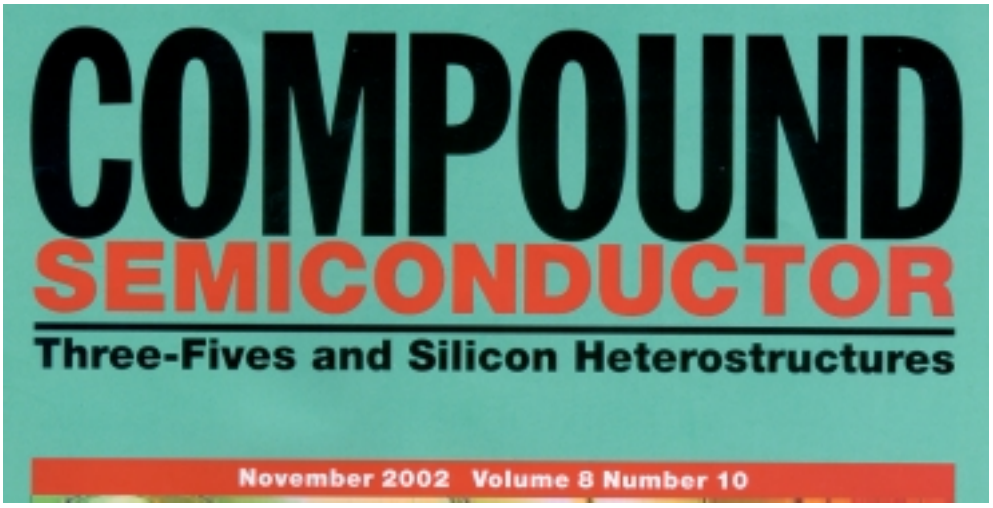

RESEARCH REVIEW

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Growth on GaN improves properties of UV LEDs

Short-wavelength GaN-based UV LEDs require the use of high aluminum mole fraction alloys. This leads to increased strain and cracking, more resistive material, larger piezoelectric fields, and lower overall material quality, when compared with the InGaN-based structures used for longer wavelength LEDs. Free-standing GaN substrates provide a good lattice match for GaN-based LED structures, allowing for the growth of higher quality material. In addition, these substrates provide for significantly better heat dissipation compared with thin GaN films grown on poor thermal conductivity sapphire. In future, the use of GaN and AlN substrates is expected to have a major impact on III-nitride device technology, if the substrates can be provided cheaply and in large quantities (*Compound Semiconductor* July 2002 p45).

Researchers at Northwestern University have made the first reporting of significant improvements to the electrical and optical properties of 340 nm UV LEDs through growth onto free-standing GaN substrates (*Appl. Phys. Lett.* 2002 **81(12)** 2151). The researchers compared the properties of UV LEDs with AlInGaN/AlInGaN MQWs and peak emission at 340 nm, grown on either a free-standing GaN substrate or on sapphire. For the LED grown on a GaN substrate, a differential resistance as low as 13 Ω, and an output power more than one order of magnitude higher than that of the same structure grown on sapphire, was achieved. Due to the higher thermal conductivity of GaN, the output power of the LEDs saturates at higher injection currents compared with the devices grown on sapphire.