An Endoscopic Device for Spectroscopic Detection of Cancerous Cells and Tissues

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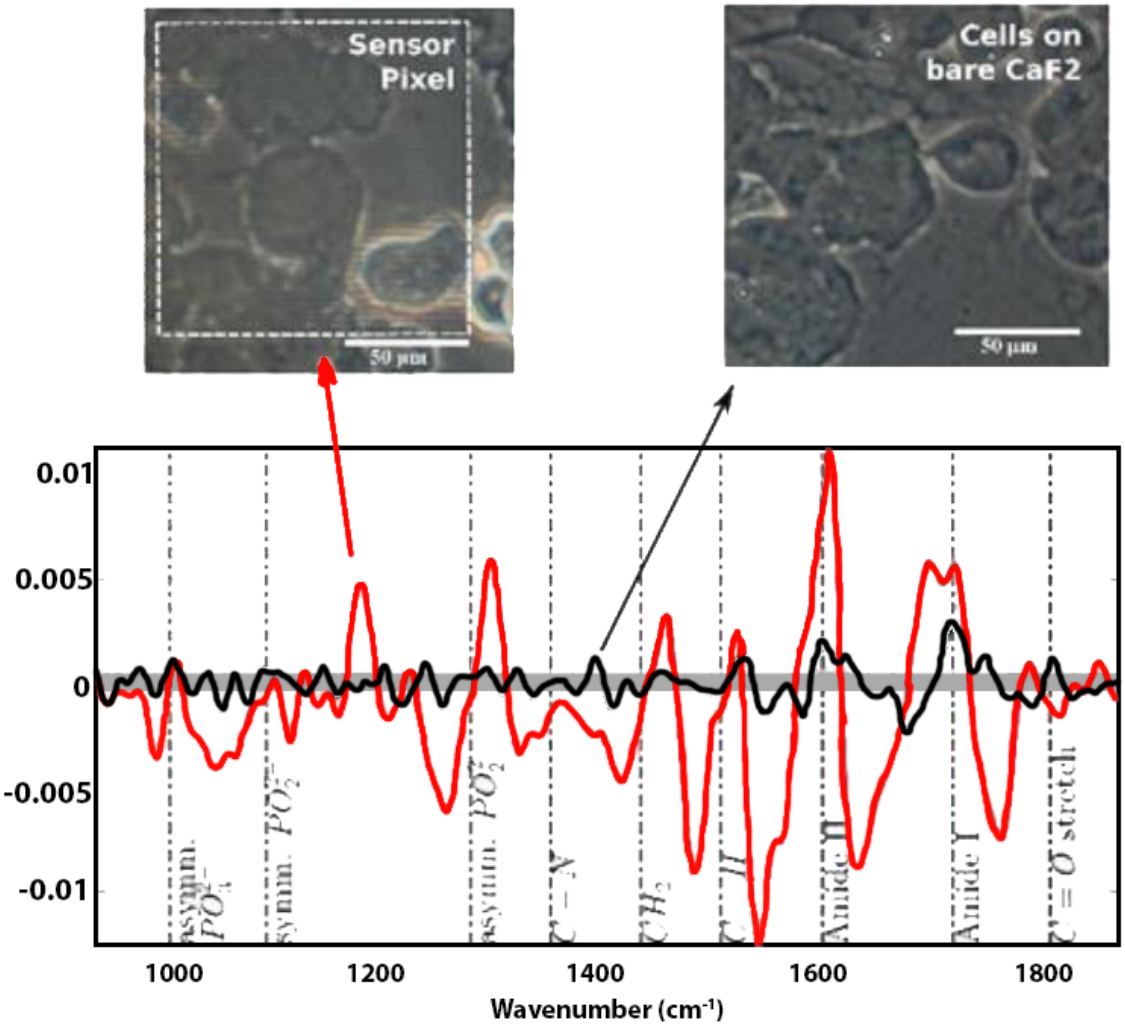
Technology description

The invention describes an optical tool for in-vivo identification of tumors and accurate determination of tumor margins during oncological surgeries.

Technology Overview

Our approach involves using an IR-transparent chalcogenide optical fiber with a tip decorated with a plasmonic nanostructure. The infrared light transmitted through the fiber is deliver directly to the tissue to be analyzed. The light is then reflected from the tissue that is in contact with fiber tip and back into the fiber to a detector for analysis. The spectral characteristics of the reflected light allows the doctor or surgeon to distinguish whether normal, pre-cancerous, or cancerous cells are in contact with the fiber’ s tip.



We have addressed a number of the challenges associated with spectroscopic methods of in-situ identification of cancerous cells. Our method, termed Metasurface Enhanced Infrared Reflection Spectroscopy (MEIRS), exploits plasmonic structures fabricated on the end of the fiber optic probe. This technique allows for a narrow optical field (10-50nm) that permits analysis of the portion of the cell, the cell membrane, which exhibits chemical signatures indicative of cancer. Inclusion of the plasmonic structures on the tip of the fiber enhances the signal by several orders of magnitude, allowing IR identification of cells.

Keywords: Physical Sciences, Engineering, Materials, Ceramic & Glass, Nanotechnology, Nanoapplications, Nanofibers, Optics & Photonics, Device Manufacturing, Fiber Optics, Lasers, Measurement, Spectroscopy, IR Spectrum, mid-IR Spectrum, Chalcogenide, Life Sciences, Biotech Research & Production Tools, Cancer, Medical Devices, Medical Diagnostics (in Vitro) , Point of care specific tests

Additional Information

Publications

S. Gupta, G. Kelp, N. Arju, S. Emelianov, G. Shvets; "Metasurface-enhanced infrared spectroscopy: From protein detection to ceils differentiation." CLEO/Europe-EQEC, 2017 Conference on Lasers and Electro-Optics Europe & European Quantum Electronics Conference; Oct 2017. http://ieeexplore.ieee.org/document/8086872/?part=1

Application area

Evaluation of surgical site to determine if additional peripheral cells are cancerous
In-situ diagnosis tool to identifying if a mass is malignant or benign

Advantages

Allows in-situ/in-vivo analysis of cells
Orders of magnitude enhancement in sensitivity
Rapid analysis of cells and tissue

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