

LIQUID CRYSTAL CELL

The liquid crystals are one of the most fascinating material systems in nature, have properties of liquids as well as of a solid crystal. The terms liquid crystal refers

to that these compounds have a crystalline arrangement of molecules, yet they flow like liquid. Liquid crystal displays do not emit or generate light, but rather alter external generated illumination. Their ability to modulate light when electrical signal

is applied made them very useful in flat panel display technology.

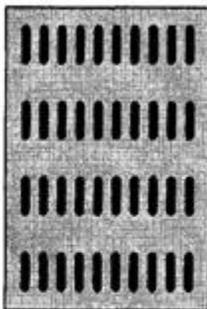
The crystal is made up of organic molecules which are rod-like in shape with a length of $\sim 20\text{\AA}$ -

100\AA . The orientation of the rod like molecule defines the 'director' of liquid crystal. The different arrangements of these rod-like molecules lead to three main categories of liquid crystals.

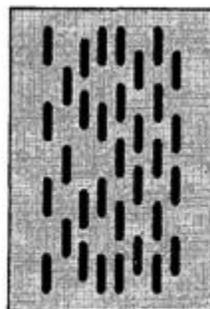
1. Smectic

2. Nematic

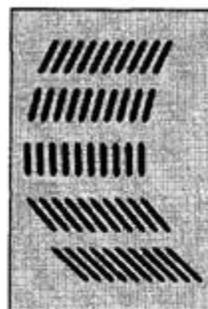
3. Cholesteric



(a) Smectic



(b) Nematic



(c) Cholesteric

Smectic

Fig. shows smectic structure of liquid crystals. In this structure the rod like molecules are arranged in layers, and within each layer there is orientational order

over a long range. Thus in a given layer, the rods are all oriented in the same

direction Also, in the smectic liquid crystals the molecules of different layers are

ordered. Thus both orientation order and positional order is present in the smectic crystals.

Nematic

Fig shows nematic structure of liquid crystals. In the nematic structure the positional order between layer of molecules is lost, but the orientation order is maintained.

Cholesteric

Fig shows cholesteric structure of liquid crystals. In these crystals the rod-like molecules in each layer are oriented in a different angle within each layer. Orientation order is maintained in each layer. The cholesteric liquid crystal is related

to the nematic crystal, with the difference being the twist of the molecules as one goes from one layer to another.

The optical activity of the crystal depends upon the orientation and the twist of the molecules as one goes from one layer to another.

There are two types of liquid crystal displays (LCDs) according to the theory of operation

1. Dynamic scattering LCD

2. Field effect LCD

Source : <http://mediatoget.blogspot.in/2011/09/liquid-crystal-cell.html>