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Abstract

Fiber Optic Sensor for Detecting Neoplastic Lesions in Biological Tissues—A Preliminary Study †

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Abstract: Tissues affected by neoplastic lesions differ from healthy tissues in terms of functionality and anatomy. These changes affect light's propagation in tissue by modifying the refractive index, and scattering and absorption coefficients. The primary purpose of this research was to create a system to detect local changes in the refractive index using a fiber optic sensor. A prototype of a micromachine for biomedical applications has been developed. The measurements were performed using the low-coherence interferometry method, i.e., a measurement technique based on the interference of light waves from a broadband light source. The constructed optical system uses a light source with a central wavelength of 1550 nm, a spectrum analyzer, a fiber optic sensor operating on the basis of a Fabry–Perot interferometer and a silver mirror acting as a reflective layer. Measurements of the interference spectrum of reference oils, used for calibration due to the high stability of their parameters, were performed. It has been shown that the developed fiber optic sensor is able to detect changes in the refractive index based on a shift in the position of the central peak in the interference spectrum. It is also sensitive to changes of the absorption coefficient.

Keywords: fiber optic sensors; Fabry–Perot interferometer; refractive index; neoplastic lesions

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