The Next Generation Electronics devices

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Abstract— this paper presents the new ideas and innovations in next generation electronic devices i.e., organic devices
Organic devices plays a vital role in the field of electronics due to some features like lightweight, unbreakable, optically transparent, mechanically flexible and have a low power consumption.
The application area of electronics devices are very wide some of these are organic solar cell (OSC), organic light emitting diode(OLED), organic thin film transistor(OTFT), organic laser, sensor, display, rechargeable battery, RFID tags and electronic skin etc.

Index Terms—Anthracene, active matrix, electronic skin, LCD, OLED, OSC, OTFT, passive matrix, pentacene, polymer, PPV, PT, RFID, UID

I. INTRODUCTION

Organic electronics as the name suggest is a branch of electronics that deals with conductive polymer, or plastics. It is called "organic" electronics because the molecules in the polymer are carbon based , like the molecules of living things. Organic electronics are still a young area of technology. Conductive polymer are lighter, more flexible, and less expensive than the inorganic conductor.
The use of organic material to build electronic devices may offer a more eco-friendly and affordable approach to growing our electronic world. The transparent and flexible electronic devices are lightweight, unbreakable, optically transparent, mechanically flexible and have a low power consumption

II. ORGANIC MATERIAL

The organic materials which have been used to as active semiconductor material used in organic devices are pentacene polythiophene etc. materials based on carbon is mostly used as organic electronics because of so many different forms of carbon material. An organic semiconductor consist of aggregates of organic molecules bound by weak Vander Walls forces. These molecules contain loosely bound π-electrons that is responsible for electrical conduction. These small-molecular materials are mainly prepared by thermal evaporation.

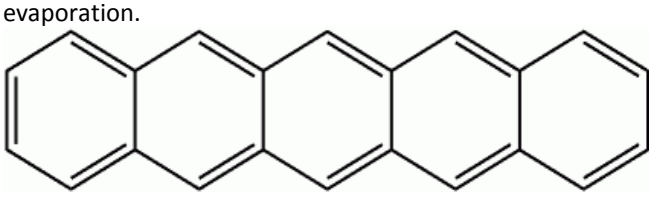


Fig 1:pentacene

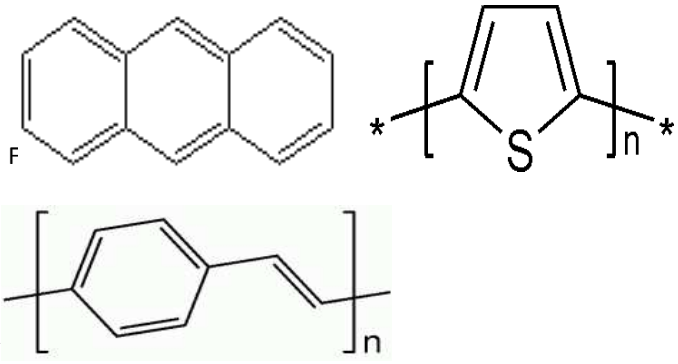


Fig 4: Polyphenylene-vinylene (PPV)

III. RFID TAGS

The RFID (Radio Frequency Identification) is a automatic identification device which use the technology of radio frequency electromagnetic field. This techniques is used to identify the objects when they come closer to RFID reader. The objects has to be carry the tags. The RFID tags consist of printed chip which is connected through a metal antenna. This printed chips does not required any internal power supply as they get their power from the radio field. The major application area for organic or polymer transistor is that RFID tags. RFID tags will be used in the identification of individual retail goods same as barcode does. RFID tags contains three major functional bodies and an antenna coil. Antenna coil is used to magnetically coupled radio frequency RF energy from RFID reader into the tag. The antenna also transmits the unique serial number to the reader. These information is stored in the system called data base. Each RFID tag has a UID number. This number contains the information printed as barcode. RF energy rectifier in the RF interface provides a DC power supply to the entire RFID .

Fig 5: RFID transistor

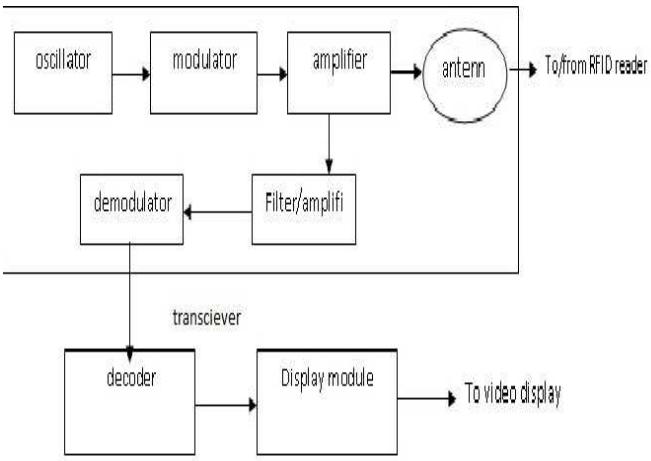


Fig 6: block diagram of RFID tag reader

IV. ORGANIC SOLAR CELL

The organic solar cell or photovoltaic cell consist of four layer. The two electrodes in which one is transparent, a photoactive layer and a hole transport layer where light is transformed into charge carrier. From the year 1950s the conventional solar cells have been rapid advances in the efficiency and reliability along with decrease in fabrication cost. Even though the cost of solar electricity is higher as compared to the electricity from electrical grid. A basic difference between conventional solar cell and organic solar cell is that absorption of light in the case of IPVs formation of free electron and hole, but in the case of organic solar cell formation of excitons in molecular material called Frenkel excitons. It is a electron hole pair located on the same molecule and move as a unit through the crystal lattice. The mean distance between electron and hole is defined as the radius of the excitons.

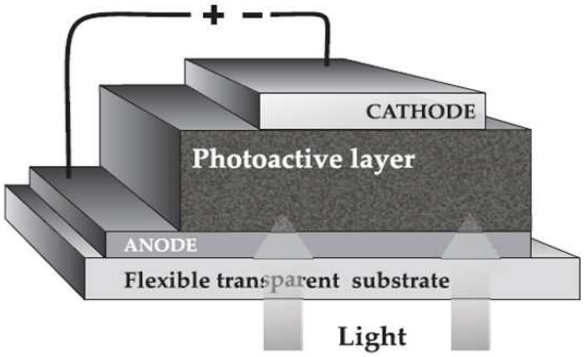


Fig 7: organic solar cell layers

A. Basic process of organic solar cell

:-Absorption of light and generation of excitons
:-Diffusion of excitons to an active interface
:-Charge separation
:-Charge transport
:-Charge collection

The substrate material of OPV device must have optical transparency quality so that light reach the photo active layer .

Research area is in lifetime operating though it has to work in intense sunlight.

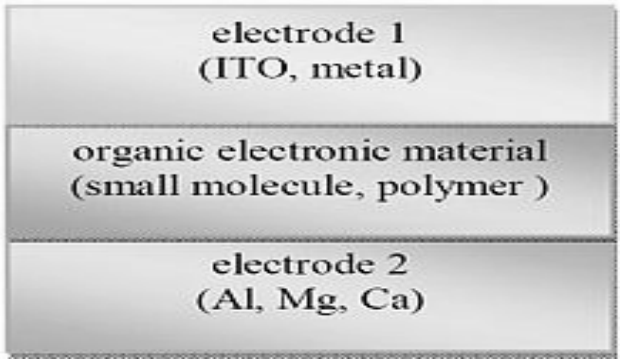


Fig 8: Single layer OPV cell

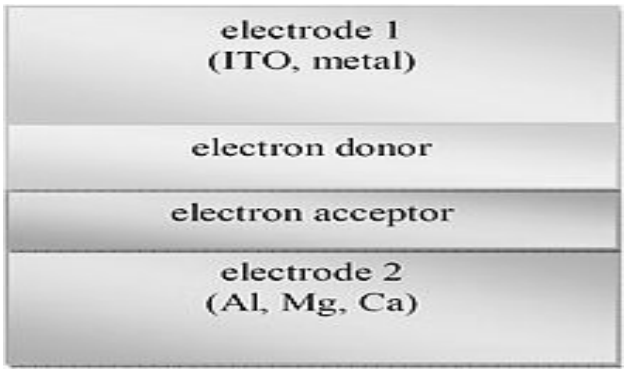
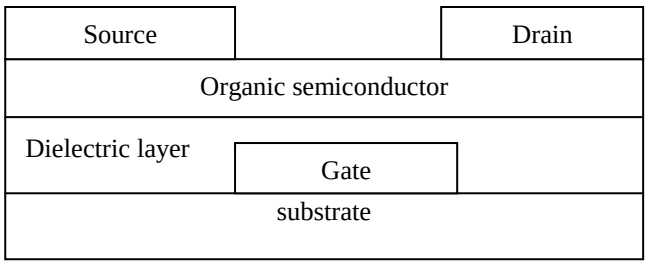


Fig 9: Multilayer OPV cell

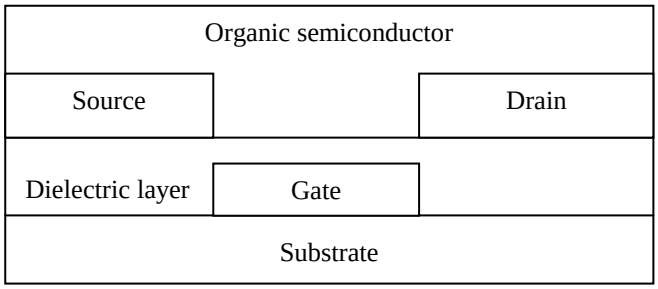
V. ORGANIC THIN FILM TRANSISTER (OTFTs)

A transistor is refer as organic if the semiconductor layer is made up of organic molecules or polymer, in-fact all the components are potentially be replaced by organic material. An OTFT is a three terminal device. Source, drain, and gate electrodes are the three main components of the OTFT with a dielectric layer and the active semiconductor layer. OFET is biodegradable electronics. The device are classified into two types.

1. *Top contact*



2. *Bottom contact:*



The voltage applied at the gate electrode controls the current flow between source and drain electrode. The device can be optimized by minimizing the channel length and maximizing the mobility of the organic semiconductor. The first organic

transistor 1986 made of organic molecules (polymers) rather than silicon for their active metal.

A. Organic transistor consist of four elements:

:-An electrically conductive material
:-An insulating material
:-A semiconductor material and
:-A carrier substrate

Research area is in role of defects, stress effects ,long time scale relaxation effects.

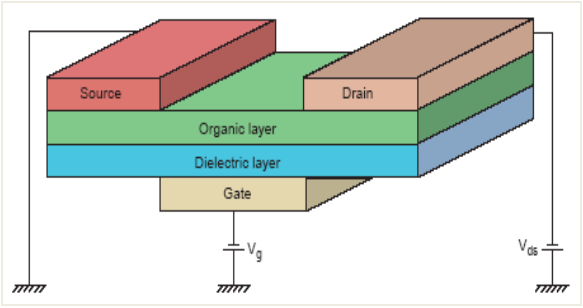


Fig 10: OTFT layers

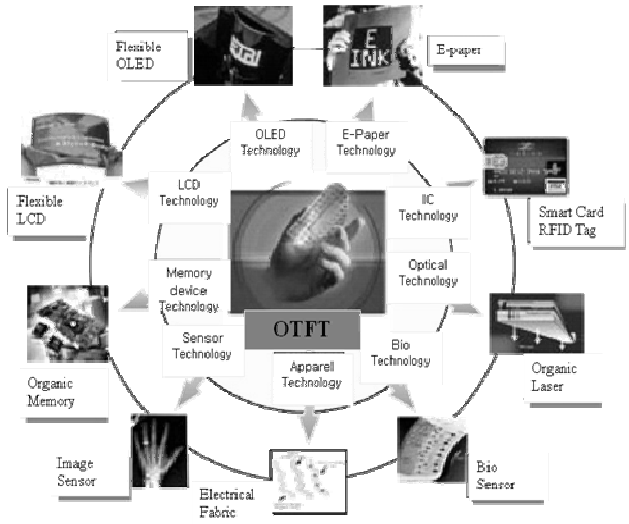


Fig 11: application area of OTFT

VI. ORGANIC LIGHT EMITTING DIODES

OLEDs is a flat light emitting technology. OLEDs are fabricated from one or more layers of organic and hybrid materials(either small molecules or polymer) which is in between two electrodes (eg. Indium-Tin-Oxide). Unlike other display technology which require a backlight to display OLEDS generate their own light via electroluminescence and therefore they do not require backlight. They require less power and more energy efficient than backlight dependent display. LCD or silicon based FETs use crystalline inorganic semiconductor as the active electronic material. Therefore inorganic semiconductor material are inflexible. On the other hand organic devices made of polycrystalline or amorphous material, as a result they are flexible. In polymer LEDs the use of PPV derivatives is electron transport and emitting layer. But in the case of organic LEDs Alq3 is act as electron transport and emitting layer.

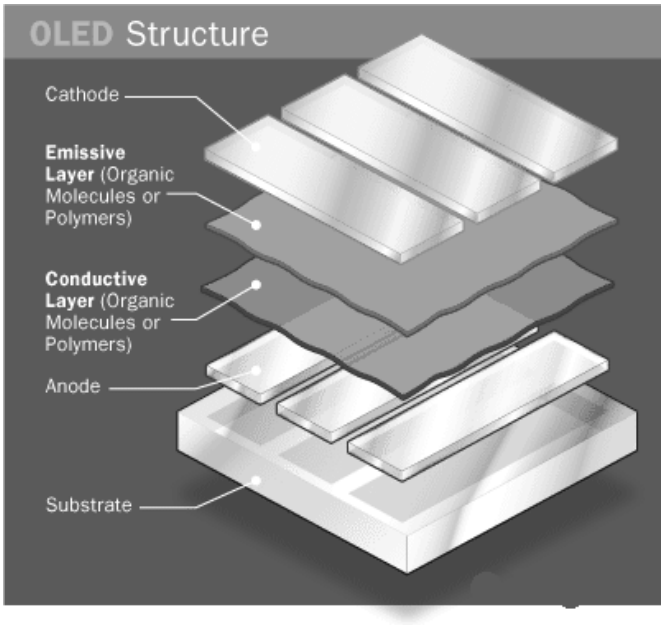


Fig 12: different layers of OLED structure

A. OLED vs LCD

:-Power consumption is low
:-Better contrast
:-Brightness is very high with fuller viewing angle
:-Ultra-thin, flexible and transparent displays
:-OLED operates and can withstand high temperature range
:-Lighter weight so the screen is thinner and can be printed on flexible surface

B. How OLEDs work:

Unlike lighting source such as incandescent bulbs, that generate light by passing electricity through the wire, or fluorescent lamps in which current pass through gas, same in OLED current passes through one or more thin layer of organic semi-conductive layers. These layers are sandwiched between positively charged transparent layer of indium tin oxide and negatively charged layer of aluminum. When aluminum layer is provided current it conduct to positive layer through organic film. The film emits light. The whole sandwich is contact with glass sheet. Different color is emitted by using different material. The OLED display works in two architecture. Active matrix (AM) and passive matrix (PV) display Research area is in to design and fabricate OLED with white light emission.

VII. CONCLUSION

The main theme of this paper is to introduce the new generation technology to the reader. The field of organic electronic devices will continue to grow changing the way society interacts with technology. Over the past decade several aspects of organic electronics research have progressed. The speed of progress is continued. Organic electronics may be able to open up an entirely new world that can be hardly forecast in detail at this point. Organic electronics becomes latest and fascinating technology for future electronics.

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