Integrated, Miniaturized Fiber Optic Probe for Light-Based Diagnostics

View U.S. Patent No. 8,369,915 in PDF format.

WARF: P09149US

Inventors: Thomas Kuech, Nirmala Ramanujam, Leon McCaughan

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an integrated fiber optic probe for light-based diagnosis of tissue changes, including the development of cancerous or precancerous conditions.

Overview

Light-based diagnostics are used to create images of human tissue to detect the development of diseases like cancer. The popularity of light-based diagnostics is growing due to their non-intrusive nature and potentially rapid implementation with existing techniques.

One major absorber of light in tissue is hemoglobin, which shows distinctive absorbance characteristics depending on its concentration and oxygenation. Light scattering in tissue is sensitive to the size, density and refractive indices of cellular structures such as nuclei and mitochondria. Therefore, diffuse reflectance spectroscopy, which measures absorption and scattering of tissues, can quantify changes in oxygenation, blood volume and cellular density and morphology.

However, existing light sources and detectors are bulky and expensive, which limits the implementation of this spectroscopy technique. Furthermore, a spectrometer typically is utilized in the acquisition and dispersion of the emitted light, adding substantial cost and complexity to the system. A need exists for compact, inexpensive and integrated light sources and spectrometers.

The Invention

UW–Madison and Duke University researchers have developed an integrated fiber optic probe that allows for *in vivo* sensing of biochemical and morphological changes in local tissue. The probe replaces a spectrometer by bonding thin, flexible photodetector elements directly to the fiber probe tip, which makes local detection of light feasible. The fiber is processed further to incorporate a mutual ground plane, an insulator and metal lines for transmitting the detected signal. The structure may be constructed to be compact enough to fit within the shaft of a needle, allowing probing of tissue without the need for biopsy. By directly integrating photodetectors with an optical fiber, the probe provides a compact structure that can be placed in close proximity to a sample to increase throughput and decrease cost, making it practical for clinical use.

Applications

- Monitoring of tissue oxygenation and blood loss
- Detecting pre-cancerous and cancerous conditions
- Assessing intra-operative tumor margin
- Evaluating tumor response to cancer therapy

Key Benefits

- Decreases cost of implementing spectroscopy diagnostic techniques
- Replaces bulky light sources and spectrometers with compact, unified design

We use cookies on this site to enhance your experience and improve our marketing efforts. By continuing to browse without changing your browser settings to block or delete cookies, you agree to the storing of cookies and related technologies on your device. See our privacy policy

OK

- Allows for combination of integrated fiber optic probe and biopsy needle

Additional Information

For More Information About the Inventors

- Thomas Kuech

Related Technologies

- For more information about fabricating electro-optic elements through thin-film materials integration, see WARF reference number P02184US.

Tech Fields

- Medical Devices : Diagnostics & monitoring tools
- Medical Imaging : Other diagnostic imaging

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846

We use cookies on this site to enhance your experience and improve our marketing efforts. By continuing to browse without changing your browser settings to block or delete cookies, you agree to the storing of cookies and related technologies on your device. See our privacy policy

OK