

The Development of SPR Fiber Optic Sensors

Article Overview

SPR fiber optic sensors have evolved into highly sensitive, versatile devices for biochemical, environmental, and IoT applications, leveraging advanced fiber designs and plasmonic coatings.

Historical Background and Principles

Surface Plasmon Resonance (SPR) is a phenomenon where free electrons at a metal-dielectric interface resonate with incident light under specific conditions, leading to energy absorption that is highly sensitive to changes in the surrounding refractive index (RI). The concept was first demonstrated in prism-based configurations by Kretschmann and Otto in the 1960s, and later adapted to optical fibers, enabling compact, flexible, and remote sensing capabilities. In fiber-based SPR sensors, light propagates through the fiber core and excites surface plasmons on a thin metallic coating, typically gold or silver, with the resonance condition dependent on the RI of the adjacent medium.

Technological Advancements

Over the past two decades, SPR fiber optic sensors have undergone significant development:

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Fiber Architectures: Early designs used unclad or tapered fibers, while modern sens...

Article Content

Oct 11, 2025

Advanced SPR biosensor with optimized gold-TiO₂ D-shaped ...

In this paper, we present the design, investigation, and optimization of a surface plasmon resonance (SPR) biosensor

Nov 15, 2025

Research Advances on Fiber-Optic SPR Sensors with Temperature

Finally, this paper discusses the most recent applications and development prospects of temperature self

Dec 20, 2025

Lab on Fiber: Recent Experimental Advances in Optical Fiber Sensor ...

A detailed introduction is provided on the research progress of different detection objects including refractive index, temperature,

Sep 25, 2025

Surface Plasmon Resonance-Based Fiber Optic Sensors: Principle,

In addition, we present few examples of the surface plasmon resonance- (SPR-) based fiber optic sensors. The

Jul 05, 2026

Optical Fiber Biosensors Based on Surface Plasmon Resonance

Abstract: Optical fiber surface plasmon resonance (SPR) biosensors have great potential in the early stage detection of diseases,

Dec 16, 2025

Advancements in Fiber and Prism-Based Surface Plasmon Resonance Sensors ...

The surface plasmon resonance (SPR) technique has proven indispensable as an optical sensing method owing to its extraordinary

Aug 12, 2025

Research Advances on Fiber-Optic SPR Sensors with Temperature

Then, the latest development of temperature self-compensated sensor is reviewed from the perspective of various fiber

Jun 08, 2026

A SPR based fiber optic sensor for the development of Internet of ...

In this paper, an enhanced performance of dual core D-shape photonic crystal fiber utilizing surface plasmon

Feb 04, 2026

Advances in SPR-Based Fiber Optic Sensors for Voltage/Electric Field ...

The article analyses and compares the characteristics of single and multilayer voltage-dependent fiber optic surface

Sep 16, 2025

A SPR based fiber optic sensor for the development of Internet of ...

These optimal results suggest that we can employ this SPR-based sensor in the development of IoT-based

Jul 26, 2025

Multichannel Fiber Optic SPR Sensors: Realization Methods,

Lastly, the future development directions of multichannel fiber optic SPR sensors from principle, structure, and material

Mar 26, 2026

High-Sensitivity Fiber Optic SPR Strain Sensor Based on Asymmetric ...

This article proposes an ultrasensitivity fiber SPR strain sensor based on an asymmetric groove structure (AGS).

Jan 09, 2026

Surface Plasmon Resonance-Based Fiber Optic Sensors

The present review may provide researchers valuable information regarding fiber optic SPR sensors and encourage

Feb 26, 2026

Advances in Surface Plasmon Resonance-Based Plastic Optical Fiber Sensors

Abstract In the current review, recent advances in the field of surface plasmon resonance (SPR)-based plastic optical

Jul 14, 2026

Recent advance on fiber optic SPR/LSPR-based ultra-sensitive

Ultra-selective fiber optic SPR platform for the sensing of dopamine in synthetic cerebrospinal fluid incorporating

Jul 19, 2026

Review on recent experimental SPR/LSPR based fiber optic analyte sensors

The recent progress in nano-optics has developed susceptible and label-free optical devices using SPR/LSPR

Jan 15, 2026

Enhancing Fiber-Optic SPR sensor performance using principal

In this work, for the first time, the application of Principal Component Analysis (PCA) to process Surface Plasmon

Jan 22, 2026

Recent advances of optical fiber biosensors based on surface

This overview aims to provide guidance for future research and development of this important and burgeoning field. In this review,

Mar 12, 2026

Specialty optical fibers and 2D materials for sensitivity enhancement ...

In this paper, a review of recent studies on the optical fiber-based surface plasmon resonance (SPR) sensor and the

Sep 22, 2025

Research on Fiber Optic Surface Plasmon Resonance Biosensors: A

<p>Due to the benefits of the high sensitivity, real-time response, no labeling requirement, and good selectivity, fiber optic sensors

Feb 28, 2026

U-shape Fiber Optic-Based SPR Sensor | Springer Nature Link

This chapter provides an in-depth exploration of U-type fiber optic sensors and their applications in SPR sensing.

May 01, 2026

SPR-Based Fiber Optic Sensor for the Development of ...

This manuscript analytically explores the propagating features of a remarkably sensitive SPR-based sensor for the development of

Feb 26, 2026

Fiber Optic SPR Sensor Past, Present, and Future

1.1 Introduction to Fiber Optic SPR Sensor In recent decades, a wide range of sensing applications based on optical fiber inter

May 27, 2026

Plasmonic Fiber Optic Refractometric Sensors: From Conventional

Yet, the large diversity of SPR fiber sensor designs has made it difficult to understand the advantages of each

Jul 04, 2026

Fiber Optic Surface Plasmon Resonance (FO-SPR) Sensing Laboratory

Fiber optic surface plasmon resonance (FO-SPR) sensing technology is an innovative fusion of fiber sensing

Dec 28, 2025

Fiber-Optic Sensors Based on Surface Plasmon Resonance: A

Abstract: Since the introduction of optical fiber technology in the field of sensor based on the technique of surface plasmon

Dec 24, 2025

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