Materials and Components of Current TFT-LCDs

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Abstract

The liquid crystal display (LCD) technology, compatible with highly integrated and low power consuming electronics, will play a key role in the area of flat panel displays such as high performance information displays and future high-definition television sets. The range of applications of LCDs is expanding to include virtually every field - from office automation equipment to consumer and industrial equipment. The basic physics of LCs, the principles of LCDs, and some progress toward solving the existing problems will be described in view of the current status of LCDs.

Recently, liquid crystal displays (LCDs) are widely used for applications in computers, communications, and consumer electronics. Multi-media, mobile communications, personal digital assistants, and viewer camcorders are some of these applications. For the growing success of LCD technology, there have been three major prerequisites: the successful synthesis of new LC materials with suitable properties, the discovery of new physical phenomena and electro-optic effects for LCDs, and the last but not the least, the development of required manufacturing processes and tools.

Thin-film transistor (TFT) LCDs have made great progress in late 80's and early 90's. The combination of Si-based microelectronics and twist-nematic (TN) effect of LC materials makes it possible to produce a flat panel display featuring lightweight, low power consumption, and full color representation. In addition to conventional notebook personal computers (PCs), LCD manufacturers are gearing up to develop a new generation of large-screen TFT-LCD panels with much improved viewing characteristics, lower power consumption, and lower reflectance. Currently, color TFT-LCD products have been mainly focused on monitors for laptop computers and HDTV systems beyond portable applications such as notebook PCs and small TVs.

The continued development of materials and components, such as new substrates, color filters, LC materials, optical plates, and driving ICs, will promise the success of the next generation LCDs needed in the information era.