A Review Paper on Transparent Electronics (Applications & Future)

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Abstract— This paper introduces a new trend of revolutionary technology called as "Transparent Electronics", which is an emerging science and technology field mainly focusing on producing 'invisible' electronic circuitry and opto-electronic devices. The paper informs about the improved techniques of navigation display in military and armed forces using transparent electronics. This proposed system thus uses flexible AMOLEDs which gives high information content full color display.

Key words: Transparent Electronics, AMOLED, PHOLED

I. INTRODUCTION

Today the modern life requires the equipment's containing low power consumption, high speed, less weight. The important technology named Transparent Electronics is one of the most advanced technologies that fulfill all of the above requirements of the modern life.

Transparent electronics has various applications in various fields such as: -

- New Energy Sources
- Military
- Consumer Electronics
- Transportation
- Civilians

We represent one of the progressing applications of TE regarding to the security of the nation. In military, we use transparent electronics for navigation display. For this a prototype is designed that fits over the user's wrist completely.

A prototype is a device which helps the soldiers to overcome various difficulties. The soldiers can see real-time video and graphics information. Here we use full-colored flexible Phosphorescent organic light - emitting diodes (PHOLED) which uses the principle of phosphorescence that is having high internal efficiencies than fluorescent OLEDs. The displays use amorphous Si backplanes fabricated on a substrate made of stainless steel, with a total thickness of 0.3mm or less. The power consumption in video mode is only 0.3W.

Fig. 1: Demonstration of a prototype wrist unit that is wearied by soldier with a navigation display on

In military, the navigation display present on the wrist unit of soldier must be of full-colored and of high information content. This can only be provided using organic light-emitting devices. An OLED display can be built using an active matrix backplane. This backplane is referred to as an AMOLED display. The front plane of OLED forms the top part of this back plane. As the OLEDs gets degraded in the presence of oxygen or moisture, therefore the device needs to be encapsulated for its high operational lifetime.

II. WORKING

The flexible substrates present should support the process of fabrication. Stainless steel foil they provide both the reasonable flexibility as well as excellent thermal stability is the excellent barrier to moisture and oxygen.

Amorphous silicon (a-Si) TFTs is basically used for the backplane technology. A thin-film transistor (TFT) is one of the special kind of field-effect transistor that made by the deposition of thin films of a semiconductor active layer as well as the dielectric layer and the metallic contacts are also used over a supporting substrate. These TFTs provide following advantages such as:

- Low Cost Fabrication
- Uniform electrical characteristics over large areas
- Low Temperature Process (<300°C)

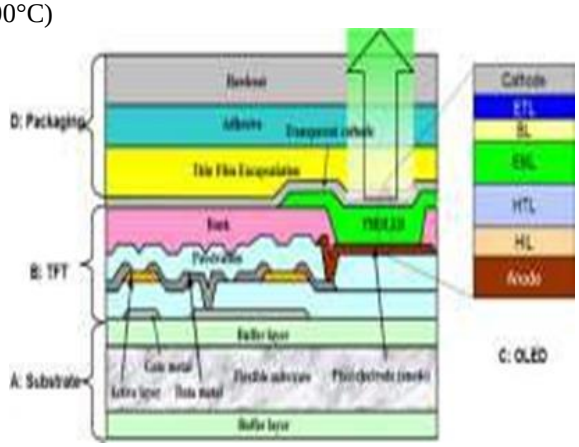

Fig. 2. The cross-sectional view of a flexible active matrix OLED (AMOLED) display structure.

Various challenges that are overcome by AMOLED displays:

A. To Reduce Threshold Voltage Shifts:

It can be provided by using a high efficient PHOLEDs having low drive voltage. Otherwise, simple circuitry can also be added.

B. Reduction of Power Consumption to A Minimum:

Phosphorescent emitters are used for low power consumption. During the time of operation, the charge is injected into the OLED device and converted into the photons through the formation and subsequent recombination of exactions, the bound molecular excited state. Excisions occur in two different patterns: singlet and other is triplet, which depends on the spins made by the electrons and holes of the system that come together to form the excision. Phosphorescent emitters contain a heavy metal atom that makes a smoother mixing of two states which is singlet and triplet, which enables the triplet states to exhibit the energy or emit it and therefore to potentially achieve are 100% internal quantum efficiency. This is up to four times higher than that of fluorescent OLEDs where the only single states emit light. This level of efficiency enables the low power consumption, and significantly extends the battery life.

III. ADVANTAGES

- Low Power
- Thin and Light
- Bendable
- Light and slim
- High luminance
- Good uniformity

IV. DISADVANTAGES

Stainless steel foil, which is used as the substrate that can present challenges in mass production, which is an additional planarization process is mainly needed. Thin-film encapsulation is required for flexible displays.

V. CONCLUSION

The combination of the two rapidly evolving areas of research, which are OLEDs and transparent electronics, which enables the realization of the novel transparent OLED displays. This appealing class of devices will have the great impulsive impact on the interaction between human and the machines in the near future. As the world is suffering from climate change which is the outcome of pollution, the transparent electronics is one of the best technologies which give the best solution as OLEDs which in the presence of oxygen breaks down without damaging the environment.

VI. FUTURE SCOPE

Flexible AMOLEDs is one which will keep improving in optical performance, lifetime, and flexibility and so in future, in some specialized applications they will be adopted, where rugged displays are needed. Automobile windshields could transmit the visual information to the driver. Police and fire fighters who are used for HMDs to display some of the practical details which are like maps and many more.

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