Photonics News 1.14

Focused on LED & Photonics Industry

De Core Group (www.dstlworld.com)

==>Insights :

1. GaN to replace Silicon?

- GaN gives high brightness emissions and intensity when used as opto electronics semiconductors, Benefits of using GaN are: high power efficiency, superior high frequency handling capacity and flexibility to be used alongside various substrates such as Si, sapphire, SiC.

- Major market segments are Power semiconductors (eg. transistor, FET, HEMT, rectifier & diodes) and opto electronics (Laser diodes and LED's).

- Silicon limits the performance of electronic devices at high voltage and high switching frequencies (of C-band and Ku-band); while due to its indirect bandgap, emission of light becomes difficult.

- GaN could make violet and purple LEDs (400nm wavelength) without the use of non linear optical frequency doubling

- Power semiconductor (GaN) market to be worth $1.75 Billion by 2022
Due to the higher cost of GaN, it is currently used in space applications

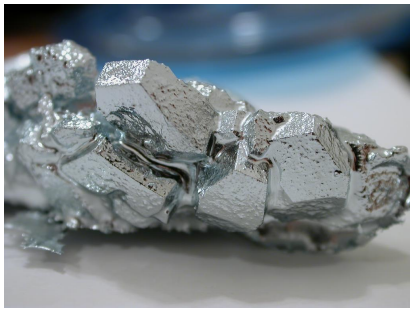

Fig: GaN crystal
(image courtesy: Wikipedia.com)

Fig: Silicon crystal
(image courtesy: Wikipedia.com)

Ref: ***GaN Semiconductor market***

==> Business:

1. The future of OLED?

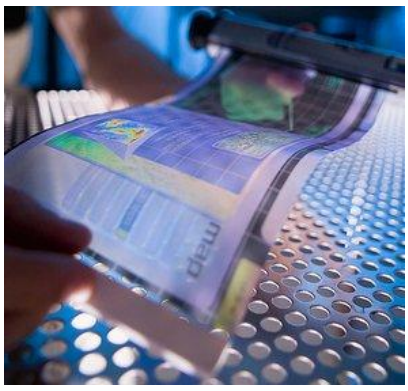

Fig: Flexible display via OLED
(image courtesy: Wikipedia.com)

- Sony and Panasonic end joint venture to develop better manufacturing techniques for OLED displays.
- Competition to superior performing OLED is the old Liquid crystal displays with Ultra high definition alternatives. An OLED basically doesn't require any backlighting, hence we observe pure black on screen, instead of dark grey. OLED cost $8000 and more for current set of models.
- The primary goal of the Sony-Panasonic partnership, which started in June 2012 and ended on Dec. 31, was to outline how to make the technology cost effective. The companies eventually were unable to figure out manufacturing efficiencies or to make the displays more resilient.

Ref: **OLED coverage at Business week.**

2. What is an ESCO model?

- ESCO (the company) installs energy saving equipment at the client company at former's cost (i.e. the ESCO). It would be operated with client's staff and the ESCO will get back the investment through savings in the contract period (say 5 to 8 years).

- Thus the risk of achieving savings to recover the installation charge is to taken by the ESCO. After the contract period, the equipment would be transferred to the client and the saving henceforth.

- **The Challenge:** In some of the ongoing projects, the baseline studies require meticulous attention; in most cases, clients are interested in third party monitoring and verification. In most cases until now the actual energy savings are not at par with the estimations. This has led to mistrust on the ESCO concept for establishment of baseline and subsequent benefit analysis.

Fig: Saving energy and hence money

Ref: **The ESCO concept: Indian scenario.**

==> So how does it work?

Quantum Wells:

1. What are quantum walls?

- Generally diode is made up of P and N Junction. A quantum well (material with smaller band gap) is inserted between P & N junction to increase the efficiency of the device. (by increasing the recombination probability in active region)

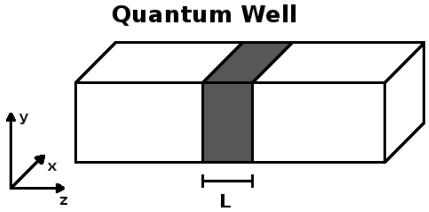

Fig: Quantum Well
(image courtesy: Wikipedia.com)

2. An Example?

For example in GaN (Eg = 3.4 eV) based Light emitting diode, a thin layer of InGaN (Eg = ~2.5 eV) quantum well is inserted between p-type GaN and n-type GaN one or several quantum wells. Which number of quantum wells will give the highest efficiency is yet a matter of research.

Fig: Quantum Corral by Julian Voss-Andreae. Created using the 1993 experimental data by Lutz et al., the gilded sculpture was pictured in a 2009 review of the art exhibition "Quantum Objects" in the journal Nature.
(image courtesy: Wikipedia.com)

2. Applications of quantum walls?

- Quantum wells are in wide use in diode lasers, including red lasers for DVDs and laser pointers, infra-red lasers in fiber optic transmitters, or in blue lasers. They are also used to make HEMTs (High Electron Mobility Transistors), which are used in low-noise electronics. Quantum well infrared photodetectors are also based on quantum wells, and are used for infrared imaging.

Ref: ***Quantum wells wiki page***

Feedbacks and comments are welcomed. Editor: Uttam Pal, can be reached at **upa@dstlworld.com**