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A Comparative Study of Organic Light Emitting Diode with Other Displays

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Abstract: ***organic light emitting diode, that is, OLED is a light emitting diode in which emissive electroluminescent layer is thin film of organic compound which emit light in response to emit light. It is an emerging display technology in display era. Also a promising technology with high expected profitability. They show high efficiency, low driving voltages, better contrast ratio.it has several advantages when compared with the other displays such as lcd and led, it also has various technologies such as patterning and material. This paper focuses on structure of OLED, how it works, comparison with other displays and its application***
Keywords: OLED, lcd, led, et

I. INTRODUCTION

An OLED is a solid state device or electronic device that typically consists of organic thin films sandwiched between two thin film conductive electrodes. When electrical current is flow, emission of light take place which is bright in nature.in OLED molecule that is used, carbon-based designer molecule and when current take place, emission of light take place. This is called electro phosphorescence. These systems are thin with the layered structure. Usually less than 500 nm or about 200 times smaller than a human hair when used to produce displays, OLED technology produces self-luminous displays that do not require backlighting and hence more energy efficient. The displays require low power, i.e., only 2-10 volts. substances used by OLED that emitted, green, blue or white light in nature. There is no source of illumination although it has very bright clear picture on display. By enhancement of organic material it is easy to control the brightness, i.e, the brightness of an OLED is determined by how much intensity is produced.

II. OLED STRUCTURE

Like an led, an OLED is a solid-state semiconductor device that is 100 to 500 nanometers thick or about 200 times smaller than a human hair. OLEDS are layered structure with one or two layer and three layer; in the latter design, the third layer helps for transportation of electrons.

A. OLED Made of the Following Layers

1) *Substrate (Clear Plastic, Glass, Foil):* OLED is supported by the substrate.
2) *Anode (Transparent):* when current take place, removal of electron is done by the anode
3) *Organic Layers:* organic molecules or polymers is used to make the organic layers
4) *Conducting Layer:* by using the conducting layer, holes are transported from anode. One conducting polymer used in OLEDs is polyaniline
5) *Emissive Layer:* organic plastic molecules are used in emissive layer (different ones from the conducting layer) that transport electrons from the cathode; this is where light is made. One polymer used in the emissive layer is polyfluorene
6) *Cathode (may or may not be Transparent Depending on the Type of OLED):* when a current pass through the device. Electrones are injected by the cathode.

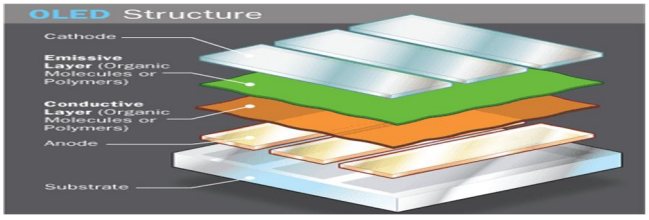

Figure 1 :OLED Structure

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III. LIGHT CREATION BY OLED

OLEDs emit light in a similar manner to leds, through a process called **electrophosphorescence**.

A. The Process is as follows

1) The battery or power supply of the device containing the OLED applies a voltage across the OLED.
2) An electrical current take place from the cathode to the anode through the organic layers (an electrical current is a flow of electrons). The cathode gives electrons to the emissive layer of organic molecules. Electrons are removed bye anode from the conductive layer of organic molecules. (this is the equivalent to giving electron holes to the conductive layer.)
3) At the boundary between the emissive and the conductive layers, electro hole is found by electrones. When an electron hole is found by electron, the hole is filled by electrones (it falls into an energy level of the atom that's missing an electron). When this happens, the energy is given by electron in the form of a photon of light.
4) The light is emitted by OLED.

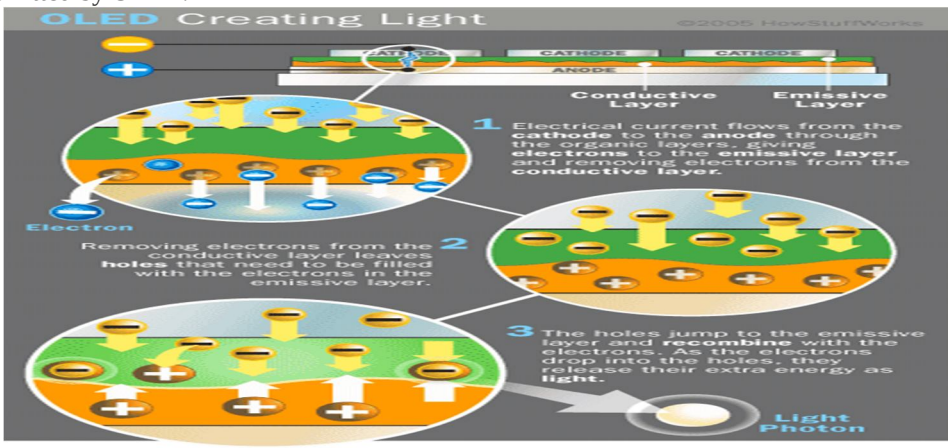

Figure 2 :OLED Light Creation

IV. COMPARISON OF OLED DISPLAY WITH OTHER DISPLAY

A. OLED and LCD

liquid crystal display LCD is fairly old technology in era of display. From calculator screens, LCD are now fairly available in mobile phones screens, pdas, computer, and many more applications. OLED's are improved version of LED'S that utilizes organic compounds to produce light. OLED's have may advantages in comparison to the LCD, so it have various application in display era. From the phrase ' light emitting 'we deduce that OLED's produce their own light, it do not require backlight as LCD require. It has lower power consumption, a great amount of the power consumed by LCDs goes to the backlight, thus the big power differences.

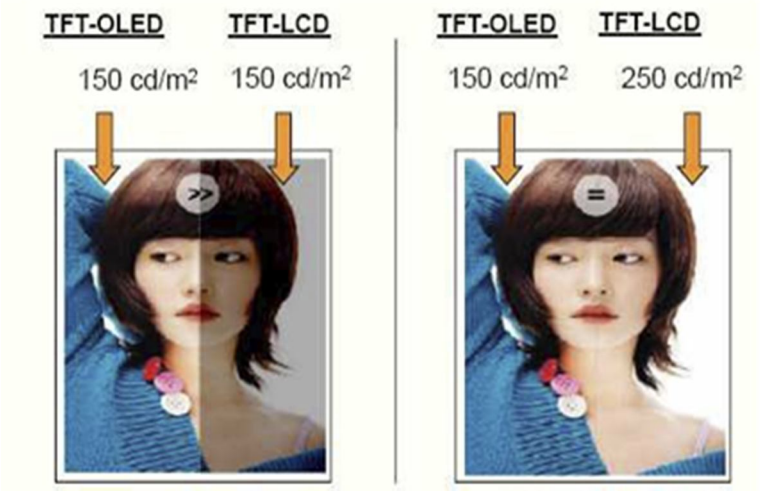

Figure 3 : Comparing OLED and LCD Pictures

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B. OLED and LED

OLED is really a new emerging technology in this era. By using millions of tiny LED's, flat panel is made. The 'o' in OLED is stands for 'organic' which means there is carbon within the molecules of the emissive layer of the panel. Large screen OLED panels need no lamps, it is self-illuminating device. They provide very wide and consistent color means a color equality.

Table 1: Comparison between OLED, LCD, LED

OLED	LCD	LED
Organic light emitting diode	Liquid crystal display	Light emitting diode
It does not require backlight for illumination of light.	It requires backlight for illumination of light	It also requires backlight
It is thinner than LCD, LED	It is thicker than the OLED	It also thicker than the OLED
It has low power consumption	It has high power consumption	It also has high power consumption.

V. APPLICATION

It is widely used as light source. It can also used as OLED television, keyboard, flexible displays, laptop, bendable displays, scrolling laptop.

Figure 4: light Source Using White OLED

Figure 5 : Typical Keyboard With OLED Display

VI. CONCLUSION

The paper presents an overview of OLED that it is an emerging technology and a great breakthrough in display technology. OLED's offers full color display, reduced manufacturing cost, larger viewing angle, more flexible, lower power consumption, better contrast, thinner, etc which help in replacing the other technologies such as LCD, LED. The technology could be used to make screens larger enough for laptop, cell phones and desktop computers. Because production is more akin to chemical processing than semiconductor manufacturing. Thus OLED has bright future in display technology.

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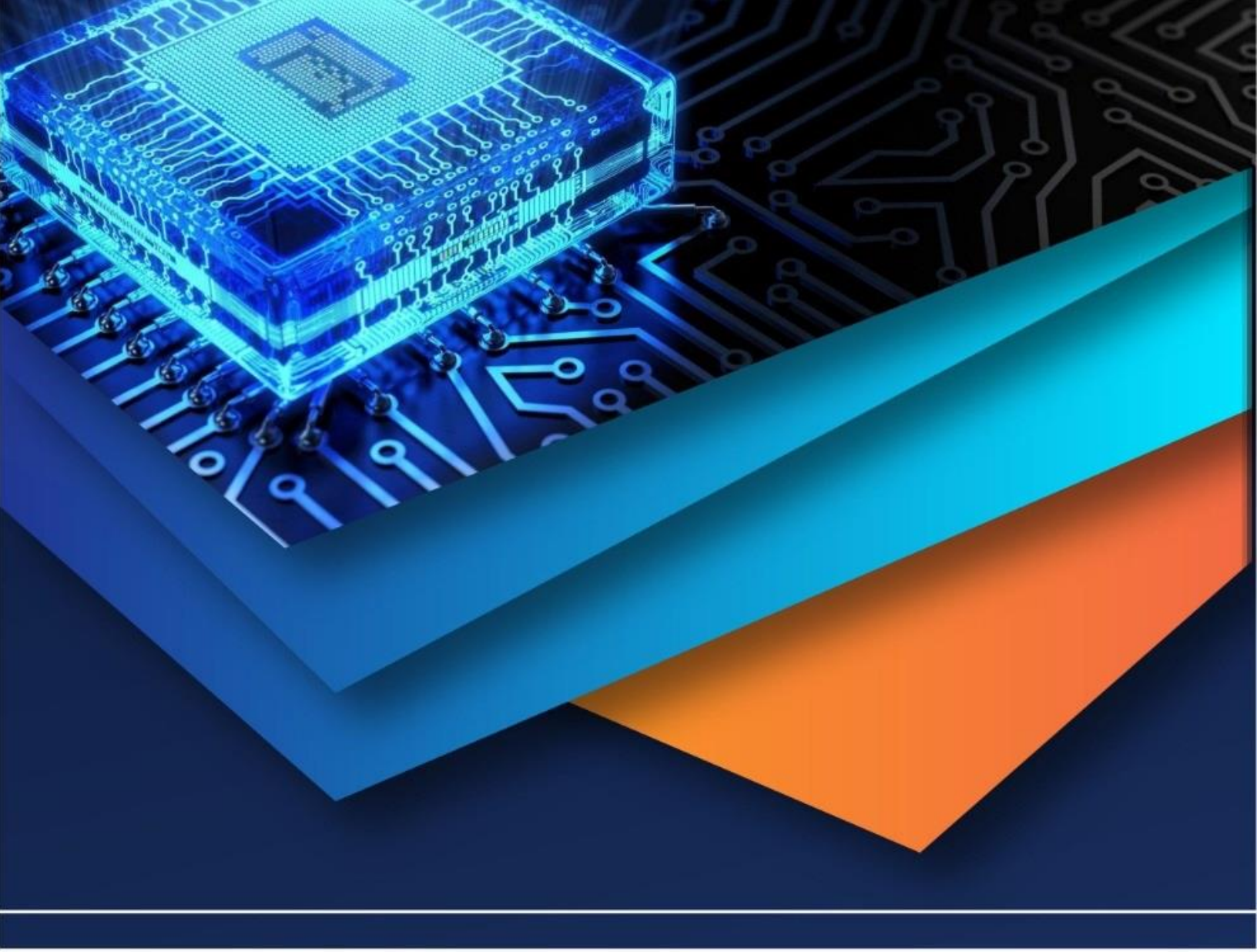

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