

## How to detect ultra-fine particles using fiber optic sensors



### Overview

This review introduces a micro-integrated device of microfluidics and fiber-optic sensors for on-site detection, which can detect certain or several specific components or their amounts in different samples within a relatively short time. In our approach, we employ nanophotonic optical structures integrated onto a fiber tip that sense particles through local changes in refractive index (Hendriks). We present a nanophotonic fiber-tip sensor with an unprecedented combination of quality factor, reflection modulation, and mode confinement by using advanced design methods. Previously, a wafer-to-fiber transfer technique developed at the TU/e was utilized to realize novel nanophotonic. Using an ultrasensitive photonic crystal, TU/e researchers were able to detect single particles down to 50 nanometers in diameter. The new research has just been published in the journal *Optica*. What do volcanic lava, fire smoke, automobile exhaust fumes, and printer toner have in common?

They are.



## Article Content

### Fiber Optic Sensors | Definition, Types & Applications

Fiber optic sensors are devices that use optical fibers to detect changes in various physical quantities by monitoring alterations in light properties such as intensity, phase, polarization,

#### Nano-optomechanical fiber-tip sensing

In this work, we present a fiber-coupled nano-optomechanical sensor that requires no coupling optics.

#### Detecting single ultra-fine particles with fiber tip sensors

Fiber-optic sensors allow for accurate and remote sensing capabilities of the properties around us while being minimally invasive and insensitive to electromagnetic interference. Previously, a wafer-to-fiber

#### A Nanophotonic Fiber-Tip Sensor for the Detection of Single

Due to this unique combination it allows for the detection of nanoscale objects, where we experimentally demonstrate the real-time detection of single 50 nm nanoparticles. Keywords: Nanophotonics,

#### A Nanophotonic Fiber-Tip Sensor for the Detection of Single

We present a nanophotonic fiber-tip sensor with an unprecedented combination of quality factor, re-reflection modulation, and mode confinement by using advanced design methods.

#### Detecting single nanoparticles using fiber-tip

Here we combine the sensitivity and flexibility of electronic sensors with the advantages of optical readout, by demonstrating a hybrid

#### Detecting single ultra-fine particles with fiber tip sensors

These nanophotonic cavities on fiber-tips can be used for the detection of individual nanoscale objects or even large single molecules. So far, single polystyrene particles in an aqueous environment with

### Optical Fiber Sensors: Working Principle, Applications, and Limitations

Fiber-optic technology emerged originally for applications in data transmission and telecommunications. However, sensors based on fiber-optics have been developed rapidly because of their excellent

#### (PDF) Optical Fiber Sensors: Working Principle,

Brief theory of sensing principle, fabrication method, applications, advantages and disadvantages of the different fiber-optic sensors, are addressed.

## Recent Progress in Microfiber-Optic Sensors

Recently, microfiber-optic sensors with high sensitivity, fast response times, and a compact size have become an area of interest that integrates fiber optics and nanotechnology. Distinct advantages

## Review of Fiber-Optic Localized Surface Plasmon

Localized surface plasmon resonance (LSPR) biosensors, which enable nanoscale confinement and manipulation of light, offer the enhanced

## Recent Progress on Microfluidics Integrated with Fiber

This review introduces a micro-integrated device of microfluidics and fiber-optic sensors for on-site detection, which can detect certain or several

## Using Low-Cost Sensors for Measuring and Monitoring

The paper deals with the measurement of individual size components of particulate matter focusing on typical particle size, mass, and number

## Review of Fiber-Optic Localized Surface Plasmon Resonance Sensors ...

The integration of LSPR with the fiber-optic technology has led to the development of compact and versatile sensors for miniaturization and remote sensing. This comprehensive review explores

## A method for the controllable fabrication of optical fiber-based ...

Abstract Optical fiber-based Localized Surface Plasmon Resonance (OF-LSPR) biosensors have emerged as an ultra-sensitive miniaturized tool for a great variety of applications.

## Optical fiber SERS sensors: Unveiling advances, challenges, and ...

Only recent advances in nanotechnology and related equipment have made it possible to effectively and reliably use optical fibers as SERS substrates. Our aim is therefore to report on the

## Fiber Optic Sensors | Precision, Speed & Versatility in

Fiber Optic Sensors: Revolutionizing Precision, Speed, and Versatility in Measurement Technologies Fiber optic sensors represent a

## Integrated Strategies for Manipulation and Detection of Ultrafine ...

Here we present a new approach for the detection and monitoring of UFPs that could potentially be much lower cost than existing methods. In our approach, we employ nanophotonic optical structures

## Detecting single ultra-fine particles with fiber tip sensors

The approach is to pattern a sensitive optical structure on a thin membrane of semiconductor wafer, then to transfer it to the fiber facet without using an adhesive. In the case of this study, the patterned

Detecting single ultra-fine particles with fiber tip sensors

Semantic Scholar extracted view of "Detecting single ultra-fine particles with fiber tip sensors" by Hasan Yalcinoglu et al.

Application of machine learning in optical fiber sensors

A comprehensive overview of machine learning methods applied to optical fiber sensors was provided. In recent years, with the increasing demand for intelligent society, intelligent photonics

A nanophotonic fiber-tip solution to detect the ultrasmall

To overcome these issues, our researchers have designed a new ultra-sensitive fiber-tip sensor that can detect single particles with diameters

Integrated Strategies for Manipulation and Detection of Ultrafine ...

To address these limitations, our work focuses on the manipulation of UFPs in air in order to efficiently de-liver them to the detection volume; this involves separating UFPs from larger particles,

Fiber optic volatile organic compound gas sensors: A review

Fiber optic sensors, as intrinsically safe, miniature, portable, immune to electromagnetic interference, and easy to remote sensing and multiplexing sensing technology, are utilized in VOC

Special Issue "Fiber Optic Sensors and Applications": An Overview

We present here the recent advance in exploring new detection mechanisms, materials, processes, and applications of fiber optic sensors. Keywords: fiber optic sensors, detection mechanisms, materials,

Ultrafine particle sensors for drastic improvement of air

New methods for measuring the size and concentration of ultrafine particles using charged plasmas can be used to make future sensors for health

Fiber Optic Sensors: Fundamentals, Principles & Applications

Light Injection into the Optical Fiber Source (Laser, LED etc.) Transmission of Modulated Light to a Monitoring Point Detector (PIN Diode, Avalanche Diode) Optical Fiber (Transmission Medium,

Detecting single nanoparticles using fiber-tip

Sensing nano-objects, from nanoparticles to molecules, has become a crucial need in environmental monitoring, medical diagnostics, and drug

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