

Fiber Optic Sensor for HCG Detection



AI Overview

Fiber optic sensors can detect hCG by measuring changes in optical properties, using tapered fibers or photonic crystal fibers enhanced with nanoparticles or interferometric techniques.

Tapered Optical Fiber Biosensors Tapered optical fibers decorated with gold nanoparticles (Au-NPs) are widely used for hCG detection. The fiber is stretched to a diameter of around 3–3.5 μm using a flame-brushing technique, creating a narrow waist where the evanescent field is amplified. Gold nanoparticles are deposited on the taper via photodeposition using a laser source (typically 1535–1550 nm). When hCG is present in a sample, it interacts with the nanoparticles, causing measurable changes in optical power or spectral shift. Detection ranges can cover 1 mIU/mL to 100,000 mIU/mL, with limits of detection as low as 0.03–0.04 mIU/mL in water or urine, demonstrating high sensitivity and specificity without requiring additional bioreceptors (antigens) for recognition.

Photonic Crystal Fiber-Based Interferometric Sensors Another approach uses photonic crystal fibers (PCF) integrated into a Mach-Zehnder interferometer (MZI). Sections of PCF are collapsed and spliced with single-mode fibers to create high-sensitivity regions. The presence of hCG in urine alters the refractive index and absorption, which changes the intensity and phase of the transmitted laser light. Sensitivity depends on the PCF length, with longer fibers (e.g., 1.5 cm) providing higher sensitivity. This method allows quantitative detection of pregnancy hormones and can be adapted for other biomedical assays.

Advantages and Applications High sensitivity and specificity: Both tapered fiber and PCF sensors can detect clinically relevant hCG concentrations. Rapid and label-free detection: Optical changes are measured directly without chemical labeling. Versatility: Can be applied to water, urine, or other biological fluids. Biomedical and industrial potential: Useful for early pregnancy tests, cancer biomarker detection, and research on hormone levels.

Summary Fiber optic sensors...

Article Content

Integrated Fiber Optic FPI-MMI Sensor for Simultaneous Temperature

A dual-parameter optical fiber sensor for pH and temperature suitable for estuarine acidic environments is proposed. The sensor adopts a cascaded structure of tapered fiber and hollow fiber (HCF) to

Quantification of hCG Hormone Using Tapered Optical Fiber

In this study, a novel technique for the quantification of the human chorionic gonadotropin (hCG) hormone using localized surface plasmons and a tapered optical fiber decorated with gold

Mapping the MilTech War: Eight Lessons from

This report maps out the evolution of key technologies that have emerged or developed in the last 4 years of the war in Ukraine. Its goal is to

FiberCop and Nokia test fibre sensing tech

FiberCop and Nokia test fibre sensing tech A Memorandum of Understanding will see Nokia and Italian network operator FiberCop test the use of optical fibre as a distributed sensor, for things

Biosensor for human chorionic gonadotropin detection

Accurate detection of hCG hormone in this range is relevant for the early identification and monitoring of these diseases. Therefore, developing

Fibra, FiberCop and Nokia are testing infrastructure that acts as a sensor

Fibra, FiberCop and Nokia are testing infrastructure that acts as a sensor Memorandum of Understanding signed to trial fibre sensing: optical fibre not only transmits data, but can also detect

Tapered Side-Polished Microfibre Sensor for High Sensitivity hCG

Abstract: A high sensitivity human chorionic gonadotropin (hCG) detection was conducted by a tapered side-polished (TSP) optical fiber sensor. Experimentally, the TSP fiber sensor was

Dual-Mode Optical Fiber Sensor with Polydopamine ...

In this paper, a microfluidic sensor based on suspended core fiber (SCF) for detecting the concentration of human chorionic gonadotropin (hCG) has been presented and experimentally...

Quantification of hCG Hormone Using Tapered Optical

Quantification and detection systems, especially those based on optical fiber, are gaining significant importance in hCG hormone detection [16,

Biosensor for human chorionic gonadotropin detection

In this work, we present a non-functionalized biosensor based on a TOF decorated with gold nanoparticles (Au-NPs) for detecting hCG hormone in

FiberCop: Agreement with Nokia to Transform Fiber Networks into an ...

A Memorandum of Understanding on fiber sensing has been signed to test the use of optical fiber as a distributed sensor capable of detecting weather events, anomalies, and potential failures.

(PDF) Quantification of hCG Hormone Using Tapered

Quantification tests for hormone concentrations were carried out by measuring the optical power response of the tapered optical fiber with Au-NPs

Label Free hCG Concentration Biosensor Based on Suspension Core

In this paper, a microfluidic sensor based on suspended core fiber (SCF) for detecting the concentration of human chorionic gonadotropin (hCG) has been presented and experimentally

Fiber Unit

This is a series of fiber optic sensor heads designed to be connected to a fiber optic sensor amplifier. The FU Series offers a wide variety of options including

Sensors International | Vol 7, In progress (2026)

Multimetallic graphene-coated THz metasurface biosensor for high-sensitivity hCG detection in pregnancy testing: A simulation study K. Vijayakumar, S. Subha, N.K. Anushkannan, Kumaravel

Dual-mode optical fiber sensor with polydopamine-functionalized

Abstract This study introduces a temperature-compensated dual-mode optical fiber sensor for ultrasensitive human chorionic gonadotropin (HCG) detection, integrating polydopamine (PDA)

(PDF) Quantification of hCG Hormone Using Tapered

Optical fiber sensors have great potential for protein detection due to the excellent characteristics of high sensitivity, miniaturization, and capability for

Fiber Optic Security System | Future Fibre Technologies

Future Fibre Technologies is a leader in intrusion detection systems, offering fibre optic security system solutions for pipeline, fence, and perimeter.

Home | Hamamatsu Photonics

The official website of Hamamatsu Corporation whose mission is to advance science and industry through photonic technologies. Our products include optical sensors

Dual-mode optical fiber sensor with polydopamine-functionalized

In this work, we developed a miniaturized, dual-mode optical fiber biosensor that integrates Fabry-Perot interferometry and surface plasmon resonance into a single fiber-based

Fibercop and Nokia to test the use of optical fibre as a distributed sensor

Memorandum of Understanding signed on fibre sensing to test the use of optical fibre as a distributed sensor, capable of detecting climate events, anomalies and potential faults Analysis of the

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Quantification of hCG Hormone Using Tapered Optical Fiber Decorated with Gold Nanoparticles. Sensors, 23 (20), 8538. doi /10.3390/s23208538.

Optical sensors

Optical sensors - special tools for industry Optical sensors are devices that use light to detect the presence of an object, in addition to detecting its shape, color,

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