A

Seminar - I Report

on

AMOLED

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Submitted by

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SSBT's COLLEGE OF ENGINEERING AND TECHNOLOGY, BAMBHORI, JALGAON - 425 001 (MS)

DEPARTMENT OF COMPUTER ENGINEERING

CERTIFICATE

This is to certify that the seminar - I entitled *AMOLED*, submitted by

Vrushali Rajesh Malvadkar

in partial fulfillment of the degree of *Bachelor of Engineering* in *TE Computer Engineering* has been satisfactorily carried out under my guidance as per the requirement of North Maharashtra University, Jalgaon.

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Vrushali Rajesh Malvadkar

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Abstract

AMOLEDs are a great breakthrough in display technology .Also a new promising technology with high expected profitability on the display market. They show low driving voltages in combination with unrestricted viewing angles, high color-brilliance, light weight, small film-thicknesses and low production costs.Active Matrix Organic light-emitting devices (AMOLEDs) operate on the principle of converting electrical energy into light, a phenomenon known as electroluminescence. This paper focuses on structure of OLED, how it works, comparison with other display and applications.This layer of organic semiconductor material is situated between two electrodes. Generally, at least one of these electrodes is transparent.

Chapter 1

Introduction

An AMOLED (Active matrix organic light-emitting diode) is a light-emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound which emit light in response to an electric current. This layer of organic semiconductor material is situated between two electrodes. Generally, at least one of these electrodes is transparent.

In this chapter,In section 1.1 the contents of "AMOLED". In section 1.2 what is the amoled.In section 1.3 the marketing terms of the amoled are shown.These devices may be possible in the near future with the help of a technology called organic light-emitting diodes (OLEDs).

1.1 The AMOLED

Figure 1.1: Samsung's prototype 40-inch OLED TV

AMOLEDs are solid-state devices composed of thin films of organic molecules that create light with the application of electricity. AMOLEDs can provide brighter, crisper displays on electronic devices and use less power than conventional light emitting diodes (LEDs) or liquid crystal displays (LCDs) used today.[3]

OLED (Organic Light-Emitting Diode) refers to the thin film of organic material on top of the display. When electrical current is applied to this film, it gives off light, just like a regular LED except its only a few nanometers thick.

AM (Active Matrix) refers to the display is addressed. Each pixel has an active element (a thin-film transistor, or TFT) that actively provides current to the OLED, maintaining that pixels brightness while the other pixels are being addressed. Without the active matrix, OLED displays are small and low-resolution, used for applications like mobile phone sub-displays.

Active-Matrix Organic Light-Emitting Diode (AMOLED) is a new display technology for mobile phones, televisions, and everything in between. Currently used on several top Android Smartphones like the LG Flex, Nexus and Samsung Galaxy S series, the market for AMOLED displays is expected to reach a level of $28.3 billion by 2020, according to research firm DisplaySearch.

1.2 What Is AMOLED?

An AMOLED 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 applied, a bright light is emitted. AMOLED use a carbon-based designer molecule that emits light when an electric current passes through it. This is called electrophosphorescence. Even with the layered system, these systems are thin . usually less than 500 nm or about 200 times smaller than a human hair.[3]

When used to produce displays. AMOLED technology produces self-luminous displays that do not require backlighting and hence more energy efficient. These properties result in thin, very compact displays. The displays require very little power, ie, only 2-10 volts.[6]

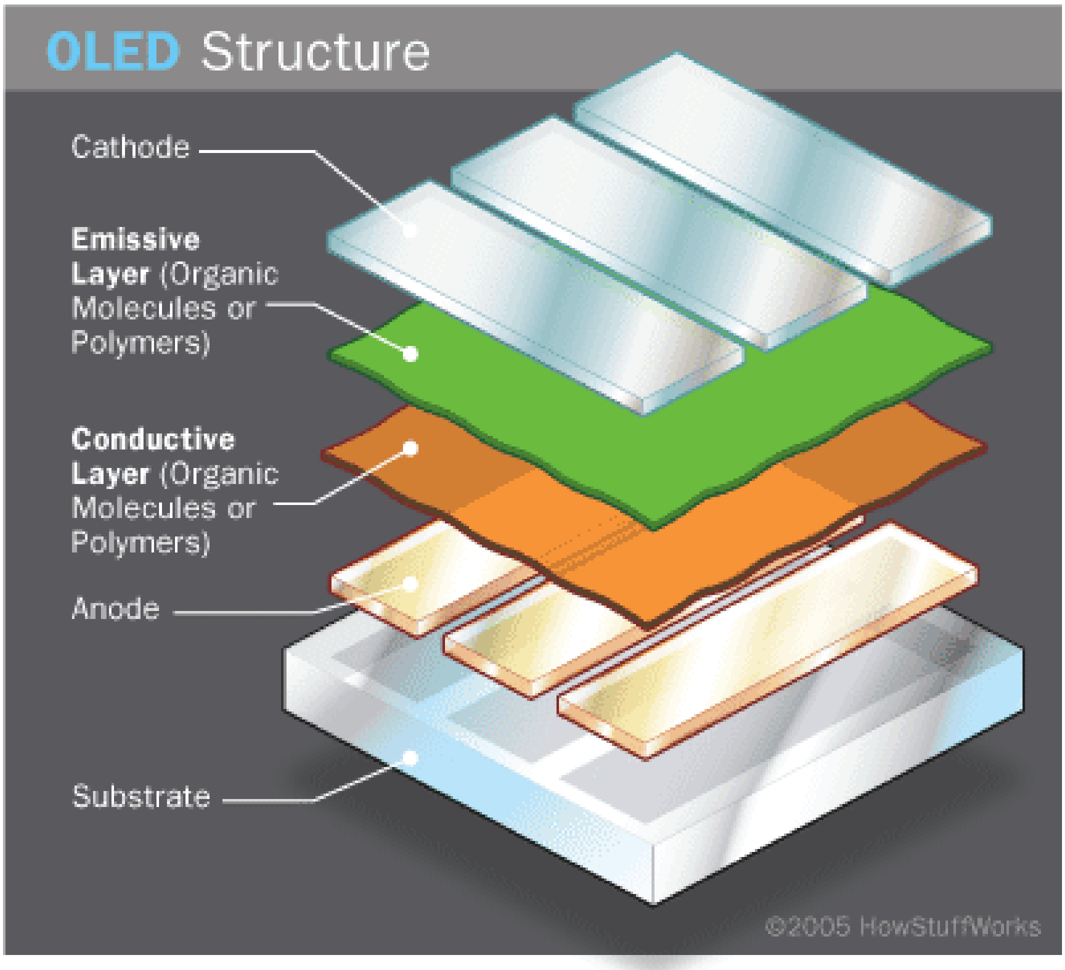


Figure 1.2: Amoled component

AMOLED technology uses substances that emit red, green, blue or white light. Without any other source of illumination, OLED materials present bright, clear video and images that are easy to see at almost any angle. Enhancing organic material helps to control the brightness and colour of light, i.e, the brightness of an OLED is determined by how much power you supply to the system.

AMOLEDs have full layers of cathode, organic molecules and anode, but the anode layer overlays a thin film transistor (TFT) array that forms a matrix. The TFT array itself is the circuitry that determines which pixels get turned on to form an image. AMOLEDs consume less power than PMOLEDs because the TFT array requires less power than external circuitry, so they are efficient for large displays. AMOLEDs also have faster refresh rates suitable for video. The best uses for AMOLEDs are computer monitors, large-screen TVs and electronic signs or billboards.

The AMOLED display consist of a matrix of OLED pixels,each having an anode, cathod and a layer of organic material between them. These pixels are activated by a thin lm transistor arrat which control each current pixel. Typically two transistors are used for each pixel-one to turn the change to the pixel on and ok,and second provide constant current.

1.3 Marketing Terms

Super AMOLED:- Super AMOLED is a term for an AMOLED display with an integrated digitizer: the layer that detects touch is integrated into the screen, rather than overlaid on top of it. According to Samsung, Super AMOLED reflects one-fifth as much sunlight compared to the first generation AMOLED.[21][22] The display technology itself is not changed. Super AMOLED is part of the Pentile matrix family, sometimes abbreviated as SAMOLED.

For the Samsung Galaxy S III, which reverted to Super AMOLED instead of the pixelation-free conventional RGB (non-PenTile) Super AMOLED Plus of its predecessor Samsung Galaxy S II, the S III's larger screen size encourages users to hold the phone further from their face to obscure the PenTile effect.[23]

Super AMOLED Plus The Samsung Galaxy S II, with a Super AMOLED Plus screen Super AMOLED Plus, first introduced with the Samsung Galaxy S II and Samsung Droid Charge smartphones, is a branding from Samsung where the PenTile RGBG pixel matrix (2 subpixels) used in Super AMOLED displays has been replaced with a traditional RGB RGB (3 subpixels) arrangement typically used in LCD displays. This variant of AMOLED is brighter and therefore more energy efficient than Super AMOLED displays[26] and produces a sharper, less grainy image because of the increased number of subpixels. In comparison to AMOLED and Super AMOLED displays, they are even more energy efficient and brighter. However, Samsung cited screen life and costs by not using Plus on the Galaxy S II's successor, the Samsung Galaxy S III.[18]

Super AMOLED Advanced Super AMOLED advanced is a term marketed by Motorola to describe a brighter display than Super AMOLED screens, but also a higher resolution qHD or 960 540 for Super AMOLED Advanced than WVGA or 800 480 for Super AMOLED and 25% more energy efficient. Super AMOLED Advanced features PenTile, which sharpens subpixels in between pixels to make a higher resolution display, but by doing this, some picture quality is lost.[24] This display type is used on the Motorola Droid RAZR and HTC One S.[25]

HD Super AMOLED Galaxy Note II subpixels representation, based on 400X image of the Note II display[27]

The Galaxy Nexus, with an HD Super AMOLED screen[28] HD Super AMOLED is a branding from Samsung for an HD-resolution (¿1280720) Super AMOLED display. The first device to use it was the Samsung Galaxy Note. The Galaxy Nexus and the Galaxy S III both implement the HD Super AMOLED with a PenTile RGBG-matrix (2 subpixels/pixel), while the Galaxy Note II uses an RBG matrix (3 subpixels/pixel) but not in the standard 3 stripe arrangement.[27]

HD Super AMOLED Plus A variant of the Samsung Galaxy S3 using Tizen OS 1 was benchmarked using a non-pentile HD Super AMOLED Plus screen in 2012.[29]

Full HD Super AMOLED As featured on the Samsung Galaxy S4[30] and Samsung Galaxy Note 3, this display has a 1920x1080 resolution that is better known as 1080p. It has the broadest color gamut of any mobile display of up to 97% of the Adobe RGB color space, hence making it a wide-gamut display.[31][32]

Quad HD Super AMOLED Quad HD Super AMOLED technology was first used by AU Optronics in April 2014.[33] After AU Optronics released their phone which used a Quad HD Super AMOLED screen, other companies such as Samsung released phones utilizing the technology such as the Samsung Galaxy Note 5 Broadband LTE-A and Samsung Galaxy S6.

1.4 Summary

In this chapter the introduction of Amoled. It described its purpose of amoled, also work on high Marketing terms. In the next chapter the literature survey we will discuss.

Chapter 2

Literature survey

Faced with the above challenges, our study aims to develop a Amoled screen.AMOLED technology uses substances that emit red, green, blue or white light. Without any other source of illumination, OLED materials present bright, clear video and images that are easy to see at almost any angle.

In this chapter, contents of literature survey of "AMOLED". Section 2.1 consist of history of the amoled. Related work is consist of all the survey on the Amoled that is Working on Android Mobiles ,how does an amoled emiit a light,its uses in various things, in the section 2.2. Section 2.3 consist of the summary of the Literature Survey.

2.1 History

The first observations of electroluminescence in organic materials were in the early 1950s by A. Bernanose and co-workers at the Nancy-Universit, France. They applied high-voltage alternating current (AC) fields in air to materials such as acridine orange, either deposited on or dissolved in cellulose or cellophane thin films. The proposed mechanism was either direct excitation of the dye molecules or excitation of electrons.

In 1960, Martin Pope and co-workers at New York University developed ohmic dark-injecting electrode contacts to organic crystals. They further described the necessary energetic requirements (work functions) for hole and electron injecting electrode contacts. These contacts are the basis of charge injection in all modern OLED devices. Pope's group also first observed direct current (DC) electroluminescence under vacuum on a pure single crystal of anthracene and on anthracene crystals doped with tetracene in 1963 using a small area silver electrode at 400V. The proposed mechanism was field-accelerated electron excitation of molecular fluorescence.[5]

Pope's group reported in 1965 that in the absence of an external electric field, the electroluminescence in anthracene crystals is caused by the recombination of a thermalized electron and hole, and that the conducting level of anthracene is higher in energy than the exciton energy level. Also in 1965, W. Helfrich and W. G. Schneider of the National Research Council in Canada produced double injection recombination electroluminescence for the first time in an anthracene single crystal using hole and electron injecting electrodes, the forerunner of modern double injection devices. In the same year, Dow Chemical researchers patented a method of preparing electroluminescent cells using high voltage (5001500 V) AC-driven (1003000 Hz) electrically-insulated one millimetre thin layers of a melted phosphor consisting of ground anthracene powder, tetracene, and graphite powder. Their proposed mechanism involved electronic excitation at the contacts between the graphite particles and the anthracene molecules.[4]

Device performance was limited by the poor electrical conductivity of contemporary organic materials. This was overcome by the discovery and development of highly conductive polymers. For more on the history of such materials, see conductive polymers.[1]

Electroluminescence from polymer films was first observed by Roger Partridge at the National Physical Laboratory in the United Kingdom. The device consisted of a film of poly(n- vinylcarbazole) up to 2.2 micrometres thick located between two charge injecting electrodes. The results of the project were patented in 1975 and published in 1983. The first diode device was reported at Eastman Kodak by Ching W. Tang and Steven Van Slyke in 1987.This device used a novel two-layer structure with separate hole transporting and electron transporting layers such that recombination and light emission occurred in the middle of the organic layer. This resulted in a reduction in operating voltage and improvements in efficiency and led to the current era of OLED research and device production.Research into polymer electroluminescence culminated in 1990 with J. H. Burroughes et al. at the Cavindish laboratory in Cambridge reporting a high efficiency green light-emitting polymer based device using 100 nm thick films of poly(p-phenylene vinylene).[2]

1. First developed in the early 1950s in France

2. Early technology would emitted a short burst of light when a voltage was applied similarly oxidized and iodine-doped polyacetylene.

3. This early form applied high-voltage alternating current field to crystalline thin films of acridine orange and quinacrine.

4. 1960s - AC-driven electroluminescent cells using doped anthracene was developed

5. In a 1977 paper, Shirakawa et al. Reported high conductivity in similarly oxidized and iodine-doped polyacetylene.

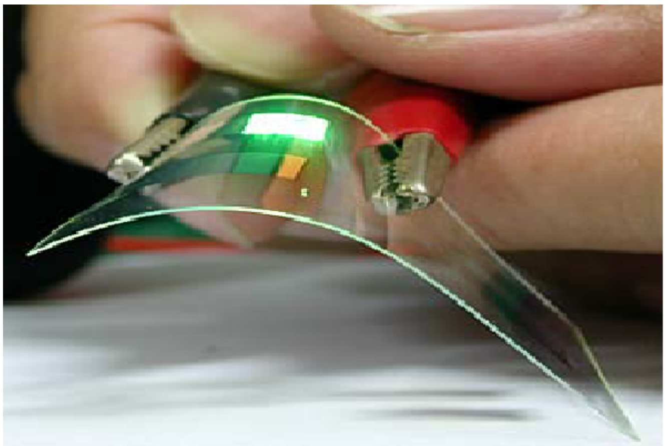


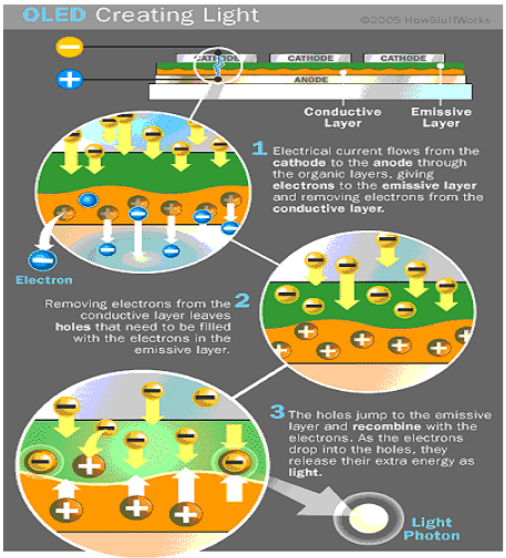
Figure 2.1: Demonstration of flexible OLED device

6. In 1987 Chin Tang and Van Slyke introduced the first light emitting diodes from thin organic layers.
7. In 1990 electroluminescence in polymers was discovered.[1]

2.2 How does an AMOLED emit light?

AMOLEDs basic structure consists of organic materials positioned between cathode and anode, which is composed of electric conductive transparent indium tin oxide(ITO). The organic materials compose a multilayered thin film, which includes the Hole Transporting Layer(HTL), Emission Layer(EL) and Electron Transporting Layer(ETL).

By applying the appropriate electric voltage, holes and electrons are injected into the EML from the anode and the cathode resp. The holes and electrons combine inside the EML , after which electroluminescence occurs. The transfer material, emission layer material and choice of electrode are the key factors that determine the quality of AMOLED components.



The process is as follows:

- The battery or power supply of the device containing the AMOLED applies a voltage across the AMOLED.
- An electrical current flows 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. The anode removes electrons from the conductive layer of organic molecules. (This is the equivalent to giving electron holes to the conductive layer.)
- At the boundary between the emissive and the conductive layers, electrons find electron holes. When an electron finds an electron hole, the electron fills the hole (it falls into an energy level of the atom that's missing an electron). When this happens, the electron gives up energy in the form of a photon of light.
- The AMOLED emits light.
- The color of the light depends on the type of organic molecule in the emissive layer. Manufacturers place several types of organic films on the same AMOLED to make color displays.
- The intensity or brightness of the light depends on the amount of electrical current applied: the more current, the brighter the light.

2.3 Architecture Of AMOLED

Like an LED, an AMOLED is a solid-state semiconductor device that is 100 to 500nanometers thick or about 200 times smaller than a human hair. AMOLEDs can have either two layers or three layers of organic material; in the latter design, the third layer helps transport electrons from the cathode to the emissive layer.

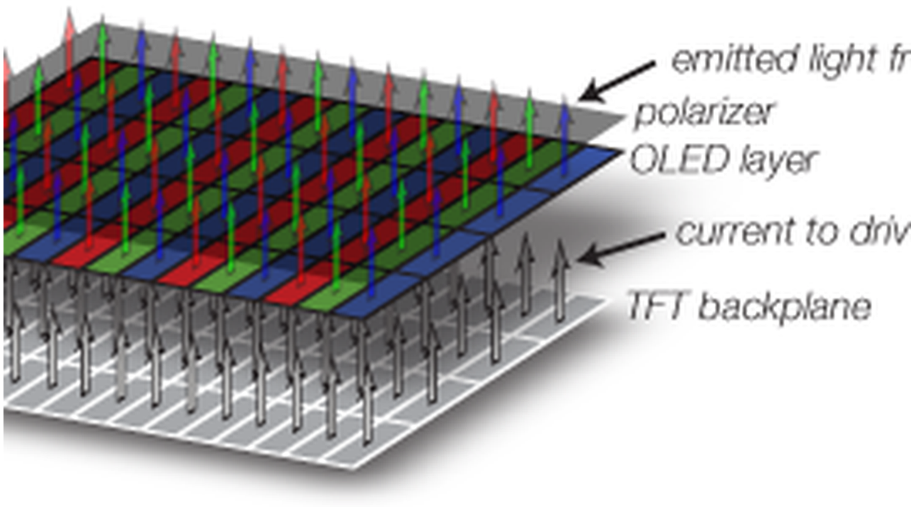


Figure 2.2: Structure of AMOLED

Substrate(clear plastic, glass, foil) - The substrate supports the AMOLED.

Anode(transparent) - The anode removes electrons (adds electron "holes") when a current flows through the device

Conducting layer - This layer is made of organic plastic molecules that transport "holes" from the anode. One conducting polymer used in AMOLEDs is polyaniline.

Emissive layer - This layer is made of organic plastic molecules (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.

Cathode (may or may not be transparent depending on the type of AMOLED) - The cathode injects electrons when a current flows through the device. [1]

ACTIVE-MATRIX organic light-emitting diode(AMOLED) displays are continuing to attract significant attention owing to their notable features such as low fabrication cost, low power consumption, wide-viewing angle and fast response time, as compared to the liquid crystal display(LCD).

In design of pixel drivers for AMOLED displays using amorphous silicon (a-Si) thin film transistors (TFTs), we encounter the problem of shift in threshold voltage of TFTs over time under gatesource voltage stress. This challenges circuit designers to devise driving schemes to compensate for the shift and provide the OLED with stable current. Several driving schemes have been presented. Current programming has shown fair stability, however it suffers from long settling times [1], [2]. In the voltage-programming [3][6], the luminance data is a voltage.

2.4 Summary

In this chapter the history and related work about the amoled is related a how an amoled emmit the light.Also the Architecture of the amoled display. The next section contains the methodology of the system.

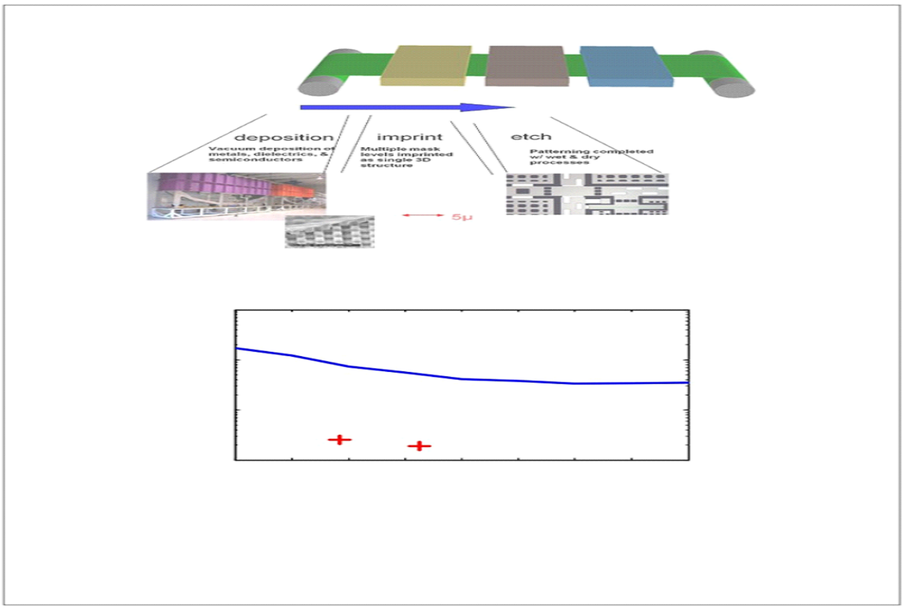
Chapter 3

Methodology

In this chapter, It consist of Workings notation of amoled professional. Section 3.1 consist of current researches of amoled display.In section 3.2 it describe basic principle. In section 3.3 In Section 3.4 it has describe current researches. Portable using amoled in section 3.5 In section 3.6 product specification of amoled.

3.1 Current Researches

Since the discovery of AMOLEDs an amazing development could be realized. The first patterns of the new displays already offer a brightness of 150 candela per square meter and contrasts above 100:1. Thus, the new technology starts at the level of present high-value TFT monitors. The initially only weakly glowing layers in laboratories became bright shining components which achieve luminosities of up to 200.000 candela per square meter - a brightness for which you need sun glasses.



While fixed organic displays slowly enter the market, flexible displays still cause some problems. They must be encapsuled carefully since light emitting polymers react sensitive to air humidity and oxygen. In flexible construction concepts this is still a problem since the film compound is exposed to extreme mechanical stress. The combination of organic LEDs with electronic circuits could allow completely flexible displays which may be bent or rolled in at will. Today, every pixel must be wired with conventional technology and must be triggered separately. The goal is to print the electronic circuit directly onto the back. Thus, displays become carrier systems and even with a film computer behind them they will measure only millimeters.

Experts predict an AMOLED display market of up to 2 billion dollars by 2007. In the future many consumer devices such as mobile phones, digital cameras, PDAs, and DVD players are going to be developed with the AMOLED technology. Roll to Roll Manufacturing.

3.2 Portable using AMOLED

The cell phone projector technology developed by Siemens communications in Samsung respectively, can detect PDA stylus presses as well as a finger taps on the projected image. The technology is already in development and soon you can projector your tiny cell phone screen onto a nearby flat surface and enjoy a larger reading area. If you happen to be a gamer, and the cell phone projector technology has a special treat to offer you. This will solve the problem for many cell phone users that are becoming nearsighted because they have to squint and decipher the small printing on a 2x2 inch cell phone screen. For professional and hobby photographers, cell phone projector technology allows you to show your portfolio with just a cell phone and a projector

3.2.1 AMOLED TV

Lighting manufacturers are constantly looking for ways to distinguish themselves in an industry comprised of light bulbs and fluorescent tubes that sell mostly on price. Potential differentiators might include the initial price paid, but for conventional products these are now so low that it is unlikely that any new technology could offer an improvement. With this in mind, lighting producers are seeking other ways to stand out in the marketplace mostly through improved aesthetics, energy efficiency and improved lifetimes.

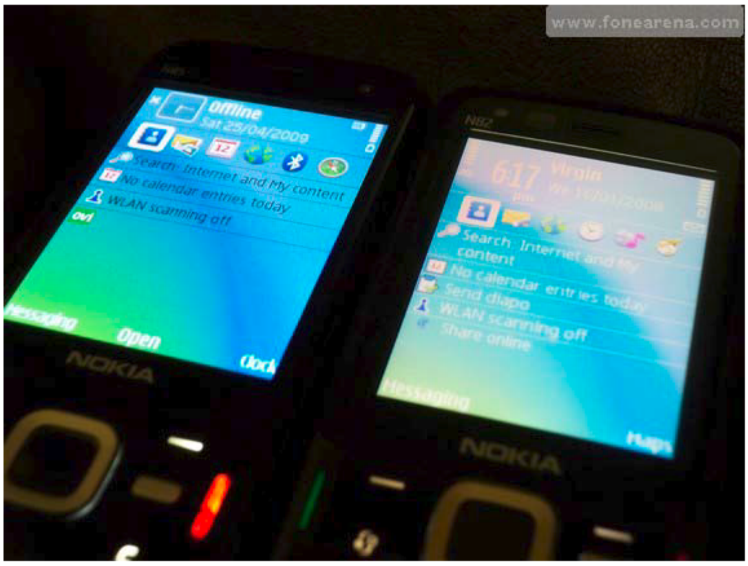
One such technology that could offer these distinct characteristics is organic light- emitting diodes (AMOLEDs). According to a report recently published by NanoMarkets, AMOLED Lighting Markets 2008, the AMOLED lighting market will grow from about $2.8 m this year to around $6 billion in 2015.

Figure 3.1: sony AMOLED TV

3.3 Comparision Of Amoled

3.3.1 AMOLED and LCD

Liquid Crystal Displays or LCD is a fairly old technology that has seen a recent burst in advancement. From calculator screens, LCDs are now fairly common in mobile phones, PDAs, computers, and a lot more applications. AMOLEDs (Organic Light Emitting Diode) are an improved version of LEDs that utilizes organic compounds to produce light. AMOLEDs have been eyed by many manufacturers as a good replacement for LCDs in many applications due to multiple advantages. From the phrase light emitting we can deduce that AMOLEDs produce their own light unlike LCDs which require a backlight that means fewer parts. Another advantage is the lower power consumption; a great amount of the power consumed by LCDs goes to the backlight, thus the big power difference. The lack of a backlight also means that an AMOLED display can be significantly slimmer than an LCD display. AMOLEDs have also been observed to show warmer images with better contrast making their image quality far superior than what LCDs currently achieve. Manufacturing AMOLEDs could also be a lot cheaper than manufacturing LCDs. LCD screens are made out of transistors that are expensive to manufacture. AMOLEDs on the other hand can be applied to a substrate that has been treated to accept organic compounds via printing methods just like ink. Any inkjet printer can do this, making it easier and more economical to mass produce AMOLED displays.



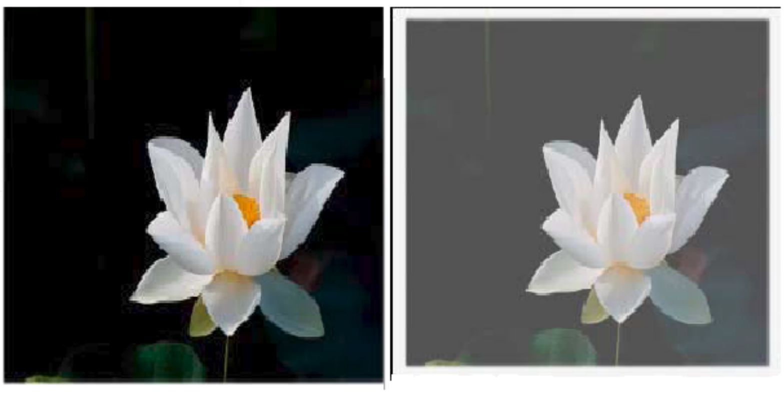
AMOLED displays may be difficult to view in direct sunlight compared with LCDs because of their reduced maximum brightness.[11] Samsung's Super AMOLED technology addresses this issue by reducing the size of gaps between layers of the screen.[12][13] Additionally, PenTile technology is often used for a higher resolution display while requiring fewer subpixels than needed otherwise, sometimes resulting in a display less sharp and more grainy than a non-pentile display with the same resolution.

The organic materials used in AMOLED displays are very prone to degradation over a relatively short period of time, resulting in color shifts as one color fades faster than another, image persistence, or burn-in. Flagship smartphones sold as of December 2011 used either Super AMOLED or IPS panel premium LCD. Super AMOLED displays, such as the one on the Galaxy Nexus and Samsung Galaxy S III have often been compared to IPS panel premium LCDs, found in the iPhone 4S, HTC One X, and Nexus 4.[17][18][19] For example, according to ABI Research the AMOLED display found in the Motorola Moto X draws just 92 mA during bright conditions and 68 mA while dim.[20] On the other hand, compared with the IPS, the yield rate of AMOLED is low, the cost is also higher.

3.3.2 AMOLED and LED

AMOLED is really a new large screen technology. The flat panel is made up of millions of tiny LEDs. The O in AMOLED stands for organic which means there is carbon within the molecules of the emissive (light producing) layer of the panel. Large screen AMOLED panels need no lamps; its a self illuminating device. AMOLED display can be thinner and lighter than the skinniest LED display. They provide very wide and consistent color no matter where you are seated in the room. LED display tends to get significantly dimmer as one moves away from center and many exhibit color shift. AMOLEDs are quite energy efficient, besting all other flat panels in low power consumption. The greatest attribute of AMOLED is the ability to have the deepest blacks of any flat panel technology. Unlike LED which at best can only dim the image in regions, AMOLEDs can produce a very low luminescence level down the individual pixel. This ability coupled with bright a white that is why AMOLEDs are expected to have the highest contrast. AMOLEDs can make more colors than LED display.

3.3.3 AMOLED and TFT



TFT: First we must clarify that no TFT display is a technology itself, but it is simply a special type of transistor with which it has succeeded in improving the quality of the image. Its use is more prevalent with LCD screens.LCD technology uses liquid crystal molecules placed between different layers that polarize and rotate as you want to display a color or another. Its main advantage, besides its small size, it is energy saving a lot more energy than any other alternative. In addition, its cost is also lower saving. When these transistors TFT screens used then we are talking about TFT LCDs, which are the most widespread at present. First we must clarify that no TFT display is a technology itself, but it is simply a special type of transistor with which it has succeeded in improving the quality of the image. Its use is more prevalent with LCD screens.LCD technology uses liquid crystal molecules placed between different layers that polarize and rotate as you want to display a color or another. AMOLED: Finally, this technology also has quite a few years and that little by little we will also viewing it more consistently. It is a variant of the classic LED, but where the emission layer has an organic component. Surely you've heard that AMOLED screens have the advantage of not needing backlight.

3.4 Summary

In this chapter the Current researches and related work about the amoled is related amoled TV. Also the comparision of the amoled display. The next section contains the Discussion of the Amoled.

Chapter 4

Discussion

In this chapter, in section 4.1 the advantages of the amoled are discussed. In section 4.2 the disadvantages of the amoled are discussed. In section 4.3 the features of the amoled are discussed.In section 4.4 the uses of the amoled are discussed.

4.1 Advantages

Faster : AMOLED has much better response time than other displays. So these screens often provide better user experience. This advantage will lead great use of AMOLED screens in mobile phones and other handheld devices where fast response time is usually required.

Efficient in Energy : AMOLED displays consume less energy as compared to LCD displays

Large Viewing Angle : Viewing angle is always an issue in flat screens. But with AMOLED displays, viewing angle could be as large as 170 degree because they produce their own light which increases their viewing angle. and other display screens. No backlit is required in these screens which is the biggest AMOLED advantage for use in portable gadgets.

Flexible : Now you get displays which you can bend. This is possible only through AMOLED screens.

Durability : Another great advantage of Durability: Another great advantage of AMOLED is that it is more durable than traditional screens. There chance of getting broken is comparatively less to LCD screens

Slimmer : AMOLED screen is slimmer than LCD display. While LCD and and other displays. Plasma displays

Low Cost : The price of AMOLED screens may be much higher now but it will come down as the technology becomes popular. AMOLED screens could become cheaper than could be few inches thick, but AMOLED advantage is that it is only few millimeters thick. LCD screens incoming time.

Good for Eyes : AMOLEDs are eye soothening. These screens provide better viewing experience because they have better contrast, brightness and color aspects. [4]

4.2 Disadvantages

Short Lifetime : AMOLED's biggest disadvantage is that these screens are not for long use. Compared with LCD, these screens are not designed to last as long. So life time may be a critical issue and of course a biggest disadvantage of AMOLED screens. However, these screens may find good use as mobile phone displays as most people don't keep phone for more than a year.

Sunlight Effect : Another disadvantage of AMOLED display is that they are hard to see in direct sunlight. So if you have open lobbies where sunlight reaches directly, you will not get benefit of viewing these screens.

Highly Water prone : AMOLED screens are highly prone to water. This adds to another disadvantage as these screens can't withstand even small water on display. In this regard, LCD screens are less susceptible to water damage

Moisture sensitivity : Over time, moisture can react with the organic layers and cause degradation and defects in an AMOLED display.

Power consumption : While an AMOLED will consume around 40% of the power of an LCD displaying an image which is primarily black, for the majority of images it will consume 6080% of the power of an LCD: however it can use over three times as much power to display an image with a white background such as a document or website. [4]

How to Lower Power Consumption AMOLED power consumption can be decreased by:

Black background. (50% 80%)

Lower full white brightness.

Auto current limit driving method.(20%)

AMOLED material & device efficiency increase.

4.3 Features

- Organic LED has several inherent properties that afford unique possibilities
- High brightness is achieved at low drive voltages/current densities.
- Operating lifetime exceeding 10,000 hours.
- Materials do not need to be crystalline, so easy to fabricate.
- Possible to fabricate on glass and flexible substrates.
- Self luminescent so no requirement of backlighting.
- Higher brightness.
- Low operating and turn-on voltage.
- Low cost of materials and substrates of AMOLEDs can provide desirable advantages over todays liquid crystal displays(LCDs)
- High contrast
- Low power consumption
- Wide operating temperature range
- Long operating lifetime
- A flexible, thin and light weight
- Cost effective manufacturability
- Increased brightness
- Faster response time for full motion video
- Conventional semiconductor components have become smaller and smaller over the course of time. Silicon is the base material of all microelectronics and is eminently suited for this purpose. However, the making of larger components is difficult and therefore costly.
- The silicon in semiconductor components has to be mono crystalline; it has to have a very pure crystal form without defects in the crystal structure. This is achieved by allowing melted silicon to crystallize under precisely controlled conditions. The larger

the crystal, the more problematic this process is. Plastic does not have any of these problems, so that semiconducting plastics are paving way for larger semiconductor components.

4.4 Uses of AMOLED

Commercial devices using AMOLED include:

Phones

- Alcatel One Touch Idol Ultra (HD Super AMOLED)
- BlackBerry Q10
- BlackBerry Priv (WQHD Plastic AMOLED)
- Cherry Mobile Cosmos X (HD Super AMOLED)
- Micromax Canvas Hue
- BenQ-Siemens S88
- Dell Venue 8 7000
- Gionee GN868 (Super AMOLED plus)
- GIONEE GN878 (HD Super AMOLED)
- HTC One S (Super AMOLED Advanced)
- HTC J (Super AMOLED Advanced)
- Lenovo S90 Sisley (HD Super AMOLED)
- LG Franklin Phone
- LG G Flex (HD Plastic-OLED)
- Micromax Superfone Pixel A90
- Motorola Moto X (HD Super AMOLED)
- Moto X (2nd Generation) (1080p Super AMOLED)
- Motorola Moto X Pro (QHD Super AMOLED)
- Google Nexus One (Early models)

- Google Nexus S (Super AMOLED)
- Google Galaxy Nexus (HD Super AMOLED)
- Google Nexus 6 (Quad HD Super AMOLED)
- Google Nexus 6P (WQHD Super AMOLED)
- MP-809T (Full HD Super Amoled)
- Nokia 700 (CBD)
- Nokia 808 Pureview (CBD)
- Nokia C6-01 (CBD)
- Nokia Lumia 800 (CBD)
- Nokia Lumia 928 (CBD)
- Nokia Lumia 930
- Nokia N86 8MP
- Nokia N9 (CBD)
- Nokia X7
- OnePlus X

4.5 Summary

In this chapter we discussed the advantages and disadvantages of Amoled and the features of the amoled. In the next chapter conclusion is also discussed.

makeindex thesis

Chapter 5

Conclusion

AMOLEDs offer many advantages over both LEDs and LCDs. They are thinner, lighter and more flexible than the crystalline layers in an LED or LCD. They have large fields of view as they produce their own light. Research and development in the field of AMOLEDs is proceeding rapidly and may lead to future applications in heads up displays, automotive dash boards, billboard type displays etc. Because AMOLEDs refresh faster than LCDs, a device with AMOLED display could change information almost in real time. Video images could be much more realistic and constantly updated.

Future Scope:- Manufacturers have developed in-cell touch panels, integrating the production of capacitive sensor arrays in the AMOLED module fabrication process. In-cell sensor AMOLED fabricators include AU Optronics and Samsung. Samsung has marketed its version of this technology as "Super AMOLED". Researchers at DuPont used computational fluid dynamics (CFD) software to optimize coating processes for a new solution-coated AMOLED display technology that is competitive in cost and performance with existing chemical vapor deposition (CVD) technology. Using custom modeling and analytic approaches, Samsung has developed short and long-range film-thickness control and uniformity that is commercially viable at large glass sizes.[8]

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