First diamond UV emitter

The Frontier Technology Laboratory (Yokohama, Japan) of the Corporate R&D Department of Tokyo Gas Co Ltd has developed the first diamond UV light emitting device (*Jpn. J. Appl.Phys.* **39** (15 June 2000) L604-6).

Room-temperature operation by current-injection is at 235 nm, the shortest wavelength reported to date. This could potentially increase optical storage density and capacity to 10 times that of red 650 nm AlGaAs laser currently used in DVDs and four times next-generation 400 nm GaN blue lasers (e.g. 4.5 hours of high-density TV per DVD), as well as efficiently irradiating fluorescent illuminating materials.

Grains of diamond are synthesised from isotopically pure (^{12}C) carbon powder (refined from "lower-value-added" liquefied natural gas - mainly methane) under high-pressure (about 50,000 atmospheres) and temperature (1,500°C). A solvent-catalyst was used to reduce impurities (such as nitrogen) and lattice defects and hence increase emission efficiency compared to previous current-injected emission of semiconducting diamond (which yielded only longer wavelengths).

Unlike conventional semiconductors, the emission is intrinsic through an intermediate state due to free excitons (an electron-hole pair bound by the Coulomb force and in a stable energy state - even at room temperature in FTL's diamond). The ^{12}C diamond also has record thermal conductivity.

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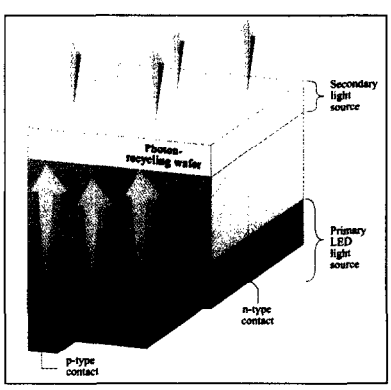
White LED wins Discover award

Fred Schubert, professor of electrical and computer engineering at Boston University's Photonics Center, is among eight winners of the 11th Annual DISCOVER Magazine Awards for Technological Innovation (presented by the Christopher Columbus Fellowship Foundation).

Schubert's Photon Recycling Semiconductor LED uses at least two different-wavelength light-emitting active regions combined to produce white light. Some blue light emitted from InGaN through the sapphire substrate is reabsorbed by a second AlInGaP active region (wafer bonded to the first) which re-emits it in the yellow/orange/red wavelength range. Although experimental efficiency so far is < 10 lumens/Watt, theoretical efficiency is 300 lm/W (vs 280 lm/W for phosphor-based white LEDs). The active regions can also be changed to produce hundreds of different colours. Boston University filed a patent on the PRS-LED in June 1999.



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