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Far-UVC LEDs for skin-tolerant inactivation of pathogens

FBH and TU Berlin have developed AlGaInN-based light-emitting diodes (LEDs) and corresponding irradiation systems for the far-UVC spectral range. Systems with emission wavelength around 233 nm are used to fight pathogens, particularly multidrug-resistant organisms (MDRO). Unlike long wavelength UVC radiation, as emitted by mercury vapor lamps, the light of these LEDs penetrates only a few micrometers into the skin and hardly reaches the deeper layers of living cells. It is therefore to be expected that the skin with its natural repair mechanisms remains almost undamaged. MDRO could thus be inactivated directly on the human body without lasting side effects.

Specifications of the LEDs

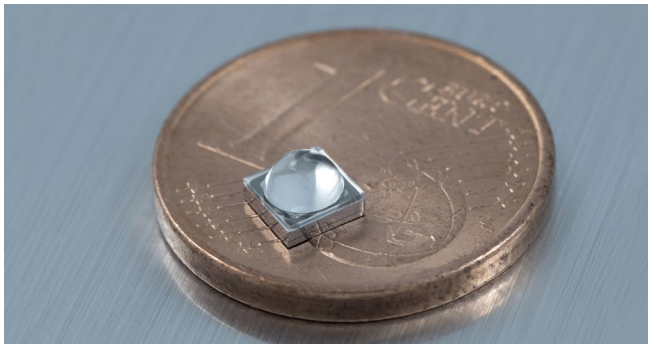
- wavelength: ~233 nm
- optical output power: >3 mW at 200 mA
- various packages: silicon-based with monolithically integrated ESD protection, ceramic AlN, beam shaping

Specifications of the irradiation system

- comprising an array of 120 LEDs on an area of 8 cm x 8 cm
- filter for suppression of any UVC radiation at >240 nm
- maximum irradiance of 0.4 mW/cm^2 at 50 mm distance
- more than 90 % uniformity over a circular area of 71 mm diameter

Application

- skin-tolerant inactivation of pathogens (UV antisepsis)



Far-UVC LED emitting at 233 nm mounted in CiS Si-package with plano-convex quartz lens.

Prototype of the far-UVC LED irradiation system to fight multidrug resistant pathogens.

Advantages

- far-UVC radiation as an antibiotics alternative to avoid the development of resistances
- advantages of far-UVC LEDs over excimer lamps:
  - small-sized for use in endoscopes
  - low voltage ensuring safety
  - adjustable wavelengths for optimal effects

Profile

The Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH) researches electronic and optical components, modules and systems based on compound semiconductors. In the field of III-V electronics, it manufactures high-frequency devices and circuits for communications, power electronics, and sensor technology. Moreover, FBH develops light sources from the visible to the UV spectral range: high-power diode lasers, UV light sources, and hybrid laser systems. Applications range from medical technology, materials processing and sensors to optical communications in space and integrated quantum technology. In close cooperation with industry, its research results lead to cutting-edge products.

The institute is a member of the Leibniz Association and part of Research Fab Microelectronics Germany (FMD).