

VALUE ADDED COURSE

536VA06 – LIQUID CRYSTALS IN EVERYDAY DEVICES

Course duration : 30 Hours

Session : September – October 2022

Objectives :

- To learn, basics of liquid crystals, their special optical properties and their applications in every .
- To learn synthesis of liquid crystals, identification of liquid crystal phases and textures.

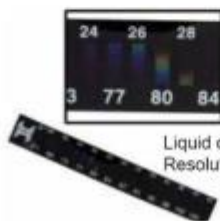
LIQUID CRYSTALS IN EVERYDAY DEVICES



LC displays (phones, monitors, TVs, GPS, etc.)



Switchable windows (Polymer dispersed liquid crystals, PDLC)
[see www.switchlite.com]



Liquid crystal thermometer.
Resolutions are in the 0.1°C range

Outcomes

- ❖ The students gain noteworthy knowledge in liquid crystals and their properties.
- ❖ The students will learn the synthesis of simple liquid crystal compound, preparation liquid crystal cell, texture observation under POM and be able to understand the working mechanism of display devices based on liquid crystals.

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SYLLABUS

Coursecode: 536VA06	Liquid Crystals in Everyday Devices	Hours:30 Credits: 2
Objectives	<ul style="list-style-type: none"> ➤ To learn, basics of liquid crystals, their special optical properties and their applications in everyday life. ➤ To learn synthesis of liquid crystals, identification of liquid crystal phases and textures. 	
Unit-I	Introduction : History of liquid crystals, Mesophase, Types of liquid crystals- Thermotropic, Lyotropic, Liquid crystals in biology.	
Unit-II	Properties of Liquid Crystals : Optical Anisotropy, Double Refraction, Birefringence, Polarization of Light, Molecular polarizability, Order Parameter, Phase Transition, I order, II order and monotropic transitions	
Unit-III	Chemistry of Liquid Crystals : Structural Requirements, Calamatic, Discotic, Bent-core liquid crystals, Nematic, Smectic and Columnar phases, Liquid Crystal Polymers, Elastomers, Synthesis of simple calamatic liquid crystal compounds	
Unit-IV	Characterization Techniques: Polarizing Optical Microscopy(POM), Differential Scanning Calorimetry, X-ray Diffraction, Electro-optical measurements, Dielectric Measurements	
Unit-V	Liquid Crystals in Devices: Liquid crystal displays – (watches, calculators, televisions, clocks, navigation systems, visors, thermometers)- Working principle, Influence of electric field	
Outcomes	<ul style="list-style-type: none"> ➤ The students gain noteworthy knowledge in liquid crystals and their properties. ➤ The students will learn the synthesis of simple liquid crystal compound, preparation liquid crystal cell, texture observation under POM and be able to understand the working mechanism of display devices based on liquid crystals. 	

Reference and Textbooks

1. Molecular Structure and the Properties of Liquid Crystals, Gray, G. W., Academic Press, 1962.
2. Handbook of Liquid Crystals, Vol. 2A: Low Molecular Weight Liquid Crystals I, Demus, D; Goodby, J; Gray, G. W.; Spiess, H. W., Wiley-VCH, 1998.
3. Dierking. Textures of Liquid Crystals. Wiley-VCH, Weinheim, 2003
4. .P. G. de Gennes and J. Prost, The Physics of Liquid Crystals (second edition, Oxford University Press, 1993).
5. Collings, J., & Hird, M. (1997). Introduction to Liquid Crystals: Chemistry and Physics, Taylor & Francis.