

Problems and Improvements of Fiber Optic pH Sensors



Overview

This review offers a comprehensive analysis of recent advances in optical fiber-based pH sensors, covering key techniques such as fluorescence-based, absorbance-based, evanescent wave, and interferometric methods. Measuring pH is a critical parameter in environmental monitoring, biomedical diagnostics, food safety, and industrial processes. Optical fiber sensors have proven highly effective for pH detection due to their exceptional sensitivity, rapid response, and resistance to electromagnetic interference. Advancements in Optical Fiber Sensors for pH Measurement: Technologies and Applications Academic Editors: Flavio Esposito, Stefania Campopiano and Agostino Iadicicco Received: 29 May 2025 Revised: 4 July 2025 Accepted: 7 July 2025 Published: 9 July 2025 Citation: Alhussein, A.



Article Content

Highly sensitive fiber-optic chemical pH sensor based on surface ...

In this work, the fiber-optic chemical pH sensors were fabricated based on carboxyl ZnCdSe/ZnS quantum dots (QDs) and tapered optical fiber. The photoluminescence (PL) intensity of

Highly Sensitive and Wide-Dynamic-Range Multichannel Optical-Fiber pH ...

Finally, the performance of the proposed PWM pH sensor was compared with that of potentiometric, optical-fiber modal interferometer, and optical-fiber Fabry-Perot interferometer pH sensors with

Recent development and applications of optical and fiber-optic pH sensors

This article provides a brief review on the development and applications of optical and fiber-optic pH sensors in the 1990s. Various methods and materials for immobilization of pH

Fiber-optic probes for real-time pH monitoring

Fiber-optic sensors provide real-time monitoring, showcasing the robustness of pH sensors in challenging environments. They exhibit heightened sensitivity, rapid response, and a

Fluorescence based fibre optic pH sensor for the pH 10–13 range ...

In this paper, a novel fibre optic sensor system for sensing pH in the alkaline region has been reported. The sensing mechanism was based on the pH induced change in fluorescence

Distributed fiber optic pH sensors using sol-gel silica based sensitive ...

Distributed fiber optic pH sensors were developed using the pH sensitive SiO₂ based materials coated on the optical fiber. Connected to an OBR, the SiO₂/Au-SiO₂ based fiber optic pH

A fluorescent fiber pH sensor for sensitive, wide-range detection using ...

Abstract pH value plays a vital role in biochemical analysis. To achieve online analysis, a new type of fluorescent fiber sensor has been developed for real-time, wide-range pH monitoring in

Development of a polymer optical fiber pH sensor for on-body monitoring ...

Abstract A pH sensor based on polymethylmethacrylate (PMMA) optical fibers has been developed for on-body monitoring in biological fluids. Detection relies on evanescent wave

Advancements in Optical Fiber Sensors for pH Measurement:

Measuring pH is a critical parameter in environmental monitoring, biomedical diagnostics, food safety, and industrial processes. Optical fiber sensors have proven highly effective for pH detection due to

Optical Fiber pH Sensors Based on PAni-Coated Microstructured Optical ...

In this article, we report the analysis of a novel optical fiber pH sensor based in polyaniline (PAni) coating applied on a trenched core-free (only-bridge) silica fiber. The results are compared to

Highly sensitive fiber-optic chemical pH sensor based on surface ...

The fiber-optic chemical pH sensor can well address the problems of traditional pH sensors mentioned above, exhibiting excellent advantages of anti-electromagnetic interference, fast

Advancements in Optical Fiber Sensors for pH Measurement:

The discussion extends to the impact of pH- sensitive coatings—ranging from nanomaterials and polymeric films to graphene-based compounds—on enhancing sensor performance. Recent

Development of optical fiber sensors for high-alkaline pH monitoring ...

Abstract Fluorescent fiber optic sensors hold promise for monitoring the pH of concrete due to their high accuracy and small size, but they still face issues such as long response times and

Advanced hydrogel optical fiber sensors with triple-readout for real ...

Herein, we have developed hydrogel-based optical fiber (OF) sensors for continuous and real-time pH sensing using a hydrogel matrix with the pH-sensitive dye Neutral Red to obtain a color ...

Self-referencing optical fiber pH sensor for marine microenvironments

The optical fiber pH sensor has additional advantages of being self-referencing, without the need of an external sensor reference, having a simple fabrication method and basic spectrometer

Development and characterisation of optical fibre-based pH sensor

Electrochemical pH sensors are unstable and inaccurate under such circumstances. As a result, recent research has focused on developing robust optical pH measurement systems that can

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Advancements in Optical Fiber Sensors for pH Measurement:

Table 2: A comparison of optical fiber-based pH sensor technologies, detailing their operating principles, functional roles, constituent materials, light sources, detection mechanisms,

No-core fiber-based highly sensitive optical fiber pH sensor

1 Introduction Optical fiber-based pH sensors have become one of the hot topics in the field of research due to their numerous advantages such as being light weight, small in size, and highly sensitive and

No-core fiber-based highly sensitive optical fiber pH sensor

The present work describes the fabrication and characterization of an optical fiber pH sensor using a sol-gel technique. The sensing head

A wide range and highly sensitive optical fiber pH sensor using ...

Whereas, the fiber optics based pH sensors are more beneficial due to compact size, wide range sensing, ease of fabrication and cost effective devices. Moreover these sensors can be used

Recent development and applications of optical and fiber-optic pH sensors

Over the past two decades, the development and applications of chemical sensors and biosensors have grown rapidly . Among all sensors, pH sensors have received the most attention

A Bio-Compatible Fiber Optic pH Sensor Based on a

The fiber optic sensor is based on a Mach-Zehnder interferometric technique, where the pH sensitive material is coated on a short, typically 20-25

Advancements in Optical Fiber Sensors for pH Measurement:

This review offers a comprehensive analysis of recent advances in optical fiber-based pH sensors, covering key techniques such as fluorescence-based, absorbance-based, evanescent wave, and

A Portable "Plug-and-Play" Fibre Optic Sensor for In-Situ

Microfluidics is used in many applications ranging from chemistry, medicine, biology and biomedical research, and the ability to measure pH values

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