsi has co-authored important educational books, including:

- *ICSE Physics for Class X (2025)*
- *ISC Practical Physics for Classes XI & XII (2021)*

He has also served as editor of the following scholarly books:

- *Characterization of Liquid Crystals and Photonic Crystals (2022)*
- *Advances in Contemporary Physics: High Energy, Cosmology and Soft Matter(2025)*

BOOK RIVERS
WE CREATE READERS

BOOK AVAILABLE
amazon
Flipkart
BOOK RIVERS
WE CREATE READERS

9 789378 370311
₹ 380/-

CONTEMPORARY ADVANCES IN PHYSICS, MATERIALS AND COMPUTATIONAL SCIENCES

BOOK RIVERS
WE CREATE READERS

CONTEMPORARY ADVANCES IN PHYSICS, MATERIALS AND COMPUTATIONAL SCIENCES

Physics
Exploring the fundamental laws of nature

Materials
Designing advanced materials for a better future

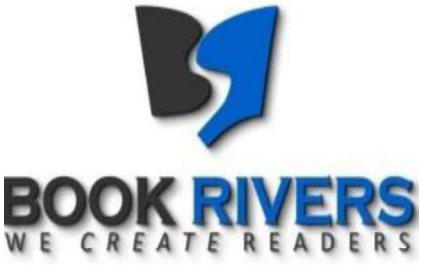
Computational Sciences
Harnessing computation to solve complex problems

Edited by
Dr. Syed Salman Ahmad Warsi

CONTEMPORARY ADVANCES IN PHYSICS, MATERIALS AND COMPUTATIONAL SCIENCES

Edited by

Dr. Syed Salman Ahmad Warsi



Published by: - Book Rivers

Website: - https://www.bookrivers.com

Email: publish@bookrivers.com

1st Print Edition – 2026

Title: Contemporary Advances in Physics, Materials and Computational Sciences

Editor : Dr. Syed Salman Ahmad Warsi

ISBN: 978-93-7837-031-1

MRP: 380 /-INR

(Printed in India)

TABLE OF CONTENTS

CHAPTER - 10

INTRODUCTION TO LIQUID CRYSTALS: FUNDAMENTALS, PROPERTIES, AND APPLICATIONS

Syed Salman Ahmad Warsi

Department of Physics, Integral University, Lucknow, 226026, India

Liquid crystals are a unique state of matter that exhibit properties intermediate between conventional liquids and crystalline solids. Their ability to respond to external stimuli such as electric fields, temperature, and light has made them indispensable in modern science and technology. This chapter introduces the fundamental concepts of liquid crystals, including their historical development, molecular organization, classification, and key physical properties. Special attention is given to the major liquid crystal phases and the relationship between molecular structure and material behavior. The chapter also provides an overview of important applications of liquid crystals in displays, photonics, sensors, and advanced functional materials, highlighting their growing significance in contemporary research and technological innovations.

INTRODUCTION:

Liquid crystals (LCs) represent a fascinating state of matter that combines characteristics of both conventional liquids and crystalline solids. Unlike ordinary liquids, whose molecules possess complete translational and rotational freedom, liquid crystals exhibit a certain degree of molecular ordering while still retaining the ability to flow. This unique combination of fluidity and anisotropy gives rise to remarkable optical, electrical, and mechanical properties that have made liquid crystals indispensable in modern science and technology.

Liquid crystals occupy an intermediate phase, commonly referred to as a mesophase, between the crystalline solid state and the isotropic liquid state. In this mesophase, molecules maintain partial orientational and/or positional order. Because of this ordered arrangement, liquid crystals