



Implantable Light Irradiation Device For Photodynamic Therapy

Tech ID: 33478 / UC Case 2023-893-0

BACKGROUND

Photodynamic therapy (PDT) is a light therapy that has proven to be an effective cancer treatment. PDT utilizes the properties of photosensitizers that accumulate in lesions in human bodies to administer a photosensitizer of its precursor to the living body, irradiate the photosensitizer with light, and selectively destroy abnormal tissue in the lesion, using reactive oxygen species generated in the tissue. In recent years, PDT has been widely used in the treatment of tumorous lesions in the field of dermatology, and there have been many studies attempting clinical applications in lung cancer, esophageal cancer, gastric cancer, colorectal cancer, malignant brain tumors, and more. Tumor-selective treatment is possible when light can be directed only to the tumor, and PDT therefore spares patients from many of the adverse effects associated with chemotherapy, radiation, and surgery. Since optical devices such as fiber optics, which directly irradiate the cancer tissues, are used in PDT, the clinical applications of PDT have been limited to specified cancers, including skin cancers, cancers in the upper aerodigestive tract, and brain tumors. Although PDT for tumors in deeply located organs is possible in principle, it has not been clinically applicable. This can be because the procedure involves surgical invasion, such as laparotomy, and because of concerns about complications such as organ damage and postoperative adhesion due to the high irradiation intensity (> 100 mW/cm2) used in conventional PDT. A new modality of PDT for treating tumors in deeply located organs is therefore needed.

DESCRIPTION

Researchers at the University of California, Santa Barbara have created a novel light irradiation device to provide PDT. This device is implanted in the human body to enable multiple and semi-permanent PDT using a wireless power supply device, which is characterized by having a light source unit with one or more LED elements each having a peak wavelength in the wavelength range of 400 nm to 420 nm, 500 nm to 520 nm, and 625 nm to 645 nm, arranged on a flexible substrate, and containing a power receiving coil for wireless power supply. The device was designed to provide PDT with 5-aminolevulinic acid (ALA-PDT) in patients with malignant tumors. 5-aminoevulinic acid, which is used in the worldwide popular photodynamic diagnosis, has no serious side effects. Currently, pancreatic cancer and glioblastoma, a malignant brain tumor, have the poorest prognoses among malignant tumors, with an average survival of less than 2 years. These tumors are lethal even with standard therapies such as surgery, chemotherapy, and radiotherapy, and new treatment methods are needed. Research suggests that ALA-PDT is useful not only for these tumors but also for tumors of other organs, and ALA-PDT has already been clinically applied to treat skin cancer. Therefore, this device can be a treatment for pancreatic cancer, glioblastoma, and tumors that occur in deeply located organs.

ADVANTAGES

- ▶ Offers expanded opportunity for treatment of malignant tumors
- ▶ Allows for the treatment of deeply located tumors
- ▶ Offers uniform illuminance even to a tumor surface having irregular shape
- ▶ Enables multiple and semi-permanent PDT

APPLICATIONS

- ▶ Cancer treatment

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
- ▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation

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OTHER INFORMATION

KEYWORDS

photodynamic therapy, PDT,

cancer treatment, light

irradiation, tumor treatment,

fiber optics

CATEGORIZED AS

- ▶ **Medical**
- ▶ Devices
- ▶ Disease: Cancer

RELATED CASES

2023-893-0

- ▶ Eliminating Misfit Dislocations with In-Situ Compliant Substrate Formation
- ▶ III-Nitride-Based Vertical Cavity Surface Emitting Laser (VCSEL) with a Dielectric P-Side Lens
- ▶ Aluminum-cladding-free Nonpolar III-Nitride LEDs and LDs
- ▶ Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-183)
- ▶ Low Temperature Deposition of Magnesium Doped Nitride Films
- ▶ Transparent Mirrorless (TML) LEDs
- ▶ Improved GaN Substrates Prepared with Ammonothermal Growth
- ▶ Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- ▶ Method for Enhancing Growth of Semipolar Nitride Devices
- ▶ Ultraviolet Laser Diode on Nano-Porous AlGa_N template
- ▶ Growth of Polyhedron-Shaped Gallium Nitride Bulk Crystals
- ▶ Nonpolar III-Nitride LEDs With Long Wavelength Emission
- ▶ Improved Fabrication of Nonpolar InGa_N Thin Films, Heterostructures, and Devices
- ▶ Growth of High-Quality, Thick, Non-Polar M-Plane Ga_N Films
- ▶ High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices
- ▶ Method for Growing High-Quality Group III-Nitride Crystals
- ▶ Controlled Photoelectrochemical (PEC) Etching by Modification of Local Electrochemical Potential of Semiconductor Structure
- ▶ Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
- ▶ MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- ▶ Methods for Fabricating III-Nitride Tunnel Junction Devices
- ▶ Low-Droop LED Structure on Ga_N Semi-polar Substrates
- ▶ Contact Architectures for Tunnel Junction Devices
- ▶ Semi-polar LED/LD Devices on Relaxed Template with Misfit Dislocation at Hetero-interface
- ▶ Semipolar-Based Yellow, Green, Blue LEDs with Improved Performance
- ▶ III-Nitride-Based Devices Grown On Thin Template On Thermally Decomposed Material
- ▶ Growth of Semipolar III-V Nitride Films with Lower Defect Density
- ▶ III-Nitride Tunnel Junction LED with High Wall Plug Efficiency
- ▶ Tunable White Light Based on Polarization-Sensitive LEDs
- ▶ Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar Ga_N
- ▶ Growth of High-Performance M-plane Ga_N Optical Devices
- ▶ Packaging Technique for the Fabrication of Polarized Light Emitting Diodes
- ▶ Improved Anisotropic Strain Control in Semipolar Nitride Devices
- ▶ Novel Multilayer Structure for High-Efficiency UV and Far-UV Light-Emitting Devices
- ▶ III-V Nitride Device Structures on Patterned Substrates
- ▶ Method for Increasing Ga_N Substrate Area in Nitride Devices
- ▶ High-Intensity Solid State White Laser Diode
- ▶ Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
- ▶ Ga_N-Based Thermoelectric Device for Micro-Power Generation
- ▶ Limiting Strain-Relaxation in III-Nitride Heterostructures by Substrate Patterning
- ▶ LED Device Structures with Minimized Light Re-Absorption
- ▶ Growth of Planar Semi-Polar Gallium Nitride
- ▶ High-Efficiency and High-Power III-Nitride Devices Grown on or Above a Strain Relaxed Template
- ▶ UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlIn_N and AlInGa_N Alloys
- ▶ III-Nitride Based VCSEL with Curved Mirror on P-Side of the Aperture
- ▶ Enhancing Growth of Semipolar (Al,In,Ga,B)_N Films via MOCVD

