
A REVIEW ON FUTURE SCOPE OF LIQUID CRYSTALS

Avneesh Mishra^{1*}, Jitendra Singh¹

¹ Assistant Professor, Department of Physics, Shri Lal Bahadur Shastri Degree College, Gonda, Uttar Pradesh, India.

² Professor, Department of Physics, Shri Lal Bahadur Shastri Degree College, Gonda, Uttar Pradesh, India.

*Author for correspondence, e-mail: avneeshmishra85@gmail.com

ABSTRACT:

For the developments of self-sustainable wireless sensors networks, artificial heart, flip-flop paint, self-tuned vibration energy harvesting devices, seismic applications etc., scientists and researchers are looking towards Liquid Crystals (LCs). LCs are a mesophase with the property of liquid with well-arranged nature of crystals. LCs have the potential to build smart structures and materials. Our aim of this review article is to focus on LCs as per its Objectives, applications, need and its importance in recent advance in novel system.

Key words: LCs -Liquid crystals, Liquid crystals - Mesophase, Cubosomes, Thermotropic, Lyotropic

1. INTRODUCTION:

Liquid crystals has been revealed in first during the study of cholesterol by F. Reinitzer. LCs called as mesophase, inter mediate between the amorphous liquid state and the crystalline solid state. (1, 2). Liquid Crystals nano carriers are intermediary state between the solid and liquid state. LCs can be considered a fourth state of matter following solid, liquid, and gas. Thermotropic liquid crystal molecules keep rod like structure or disc like anisotropic structures. The characteristic of liquid crystals is the tendency of the molecules to support themselves with long-range direction (3-6).

In these two generic classes of liquid crystals: which are changes are driven by thermal processes, called as Thermotropic liquid crystals (7-9). Thermotropic liquid crystal are attract to scientist and researcher for their huge applications like as display, sensors, smart windows technology, etc. LCs particle may exhibit numerous smectic, nematic and chiral nematic phases as the temperature is increased/decreased (2, 8). Thermotropic liquid crystalline materials have definite molecular structure, which composes of two parts, namely referred the side chain and center core. Here is core part is a rigid body which carries shape anisotropy to the molecule, and the side chain part is a flexible region which provides mobility (2, 4, 8). Therefore, they keep anisotropic physical nature for example their elastic and electrical nature, dielectric constant, , viscosity or refractive index, just to name a rare. Partly ordered, LCs also show flow properties like a liquid; they are accordingly anisotropic fluids. Discotic liquid crystal may be enhanced the property of photo voltaic cells. The liquid crystalline state can be carried about through two basically dissimilar ways, leading to the two basic classes of LC, thermotropic phases & lyotropic. Cubosomes are nanoparticles having

size ranges from 10-500nm in diameter phases (9). Lyotropic Liquid Crystals are made by the variation of concentration of molecules, due to this property it seems to be used in medical/ pharmaceutical field for artificial heart, muscle, bone lubricants, enhancement in drug delivery system etc. The orientation of molecules in this phase, it may be help us to understand about or help in the treatment of cancer. Due to versatile nature and molecular orientation of such phase in single compound or mixtures of compound or doping of nano particles etc it attracts to scientists and researchers. Huge application as well as nature of LCs attract us for writing a review article on it.

2. ADVANTAGE OF LYOTROPIC LIQUID CRYSTALS IN MEDICAL (1-6):

Lyotropic liquid crystalline materials have following properties

1. Greater drug contents surface area.
2. Simple process of preparation & biodegradability of lipids.
3. Capability of encapsulating amphiphilic, hydrophilic, hydrophobic substances and controlled release & targeted release of bioactive agents.
4. Enlarged obedience and convenience (orally, topically and intravenously) and better bioavailability due to size.
5. Improved effectiveness of drug and reduced side effects related with high initial plasma levels from rapid drug release on injection (drug burst).
6. Reduced health care costs due to simplified handling and less repeated management.
7. Decreased risks of drug mistreatment and misdirection (11)

3. APPLICATIONS OF LIQUID CRYSTALS:

1. Thermotropic Liquid Crystals (2, 7-8): the application of thermotropic liquid crystals are as
 - (i) Smart/ Switchable Glasses
 - (ii) Portable Display
 - (iii) Flip-Flop Paint (Color Changing Paint)
 - (iv) High Temperature Thermo plastic materials
 - (v) Bifocal eye contact lens & makeup Kit
 - (vi) Solar Cells etc.
2. Lyotropic Liquid Crystals (1-6, 9)
 - (i) Artificial Muscles & Heart Valve
 - (ii) Liquid crystalline structures also seem to play a role to control the Cancer & Pains
 - (iii) Easy to drug deliver in body etc.
 - (iv) In topical delivery system
 - (v) In drug delivery vehicle
 - (vi) In treatment of viral diseases (e.g. HSV, HIV) and due to bacterias (e.g. Neisseria gonorrhoeae and Chlamydia trachomatis).

4. CONCLUSION:

From above discussion we conclude that Liquid Crystalline material has versatile use in study of basic sciences, technology and bio medical field. Day by day numerous patents are synthesized for much more application in technology and bio medical field. Liquid crystals are new technique of drug loading. Some important techniques needs attention further for its practice in actual scientific industries to provide a quality outcome for a society.

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