Halbleiter-Nanophotonik

SFB 787

Einladung

Es spricht: **Dr. Leo J. Schowalter**
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Thema: "Growth of Single-Crystal Aluminum Nitride as Substrates for Pseudomorphic UVC LEDs"

Abstract:
Ultraviolet light-emitting diodes, designed to emit at wavelengths shorter than 280nm, (UV-C LED) are effective disinfectants without relying upon hazardous chemicals or mercury lamps. They also have application in a number of instrumentation applications where they are used as sources for fluorescence or absorption spectroscopy. These diodes have several distinct advantages such as small size, instant turn-on ability, ruggedness, lifetime, and safety over alternate UV-C sources such as mercury, deuterium and xenon lamps. Crystal IS has achieved improved performance of UV-C LEDs at shorter wavelengths by using high quality epitaxial nitride layers on AlN wafers with low UV absorption.

In addition, the development of low dislocation density pseudomorphic active layers grown on suitably prepared wafers has also been important in achieving better performance at short wavelengths. By this technique, dislocation densities lower than 10^5 cm^{-2} in the active device region are achieved. The low dislocation density also leads to long operating lifetimes for the devices even at high current operation. This approach has been used in the recently released Optan LED products (with wavelengths between 250 and 280nm) which represent the first commercial products based on AlN substrates.

The intrinsic bandgap of AlN is approximately 210 nm. Thus, it is possible to fabricate UV-C LEDs with wavelengths significantly shorter than 255 nm by reducing the GaN fraction in the epitaxial layers. Because the lattice match between AlN and $Al_{1-x}Ga_xN$ improves as x gets smaller, pseudomorphic layer thickness is increased and epitaxial layer quality can be improved for device designs for shorter wavelengths. We have demonstrated low sheet resistances for Si-doped $Al_{1-x}Ga_xN$ layers where x≥80% and have achieved LEDs with powers exceeding 1mW at 240nm and 0.5mW at 235nm when operated at 100mA current.

Gäste sind herzlich willkommen!

Prof. M. Kneissl und Dr. T. Wernicke