

**Influence of laboratory grown new materials (such as GaN) in the future developments of home based electronic devices, high definition (HD) TV's, and high efficiency solar cells.**

Blue-ray, also known as Blue-ray Disc (BD) is the name of a next-generation optical disc format. The format was developed to enable recording, rewriting and playback of high-definition video (HD), as well as storing large amounts of data. While single-layer DVD disks have a capacity of just under 5 Gigabytes (1Gb= 1 thousand million bits or 1GB), HD-DVD offers 15GB and Blu-ray 25GB. Double-layer disks offer twice the capacity which is more than five times the storage capacity of traditional DVDs .

The recent availability of Blue-ray and HD-DVD are essentially developments of high-definition (HD) TV systems that gives super quality pictures with very high image resolution. Current DVD and digital TV image resolutions are typically 720x480 pixels. The high-density DVD (HD-DVD) format is supported by a forum known as DVD Forum, while Blue-ray is an independent format. HD formats of 1280x720 pixels are already available in the market(HDTV) and 1920x1080 pixels are in development. Also the maximum number of color levels per channel is increasing from 8-bit (256) to 10-bit (1024) which gives superfine color resolution and crispy images. Naively, one could see an increasing data rates by a factor of almost about 19 times which made the super high quality HDTV's a success.

Although Blue-light high density optical storage entered the market about 2 years ago, it took more than 10 years of research and development work to develop a commercial laser diode (LD) in which the laboratory grown GaN(Gallium Nitride) material has been used. In a CD or DVD system data is encoded either as a series of pits (read-only) or crystalline/amorphous (read-write) regions, typically on 120mm diameter disks. The high energy laser beam spots or blue laser that makes the spots or grooves by burning the CD/DVD surface, comes from an electronic device made from the composite structure of GaN.

Until now the most promising base material that can be used to produce the high energy blue light is GaN(Gallium Nitride) and some of its composites, which is not available in nature but is to be grown in the high tech laboratories by very highly skilled growth engineers.

GaN or the composite GaInN(Indium Gallium Nitride) devices are not restricted to the narrow needs of optical storage devices. The laser range covering

blue–green to near-ultraviolet rays have applications in medicine, biotech analysis, full-color displays and so many. Shorter-wavelengths (UV) have biological applications such as medical sterilization, food processing and treatment of skin conditions such as psoriasis (for which the optimum wavelength is 311 nm). The very recent and important applications of blue lasers are in the eye surgery field, and high efficiency solar cells.

GaN is a classic example how a laboratory made material can change the face of future technology. Recent developments suggest that high efficiency solar cells made of InGaN (which is a composite of GaN and Indium) may change the total energy supply picture for the entire world and speed up the process of achieving the dream of “Green Energy” revolution.