Seminar Report On OLED

ABSTRACT

OLED is a solid state device composed of thin films of organic molecules that create light with the application of electricity.OLEDs can provide brighter.crisper displays on electronic devices and use less power than conventional light emitting diodes(LEDs)used today.

Like an LED,an OLED is a solid state semiconductor device that is 100 to 500 nanometres thick or about 200 times smaller than a human hair.OLEDs can have either two layers or three layers of organic material. An OLED consist of the following parts:

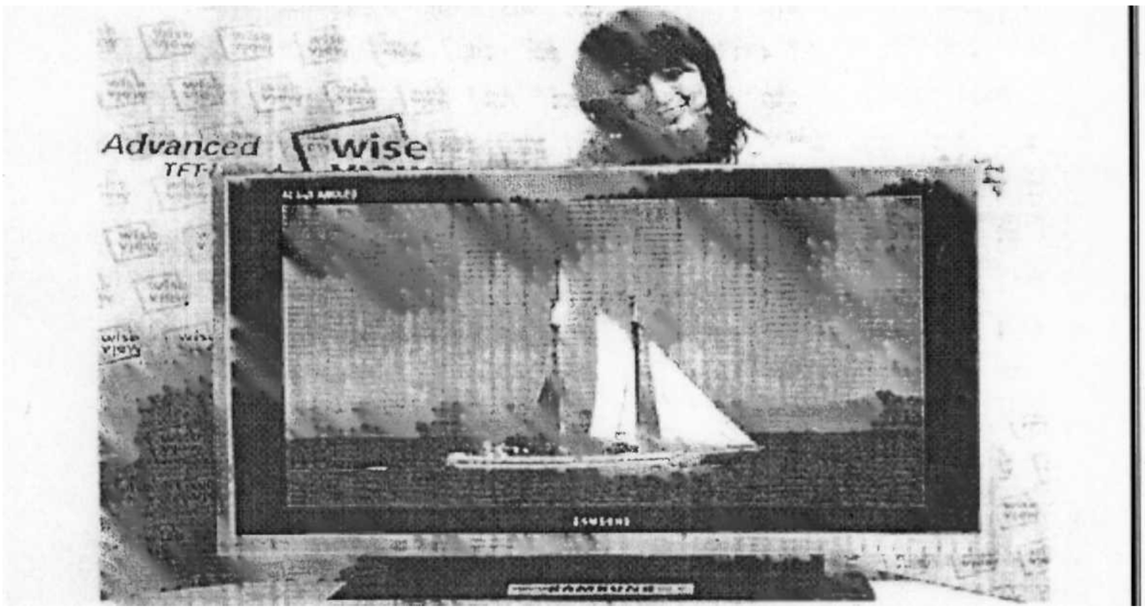
- Subtrate
- Anode
- Organic layers
- Cathode

OLEDS emit light through a process called electrophosphorescene. Different types of OLEDs are

- Passive-matrix OLED
- Active-matrix OLED
- Transparent OLED
- Foldable OLED
- Top-emitting OLED
- White OLED Applications

Currently.OLEDs are used in small-screen devices such as cell phones,PDAs and digital cameras.Research and development in the field of OLEDs is proceeding rapidly now and may lead to future applications in heads-up displays,automotive dash boards etc.

INTRODUCTION

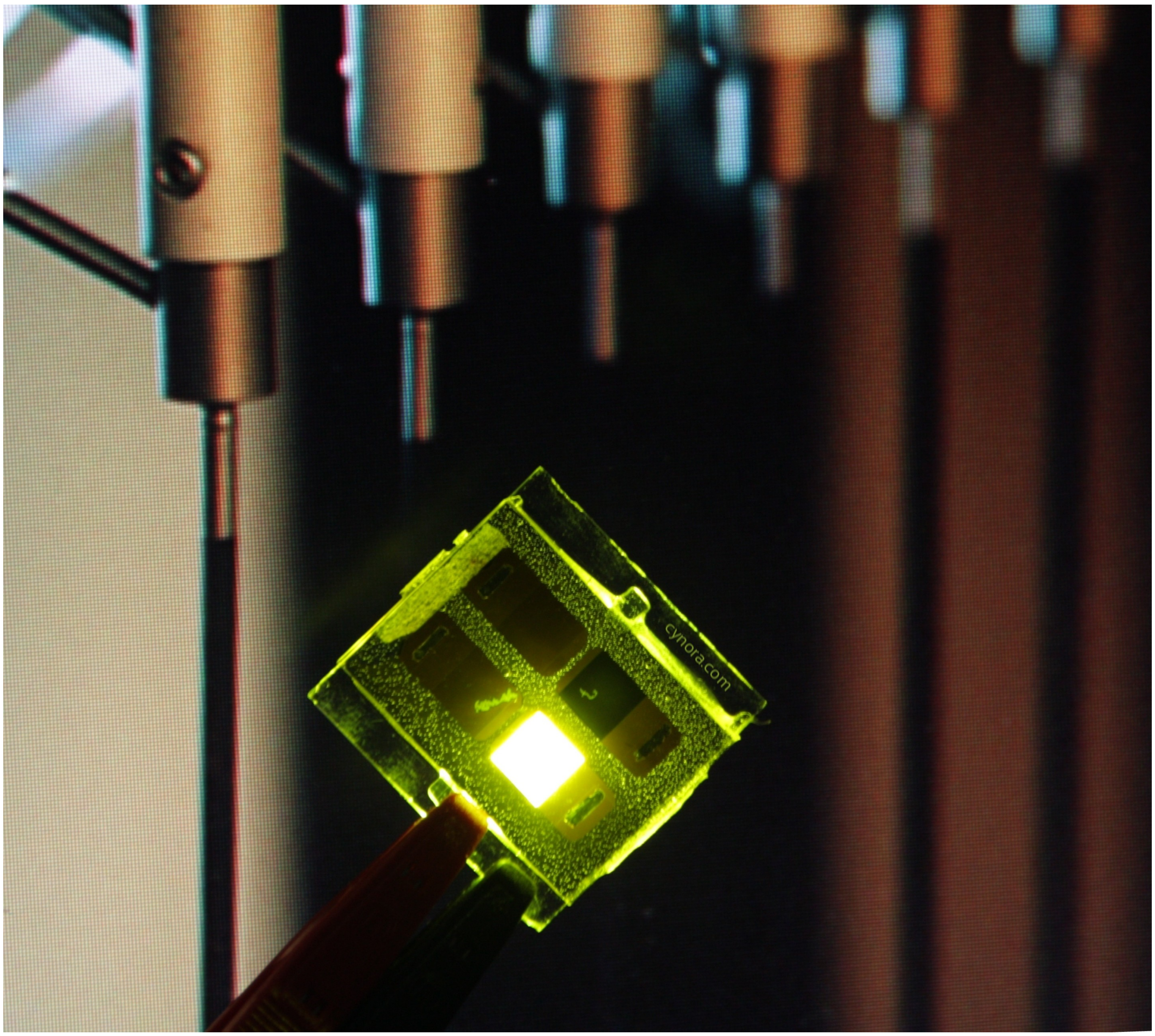


Can we just imagine of having a TV which can be rolled up? Would'nt you like to be able to read off the screen of your laptop in direct sunlight? Your mobile phone battery to last much, much longer? Or your next flat screen TVto be less expensive, much flatter, and even flexible? Well, now it is possible by an emerging technology based on the revolutionary discovery that, light emitting, fast switching diode could be made from polymers as well as semiconductors.

We know, ordinary LED emits light when electic current is passed through. Organic displays use a material with self luminous property that eliminates the need of a back light. These result in a thin and compact display. While backlighting is a crucial component to improving brightness in LCDs, it also adds significant cost as well as requires extra power. With an organic display, your laptop might be less heavy to carry around, or your battery lasts much longer compared to a laptop equipped with a traditional LCD screen.

A screen based on PolyLEDs has obvious advantages: the screen is lightweight and flexible, so that it can be rolled up. With plastic chips you can ensure that the electronics driving the screen are integrated in the screen itself. One big advantage of plastic electronics is that there is virtually no restriction on size.

Research and development in the field of OLED is proceeding rapidly and may lead to future applications in heads-up displays, automotive dashboards, billboard-type displays, mobile phones, television screen, home and office lighting and flexible displays.



history

The first observations of electroluminescence in organic materials were in the early 1950s by A. Bernanose and co-workers at the Nancy-Université, 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.

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 (500–1500 V) AC-driven (100–3000 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.

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.

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[14 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 Cavendish Laboratory in Cambridge reporting a high efficiency green light-emitting polymer based device using 100 nm thick films of poly(p-phenylene vinylene).

FEATURES OF OLED

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 OLEDs can provide desirable advantages over today's liquid crystal displays(LCDs),

- High contrast
- Low power consumption
- Wide operating temperature range
- Long operating lifetime
- A flexible, thin and lightweight
- Cost effective manufacturability

OLED displays have other advantages over LCDs as well:

- Increased brightness
- Faster response time for full motion video

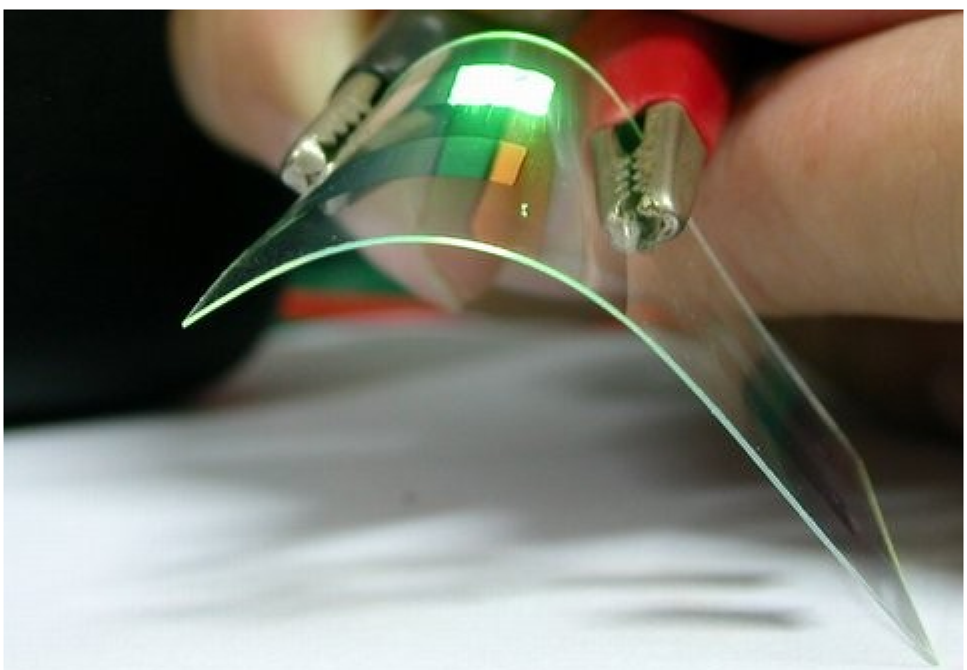
  Lighter weight Greater

  durability

  Broader operating temperature ranges

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.



HOW OLED HAS EMERGED ?

OLED

Kodak first discovered that organic materials glow in response to electrical currents, in the late 1970s. Since then Kodak has been working for the improvement of this technology.

In the late 1970s. Eastman Kodak Company scientist Dr.Ching Tang discovered that sending an electrical current through a carbon compound caused these materials to glow. Dr.Tang and Steven Van Slyke continued research in this vein.

In 1987, they reported OLED materials that become the foundation for OLED displays produced today. The first colour they discovered in this early OLED research was green.

As early as 1989, the Kodak research team demonstrated colour improvements using fluorescent dyes, or dopants, to boost the efficiency and control of colour output.

WHAT IS OLED?

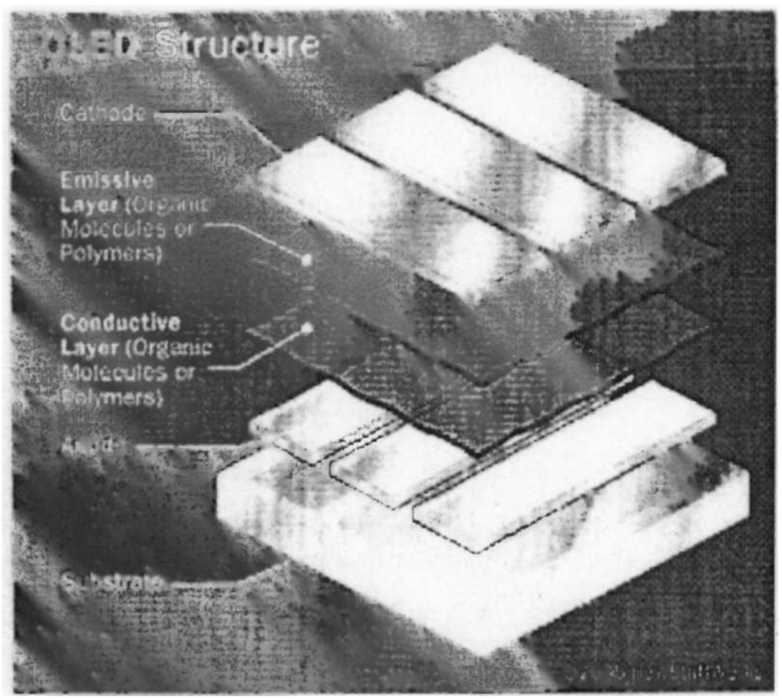
An OLED is a solid state device or electronic device that typically consists of organic thin films sandwiched between two thin film conductive electrodes. When electrical current is applied, a bright light is emitted. OLED use a carbon-based designer molecule that emits light when an electric current 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.

When used to produce displays. OLED 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.

OLED 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, ie, the brightness of an OLED is determined by how much power you supply to the system.

OLED COMPONENTS

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 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. In this article, we will be focusing on the two layer design.



An OLED consists of the following parts:

- Substrate (clear plastic, glass, foil)-The substrate supports the OLED.
- Anode(transparent)-The anode removes electrons(adds electron holes) when a current flows through the device.
- **Organic layers-** These layers are made up of organic plastic molecules that transport "holes" from the anode. One conducting polymer used in OLEDs is polyaniline.

- **Emissive layer-** This layer is made of organic plastic molecules(different ones from the conducting layer) that transport electons from the cathode; this is where light is made. One polymer used in the emissive layer is polyflourene.
- **Cathode** (may or may not be transparent depending on the type of OLED)-The cathode injects electrons when a current Hows through the device.

OPERATION

How do OLEDs emit light?

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

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 flows from the cathode to the anode through the organic layers(an electrical current is a flow of electrons)

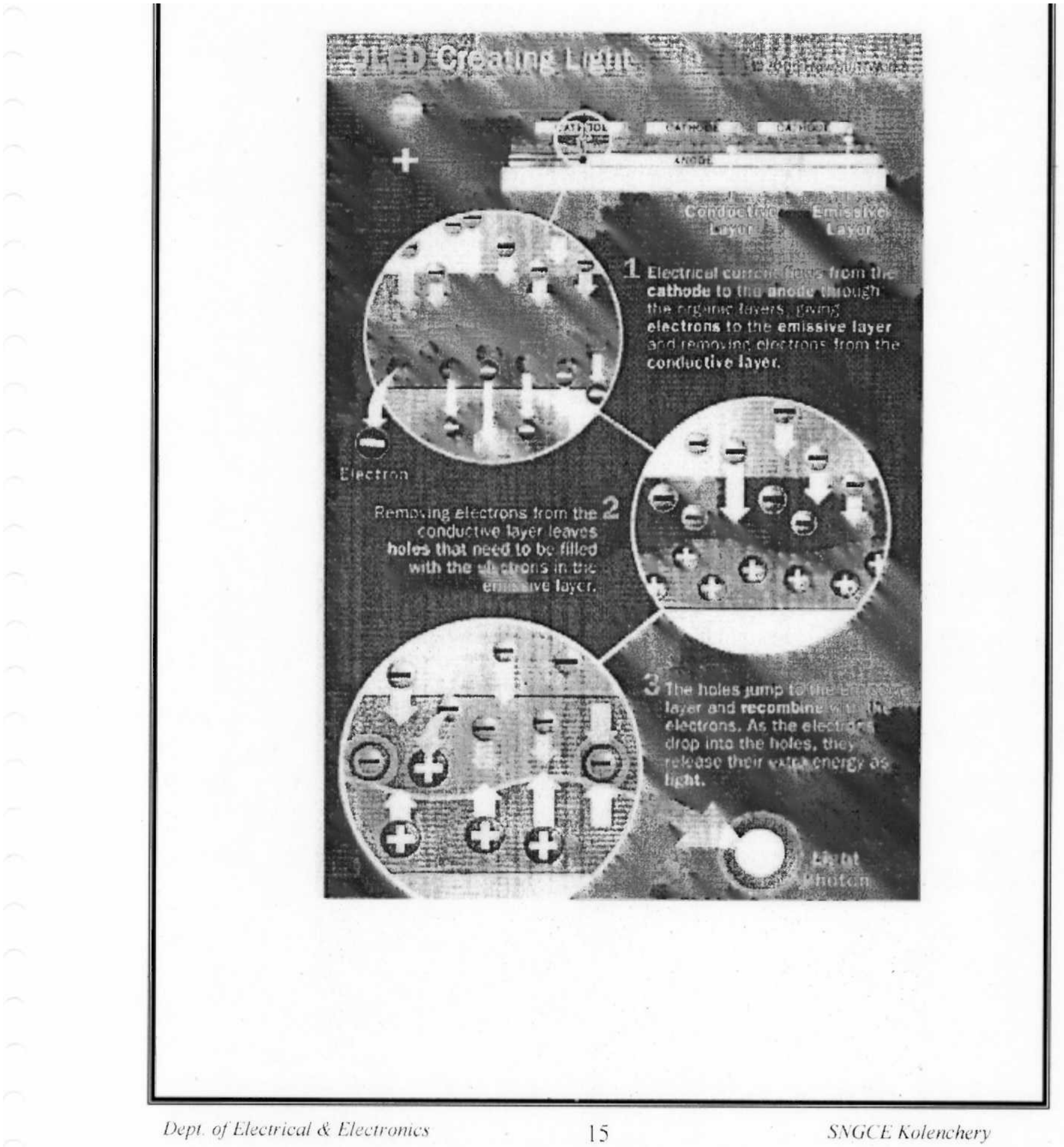
- The cathode gives electrons to the emissive layer of organic molecules.
- The anode removes electrons from the conductive layer of organic molecules.(This is the equivalent to giving electron holes to the conductive layer)

3. 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 is missing an electron).
- When this happens, the electron gives up energy in the form of a photon of light.

4. The OLED 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 OLED to make color displays.

5. The intensity or brightness of the light depends on the amount of electrical current applied. The more the current, the brighter the light.



When electricity is applied to OLED, charge carriers (holes and electrons) are injected from the electrodes into the organic thin films.They migrate through the device under the influence of an electrical field. The charge carriers then recombine, forming excitons. In conventional LED only about

25% of these excitons could generate light, with the remaining 75% lost as heat. This was known as fluorescent emission.

However, 100% of the excitons can be converted into light using a process known as electrophosphorescence.Thus. the efficiency of an OLED is up to four times higher than that of a conventional OLED.

MAKING OLED

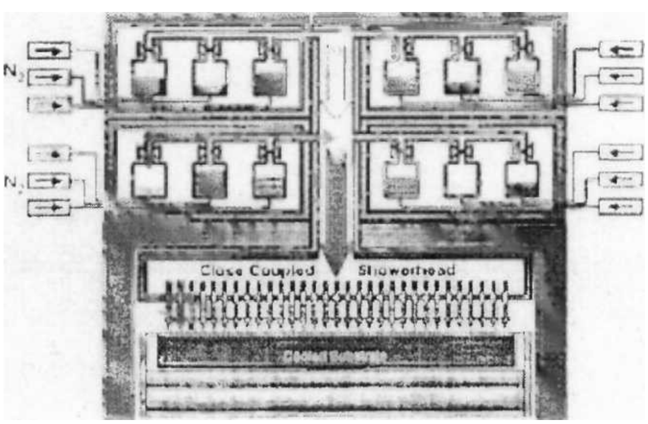
The biggest part of manufacturing OLEDs is applying the organic layers to the substrate. This can be done in three ways:

1.Vacuum deposition or vacuum thermal evaporation(VTE):

In a vacuum chamber, the organic molecules are gently heated(evaporated) and allowed to condense as thin films onto cooled substrates. This process is very expensive and inefficient.

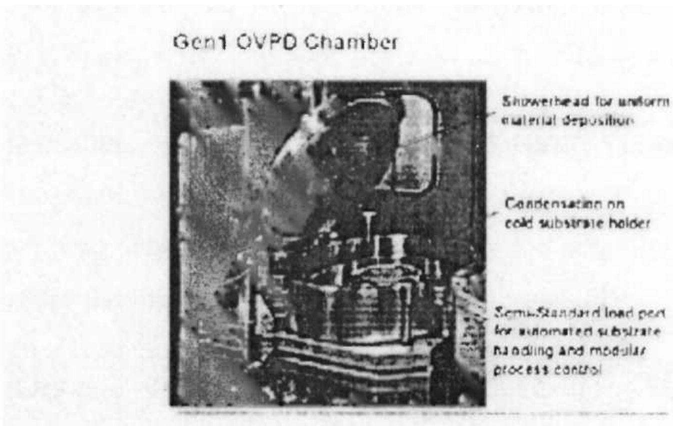
2.Organic vapour phase deposition

In a low pressure, hot-walled reactor chamber, a carrier gas transports evaporated organic molecules onto cooled substrates, where they condense into thin films. Using a carrier gas increases the efficiency and reduces the cost of making OLEDs.



The OVPD process employs an inert carrier gas to a precisely transfer films of organic material onto a cooled substrate in a hot-walled, low pressure chamber. The organic materials are stored in external, separate, thermally-controlled cells .Once evaporated from these heated cells, the materials are entrained and transported by an inert carrier gas such as nitrogen, using gas flow rate, pressure and temperature as process control variables. The materials deposit down onto the cooled substrate from a manifold located only several centimeters above the substrate. Usually we go for this method.

Higher deposition rates :- Deposition rates with OVPD can be several times higher than the rate for conventional VTE processes because the OVPD deposition rate is primarily controlled by the How of the carrier gas.



Higher materials utilization :- Because the organic materials do not deposit on the heated surfaces of the chamber, materials' utilization is much better than with VTE where the materials deposit everywhere. This feature should translate into lower raw material cost, less downtime and higher production throughput.

Better device performance :- The OVPD process can provide better film thickness control and uniformly over larger areas than VTE. With three variable process control, OVPD offers more precise deposition rates and doping control at very low levels. As a result, sharper or graded layer interfaces can be more easily achieved. In addition, multiple materials can be co-deposited in one chamber without the cross-contamination problems commonly experienced in VTE systems.

Shadow mask patterning :- OVPD offers better shadow mask-to-substrate distance control than is possible with VTE up-deposition. Because the mask is above, instead of below the substrate, its thickness can be dictated by the desired pattern shape rather than the need for rigidity. Thus precise, reproducible pixel profiles can be obtained.

Larger substrate sizes :- Because the Aixtron AG-proprietary showerhead can be designed to maintain a constant source-to-substrate distance, OVPD may be more readily scaled to larger substrate sizes. This also may render OVPD more adaptable to in-line and roll-to-roll processing for flexible displays.

3. Inkjet printing

With inkjet technology, OLEDs are sprayed onto substrates just like inks are sprayed onto paper during printing. Inkjet technology greatly reduces the cost of OLED manufacturing and allows OLEDs to be printed onto very large dims for large displays like 80 inch TV screens or electronic billboards.

TYPES OF OLED

There are six different types of OLEDs. They are:

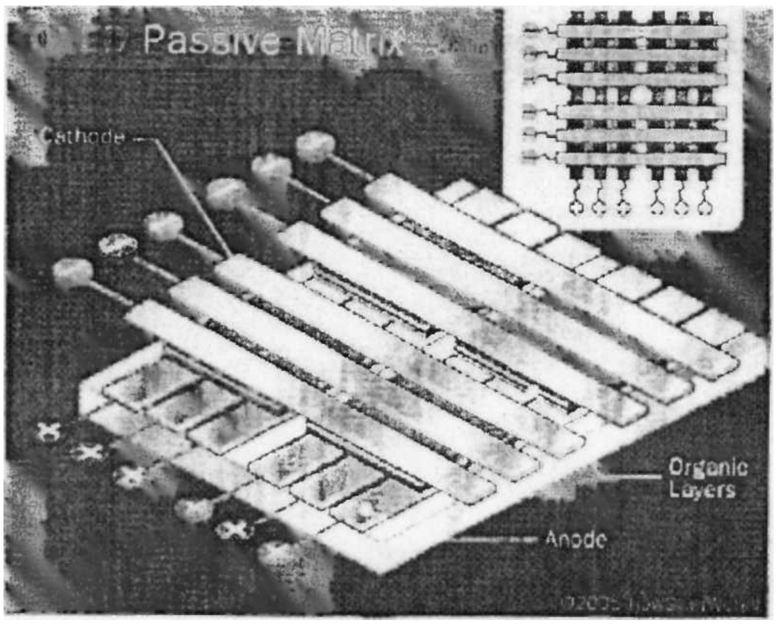
- Passive-matrix OLED
- Active-matrix OLED
- Transparent OLED
- Foldable OLED
- Top-emitting OLED
- White OLED

PASSIVE MATRIX OLE!)

Passive-matrix OLEDs are particularly well suited for small-area display applications, such as cell phones and automotive audio applications.

PMOLEDs have strips of cathode, organic layers and strips of anode. The anode strips are arranged perpendicular to the cathode strips. The intersections of the cathode and anode make up the pixels where light is emitted. Sandwiched between the orthogona column and row lines, thin films of organic material are activated to emit light by applying electrical signals to designated row and column lines. The more current that is applied, the more brighter the pixel becomes.

PMOLEDs are easy to make, but they consume more power than other types of OLED. mainly due to the power needed for the external circuitry.

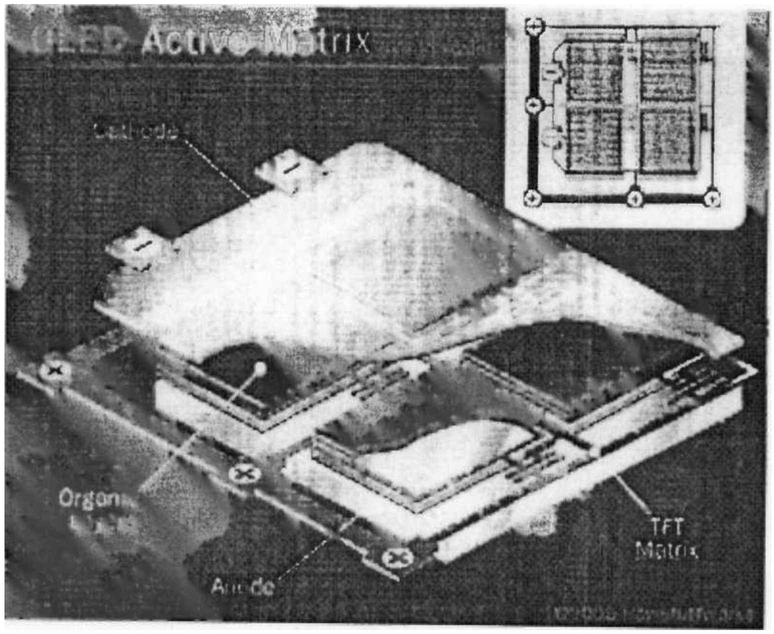


ACTIVE MATRIX OLED

AMOLED have full layers of cathode, organic molecule 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.

In contrast to a PMOLED display, where electricity is distributed row by row. the active-matrix TFT backplane acts as an array of switches that controls the amount of current flowing through each OLED pixel. The TFT array continuously controls the current that Hows to the pixels, signaling to each pixel how brightly to shine.

OLED

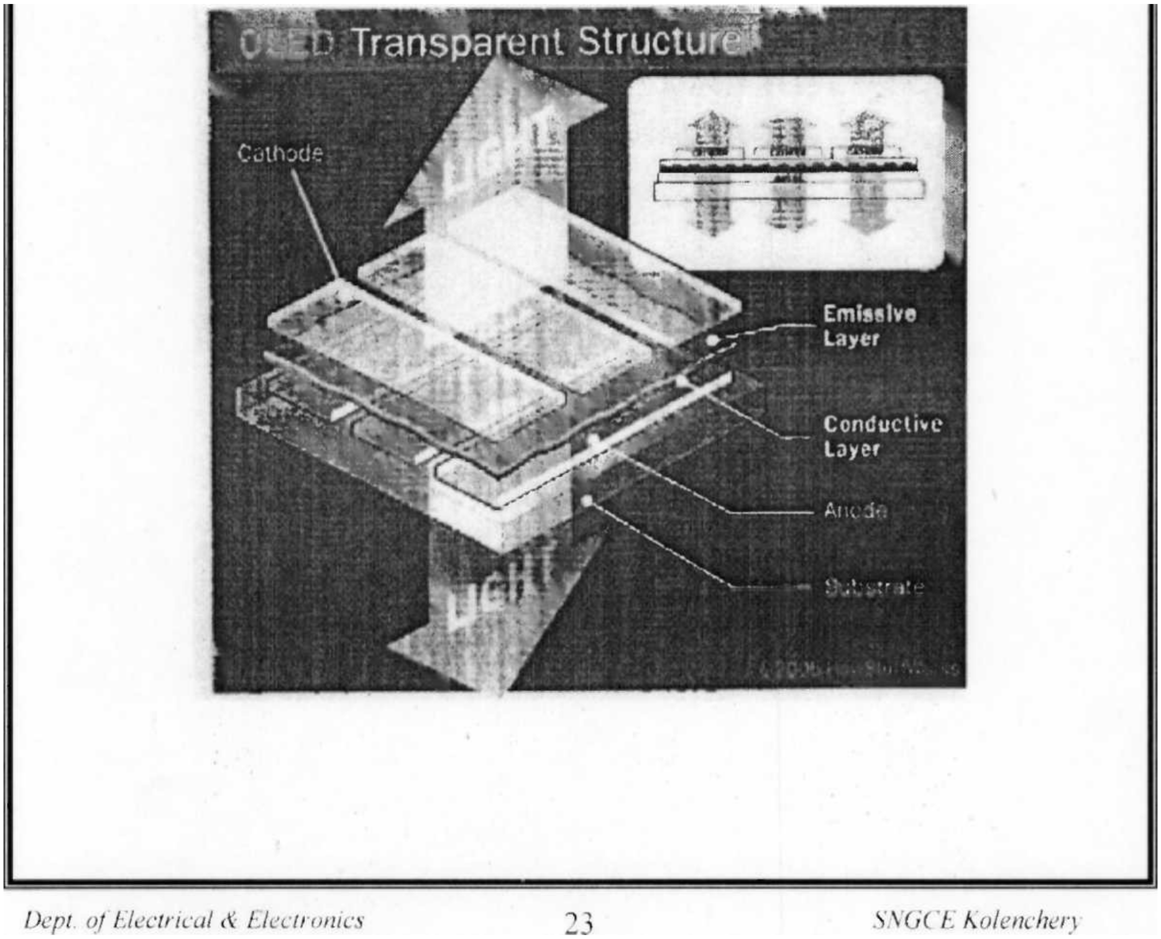


Active-matrix OLED displays provide the same beautiful video-rate performance as their passive-matrix OLED counter part, but they consume significantly less power. The advantage makes active-matrix OLEDs especially well suited for portable electronics

- where battery power consumption is critical and for large displays. The best uses for AMOLED are computer monitors, large screen TVs and electronic signs or billboards.

TRANSPARENT OLED

Transparent OLEDs have only transparent components (substrate, cathode and anode) and, when turned off, are up to 85 percent as transparent as their substrate. When a transparent OLED display is turned on, it allows light to pass in both directions. A transparent OLED display can be either active or passive matrix. This technology can be used for heads-up displays.



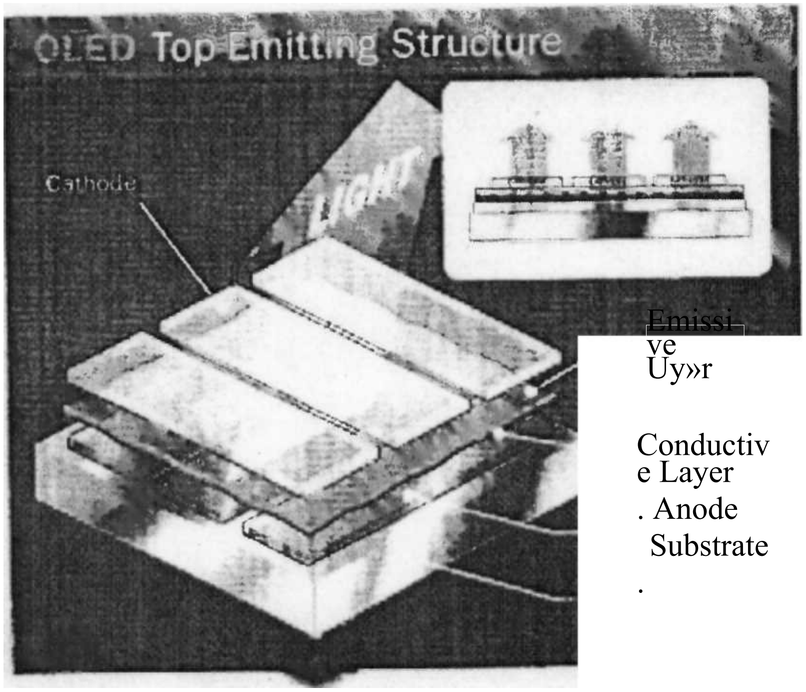
FOLDABLE OLED

Foldable OLEDs have substrates made of very flexible metallic foils or plastics. Foldable OLEDs are very lightweight and durable. Their use in devices such as cellphones and PDAs can be sewn into fabrics for "smart" clothing, such as outdoor survival clothing with an integrated computer chip, cell phone, GPS receiver and oled display display sewn into it.

TOP-EMITTING OLED

Top-emitting OLEDs have a substrate that is either opaque or reflective. They are best suited to active-matrix design. Manufacturers may use top-emitting OLED displays in smart cards.

OLED



WHITE OLED

White OLEDs emit white light that is brighter, more uniform and more energy efficient than that emitted by fourescent lights. White OLEDs also have the true-color qualities of incandescent lighting. Because OLEDs can be made in large sheets, they can replace fluorescent lights that are currently used in homes and buildings. Their use could potentially reduce energy costs for lighting.

OLED ADVANTAGES AND DISADVANTAGES

The LCD is currently the display of choice in small devices and is also popular in large screen TVs. Regular LEDs often form the digits on digital clocks and other electronic devices. OLEDs offer many advantages over both LCDs and LEDs

- The plastic, organic layers of an OLED are thinner, lighter and more flexible than the crystalline layers in an LED or LCD.

- Because the light emitting layers of an OLED are lighter, the substrate of an OLED can be flexible instead of rigid. OLED substrates can be plastic rather than the glass used for LEDs and LCDs.
- OLEDs are brighter than LEDs. Because the organic layers of an OLED are much thinner than the corresponding inorganic crystal layers of an LED. the conductive and emissive layers of an OLED can be multi-layered. Also, LEDs and LCDs require glass for support, and glass absorbs some light, OLEDs do not require glass.
- OLEDs do not require backlighting like LCDs. LCDs work by selectively blocking areas of the backlight to make the images that you see, while OLEDs generate light themselves.Because OLEDs do not require backlighting, they consume much less power than LCDs(most of the LCD power goes to the backlighting). This is especially important for battery operated devices such as cell phones.
- OLEDs are easy to produce and can be made to larger sizes. Because OLEDs are essentially plastics, they can be made into large, thin sheets. It is much more difficult to grow and lay down so many liquid crystals.
- OLEDs have large fields of view, about 170 degrees. Because LCDs work by blocking light, they have an inherent viewing obstacle from certain angles. OLEDs produce their own light, so they have a much wider viewing range.

PROBLEMS WITH OLED

OLED seem to be the perfect technology for all types of displays, but they also have some problems:

- Lifetime :- While red and green OLED films have long lifetimes (10000 to 40000 hours), blue organics currently have much shorter lifetimes(only about 10000 hours).
- Manufacturing :- Manufacturing processes are expensive right now.
- Water :- Water can easily damage OLEDs.

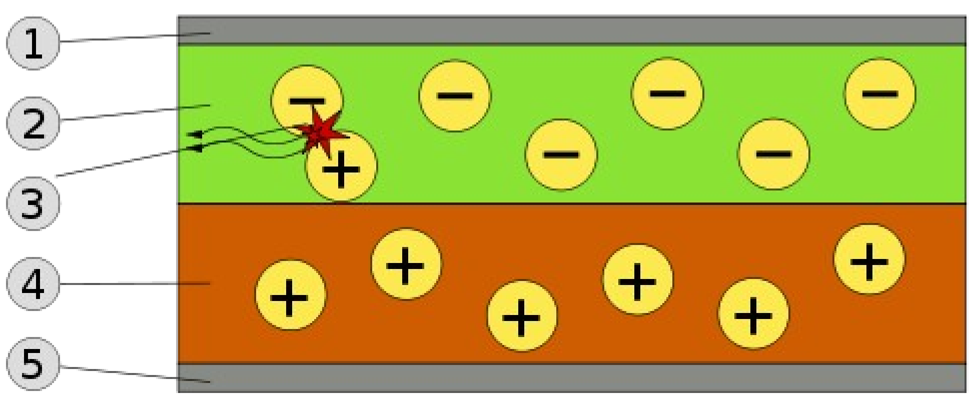
CURRENT AND FUTURE OLED APPLICATIONS

Currently, OLEDs are used in small-screen devices such as cell phones, PDAs and digital cameras. In September 2004, Sony Corporation announced that it was beginning mass production of OLED screens for its CLIE PEG-VZ90 model of personal entertainment handhelds. Kodak already uses OLED displays in several of its digital camera models.

Several companies have already built prototype computer monitors and large screen TVs. In May 2005, Samsung Electronics announced that it had developed the first 40 inch, OLED based, ultra-slim TV.

Research and development in the field of OLEDs is proceeding rapidly and may lead to future applications in heads up displays, automotive dashboards, billboard-type displays, home and office lighting and flexible displays. Because OLEDs refresh faster than LCDs, almost 1000 times faster , a device with an OLED display can change the information almost in real time.

Video images could be much more realistic and constantly updated. The newspaper of the future might be an OLED display that refreshes with breaking news and like a regular newspaper,you could fold it up when you are done reading it and stick it in your backpack or briefcase.



COMMERCIAL USES

OLED technology is used in commercial applications such as displays for mobile phones and portable digital media players, car radios and digital cameras among others. Such portable applications favor the high light output of OLEDs for readability in sunlight and their low power drain. Portable displays are also used intermittently, so the lower lifespan of organic displays is less of an issue. Prototypes have been made of flexible and rollable displays which use OLEDs' unique characteristics. Applications in flexible signs and lighting are also being developed.[70] Philips Lighting have made OLED lighting samples under the brand name 'Lumiblade' available online.[71]

OLEDs have been used in most Motorola and Samsung colour cell phones, as well as some HTC, LG and Sony Ericsson models.[72] Nokia has also recently introduced some OLED products including the N85 and the N86 8MP, both of which feature an AMOLED display. OLED technology can also be found in digital media players such as the Creative ZEN V, the iriver clix, the Zune HD and the Sony Walkman X Series.

The Google and HTC Nexus One smartphone includes an AMOLED screen, as does HTC's own Desire and Legend phones. However due to supply shortages of the Samsung-produced displays, certain HTC models will use Sony's SLCD displays in the future,[73] while the Google and Samsung Nexus S smartphone will use "Super Clear LCD" instead in some countries.[74]

Other manufacturers of OLED panels include Anwell Technologies Limited,[75] Chi Mei Corporation,[76] LG,[77] and others.[78]

DuPont stated in a press release in May 2010 that they can produce a 50-inch OLED TV in two minutes with a new printing technology. If this can be scaled up in terms of manufacturing, then the total cost of OLED TVs would be greatly reduced. Dupont also states that OLED TVs made with this less expensive technology can last up to 15 years if left on for a normal eight hour day.[79][80]

Handheld computer manufacturer OQO introduced the smallest Windows netbook computer, including an OLED display, in 2009.[81]

The use of OLEDs may be subject to patents held by Eastman Kodak, DuPont, General Electric, Royal Philips Electronics, numerous universities and others.[82] There are by now literally thousands of patents associated with OLEDs, both from larger corporations and smaller technology companies [1].

[edit] Samsung applications

By 2004 Samsung, South Korea's largest conglomerate, was the world's largest OLED manufacturer, producing 40% of the OLED displays made in the world,[83] and as of 2010 has a

98% share of the global AMOLED market.[84] The company is leading the world OLED industry, generating $100.2 million out of the total $475 million revenues in the global OLED market in 2006.[85] As of 2006, it held more than 600 American patents and more than 2800 international patents, making it the largest owner of AMOLED technology patents.[85]

Samsung SDI announced in 2005 the world's largest OLED TV at the time, at 21 inches (53 cm).[86] This OLED featured the highest resolution at the time, of 6.22 million pixels. In addition, the company adopted active matrix based technology for its low power consumption and high-resolution qualities. This was exceeded in January 2008, when Samsung showcased the world's largest and thinnest OLED TV at the time, at 31 inches and 4.3 mm.[87]

In May 2008, Samsung unveiled an ultra-thin 12.1 inch laptop OLED display concept, with a 1,280×768 resolution with infinite contrast ratio.[88] According to Woo Jong Lee, Vice President of the Mobile Display Marketing Team at Samsung SDI, the company expected OLED displays to be used in notebook PCs as soon as 2010.[89]

In October 2008, Samsung showcased the world's thinnest OLED display, also the first to be 'flappable' and bendable.[90] It measures just 0.05 mm (thinner than paper), yet a Samsung staff member said that it is "technically possible to make the panel thinner".[90] To achieve this thickness, Samsung etched an OLED panel that uses a normal glass substrate. The drive circuit was formed by low-temperature polysilicon TFTs. Also, low-molecular organic EL materials were employed. The pixel count of the display is 480 × 272. The contrast ratio is 100,000:1, and the luminance is 200 cd/m². The colour reproduction range is 100% of the NTSC standard.

In the same month, Samsung unveiled what was then the world's largest OLED Television at 40-inch with a Full HD resolution of 1920×1080 pixel.[91] In the FPD International, Samsung stated that its 40-inch OLED Panel is the largest size currently possible. The panel has a contrast ratio of 1,000,000:1, a colour gamut of 107% NTSC, and a luminance of 200 cd/m² (peak luminance of 600 cd/m²).

At the Consumer Electronics Show (CES) in January 2010, Samsung demonstrated a laptop computer with a large, transparent OLED display featuring up to 40% transparency[92] and an animated OLED display in a photo ID card.[93]

Samsung's latest AMOLED smartphones use their Super AMOLED trademark, with the Samsung Wave S8500 and Samsung i9000 Galaxy S being launched in June 2010. In January 2011 Samsung announced their Super AMOLED Plus displays[94] - which offer several advances over the older Super AMOLED displays - real stripe matrix (50% more sub pixels), thinner form factor, brighter image and a 18% reduction in energy consumption.

Sony applications

Sony XEL-1, the world's first OLED TV.[1] (front)

Sony XEL-1 (side)

The Sony CLIÉ PEG-VZ90 was released in 2004, being the first PDA to feature an OLED screen.[95] Other Sony products to feature OLED screens include the MZ-RH1 portable minidisc recorder, released in 2006[96] and the Walkman X Series.[97]

At the Las Vegas CES 2007, Sony showcased 11-inch (28 cm, resolution 960×540) and 27-inch (68.5 cm, full HD resolution at 1920×1080) OLED TV models.[98] Both claimed 1,000,000:1 contrast ratios and total thicknesses (including bezels) of 5 mm. In April 2007, Sony announced it would manufacture 1000 11-inch OLED TVs per month for market testing purposes.[99] On October 1, 2007, Sony announced that the 11-inch model, now called the XEL-1, would be released commercially;[1] the XEL-1 was first released in Japan in December 2007.[100]

In May 2007, Sony publicly unveiled a video of a 2.5-inch flexible OLED screen which is only 0.3 millimeters thick.[101] At the Display 2008 exhibition, Sony demonstrated a 0.2 mm thick 3.5 inch display with a resolution of 320×200 pixels and a 0.3 mm thick 11 inch display with 960×540 pixels resolution, one-tenth the thickness of the XEL-1.[102][103]

In July 2008, a Japanese government body said it would fund a joint project of leading firms, which is to develop a key technology to produce large, energy-saving organic displays. The project involves one laboratory and 10 companies including Sony Corp. NEDO said the project was aimed at developing a core technology to mass-produce 40 inch or larger OLED displays in the late 2010s.[104]

In October 2008, Sony published results of research it carried out with the Max Planck Institute over the possibility of mass-market bending displays, which could replace rigid LCDs and plasma screens. Eventually, bendable, transparent OLED screens could be stacked to produce 3D images with much greater contrast ratios and viewing angles than existing products

Sony exhibited a 24.5" prototype OLED 3D television during the Consumer Electronics Show in January 2010.

In January 2011, Sony announced the NGP handheld game console (the successor to the PSP) will feature a 5-inch OLED screen.[107]

On 17 February 2011, Sony announced its 25" OLED Professional Reference Monitor aimed at the Cinema and high end Drama Post Production market.

LG applications

As of 2010 LG produces one model of OLED television, the 15 inch 15EL9500 and has announced a 31" OLED 3D television for March 2011.

conclusion

OLEDs 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 OLEDs is proceeding rapidly and may lead to future applications in heads up displays, automotive dash boards, billboard type displays etc. Because OLEDs refresh faster than LCDs, a device with OLED display could change information almost in real time. Video images could be much more realistic and constantly updated.

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