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Nitride Semiconductors-Fundamentals and Technology

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Abstract

Considered as a futile exercise only a few decades ago, nitride semiconductor technology now represents the largest semiconductor sector after Si. Applications encompass optical emitters and detectors on the optoelectronics side, and RF and switching high power devices, mainly field effect transistors (FETs) on the electronics side. On the optoelectronics front light emitting diodes are poised to have the largest impact as they went from display devices to sources of illumination for general lighting, among others, in addition to very successful developments laser and solar bling detector technologies.

The white light generating LED power conversion efficiency is over 65% already while 6 inch Si substrate technology is employed for cost reduction. On the power switching electronics side, GaN technology holds the promise for the lowest on resistance among its competitors with hold voltages of over 1 kV and on currents of over 100 A having been achieved already. On the RF end, record power levels have already been obtained in the communication and X band applications.

In this presentation, after a discussion of bulk and epitaxial technologies, challenging problems in LEDs and FETs will be elaborated on.