② Aluminium nitride deep ultraviolet light-emitting diodes

- The shortest wavelength among semiconductors -

Motivation

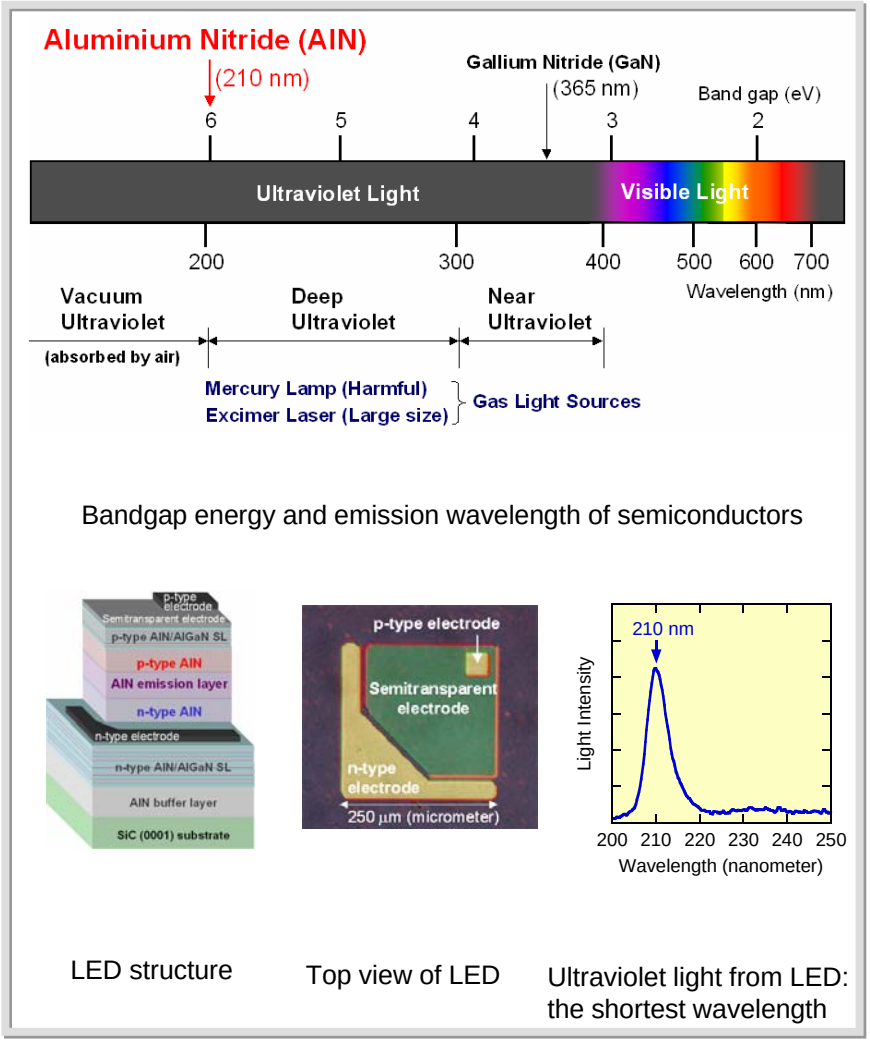
Aluminum nitride (AlN) is a direct-bandgap semiconductor with a bandgap energy of 6 eV, the largest among semiconductors. It has been theoretically predicted that an AlN light-emitting device would emit ultraviolet light. However, the high density of crystalline defects and impurities in AlN had prevented p-type and n-type doping, without which AlN light-emitting devices can be achieved.

Originality

We have developed technologies for fabricating high-purity AlN crystals and have succeeded in p-type and n-type doping for the first time. We fabricated an AlN light-emitting diode (LED) and observed deep-ultraviolet light with a 210-nm wavelength. This is the shortest wavelength ever emitted from any semiconductor.

Impact

Deep-ultraviolet light sources available at present are only gas type, such as mercury lamps or excimer lasers. AlN LEDs will replace these large and toxic gas light sources with compact and harmless semiconductor light sources. Because light with a shorter wavelength has a higher energy, the AlN LEDs can be applied as light sources for decomposing very stable, toxic chemical substances, such as dioxin and polychlorinated biphenyls (PCBs), which cause serious environmental problems all over the world.



Contact person: Dr. Yoshitaka Taniyasu and Dr. Makoto Kasu
Materials Science Laboratory, NTT Basic Research Laboratories
TEL: 046-240-3497 FAX: 046-240-4729
e-mail: taniyasu@will.brl.ntt.co.jp