A Nano-scintillator fiber optic dosimeter device for accurately measuring radiation during brachytherapy

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Publication(s)

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External Link(s)

• From the lab of Dr. Michael Therien

Value Proposition

Two-thirds of all cancer patients receive radiation therapy. However, their radiation dose safety is not currently assured in the clinic. Medically relevant estimations of patient radiation doses received for a specific form of treatment are made presently using cadavers or tissue phantoms. Radiation therapy is delivered using commercial planning software and any patient or radiation source movement can cause significant dose variations to the target tissue. The direct measurement of radiation dose could alleviate these issues, but the current scintillators display many inconvenient characteristics, such as requiring large spatial dimensions, a dependence on cryogenic cooling, high limits of detection, or sensing elements that are hygroscopic.

Technology

Duke's new technology has the potential to revolutionize our understanding of the tissue-specific doses of radiation received by the patients for any given diagnostic or therapeutic procedure. The Nano-scintillator Fiber Optic Dosimeter (nano-FOD) offers the ability to pinpoint accurate radiation detection in an inexpensive and durable detector. The detector offers a versatile platform with the potential for use in many applications, such as monitoring tissue dosing and human exposures. The nano-scintillator exhibits a linear luminescent emission response to stimulating electromagnetic radiation (<100nm) and a sensor then detects the emitted light. The light data is then processed and compared to the calibrated data dose/energy data to determine radiation dose information. The nano-FOD has been clinically demonstrated for real time dosimetry for gynecologic brachytherapy, yet these detectors have a wide-range of applications including Positron Emission Tomography (PET), CT imaging, homeland security inspections, and personal detectors.

Advantages

- Easily calibrated allowing for accurate real-time dosimeter data
- Low limit of detection with high resolution
- Adaptable sensor for many platforms
- Reduced costs