ORGANIC LIGHT EMITTING DIODE TECHNOLOGY IN BRIEF

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Organic Light Emitting Diode (OLED) is any material with light emissive layers made of organic compounds. Organic layers are sandwiched between two conductors (an anode and a cathode) in crossed rows and columns. The resulting matrix of pixels can emit light of different colors when electric current is applied to both conductors.

OLED technology is young but its achievements have been awarded Nobel Prize in 2000. First device with OLED display was performed in 1998. It was car cassette radio. Nowadays such systems can be used in television screens, computer displays, portable system screens such as cell phones and PDAs, advertising, information and indication. An important benefit of OLED displays over traditional liquid crystal displays (LCDs) is that OLEDs do not require a backlight to function. They use less power, so can operate longer on the same charge. Because there is no need for a backlight, an OLED display can be much thinner than an LCD panel.

OLEDs can be categorized into passive-matrix and active-matrix displays. Active-matrix OLEDs (AMOLED) use thin film transistor to switch the individual pixel on or off, and can make higher resolution and larger size displays possible.

According to material classification OLEDs are: small molecules (SM-OLED) or Polymer (PLED). SM-OLED was developed earlier by Kodak Company. But production of small-molecule displays often involves vacuum spraying, which makes the production process more expensive than other techniques. Polymer light-emitting diodes (PLED) are easier in processing. No vacuum is required, and the emissive materials can be applied by inkjet printing. That's why PLED technique is widely used.

Different manufacturing process of OLEDs enables many advantages over flat-panel displays made with LCD technology. OLEDs show a greater range of colors, brightness, and viewing angle than LCDs because OLED pixels directly emit light. OLED pixel colors appear perfectly, even as the viewing angle approaches 90 degrees from normal. OLEDs also have a faster response time than standard LCD screens.

The biggest technical problem for OLEDs is the limited lifetime of the organic materials and expensive price. In addition the intrusion of water

into displays can damage or destroy the organic materials. They can't be used outdoors without waterproof containers or absorbing materials inside the case.

Another great problem: Kodak has licensed its patents to other firms for commercialization, so any company must pay to continue developing.

OLED's unique characteristics allow creating fantastic devices.

Transparent organic light-emitting device (TOLED) emits light in screen plane only and passes over 70% of the light through. As a result back and front side these devices are almost transparent. It can be useful for windshield speedometers or TV- glasses.

Flexible organic light-emitting device (FOLED). The only difference in assembling process is to use flexible bottom layer instead of solid glass. So devices with bent shape can be easily performed on static or flexible surfaces.

Stacked OLED (SOLED) uses a pixel architecture that stacks the red, green, and blue subpixels on top of one another instead of next to one another as is commonly done in CRTs and LCDs. This improves display resolution up to threefold and enhances full-color quality.

Double Emission OLED (DE-OLED) can display signal on the front and backside at the same time. The viewing angle approaches to 360 degrees.

Phosphorescent OLED (PHOLED) uses the principle of electrophosphorescence to convert electrical energy in an OLED into light in a highly efficient manner.

The most interesting ideas of OLED's using can change usual things around us. It opens the door to new applications such as roll-up displays and displays embedded in clothing. Information displays on food package can warn when contents is gone off.

For military needs PHOLED panels can be a perfect lighting unit which can be twisted, pressed or even perforated during transportation. It has no influence on its operability.

For designers it can be interesting to make rolling up curtain-lamp or TOLED windows, transparent during the daytime and emitting light in the evening.