

From Nematic To Smectic Phase – A Progress In The Liquid Crystals Display (LCD)

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LIQUID crystals display (LCD) technology has experienced a tremendous development even though progressive transition is intangible since the last few decades ago. The conventional LCD-based electronic devices available in the current market such as watch and flat panel of laptop rely very much on the ordering nature of nematic or super-twisted nematic LC molecules over certain temperature range. Although the nematic and twisted nematic LC are common materials for LCD devices in the past and present days, the workability of the product using these materials are still subject to further investigation. Several parameters such as the viewing angle, shutter speed and response time need to be improved or upgraded.

In 1974, a first truly polar liquid crystal was reported by R.B.Meyer and his coworkers [1]. The materials that he recognized as a chiral tilted smectic substance possess an intrinsic ferroelectric properties in the sense that every smectic layer has an electric dipole density, P , which is perpendicular to the molecular tilt direction, n , and parallel to the smectic layer plane. The importance of this ferroelectricity has further been substantiated by Clark-Lagerwall [2] who was responsible for the discovery of ferroelectric liquid crystals FLC. This kind of FLC domains have subsequently been related to a unique substance called surface-stabilized ferroelectric liquid

crystal (SSFLC) owing to the existence of spontaneous polarization which responds to the external field with higher speed.

The leap from nematic to smectic phase within the LC materials is not a sudden process but appears in gradual manner. The Liquid Crystal Research Laboratory in the School of Chemical Sciences has regarded it as one of the niche research areas years ago. The research in the past [3] and several projects being expedited currently have shown promising results of which the orientational ordering of the molecules thus synthesized seemed to exhibit smectic as well as nematic phases [4].

References:

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