

ANALYTICAL INVESTIGATION OF HIGHLY SENSITIVE FIBER OPTIC BIOSENSOR FOR THE EARLY DETECTION CORTISOL BIOMARKER: A WAVE THEORY-BASED APPROACH

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Quantifying cortisol levels as a stress biomarker is crucial in several medical illnesses linked to an elevated susceptibility to metabolic syndromes, including nervousness and heart diseases, among others. In this paper, an analytical study of a multilayered SPR-based fiber optic biosensor utilizing wave theory and Gaussian beam as a source is proposed for the early diagnosis of cortisol biomarker. The sensor achieved a sensitivity of 8324.61 nm/RIU and 57492.66 dB/RIU, with a resolution of 1.74×10^{-7} for the concentration range of cortisol biomarker of 0–1 ng/mL. Consequently, the proposed method, which employs optical quantification to detect stress biomarker like cortisol at a lower concentration, can aid in the improvement of early diagnosis psychological stress.