Fiber Optic Force Sensing Transducer

Tech ID: 22917 / UC Case 2012-125-0

BACKGROUND

The ability to measure forces and/or mechanical displacements with high precision has direct implications on the development of advanced sensing platforms that can respond to acoustic, strain, pressure, and/or chemical signals. Measuring small forces (< 1 nN) is typically carried out by sophisticated instruments such as an optical trap (or optical tweezer) or atomic force microscope which acts as a calibrated force transducer that can directly measure the force and distance of a system. Both techniques offer excellent force sensitivity (piconewton range), but it would be extremely difficult to integrate these platforms into transportable, or embeddable, sensors that can detect stimuli such as sound waves, pressure changes, or chemicals.

TECHNOLOGY DESCRIPTION

University researchers have developed a highly versatile, fiber-based detection platform for measuring extremely small forces (< piconewtons) generated by various stimuli. In the invention, the movement of optical transmitters in the evanescent field of a subwavelength optical fiber, or more generally a waveguide, is used to detect forces imposing on the fiber. The invention provides a single element fiber optic force sensor that is highly tunable and can be configured for various applications including: nanomechanical sensors for medical research (cancer diagnostics, fundamental cellular studies, single molecule analytics, and real-time biological responses); fiber optic sensors tuned to detect sound waves (underwater receiver for marine-life research), chemicals, pressure/temperature changes; and scanning probes capable of imaging topography of planar and non-planar surfaces.

INTELLECTUAL PROPERTY INFO

The invention has a patent pending and is available for licensing and/or sponsorship.

RELATED MATERIALS

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- Yoon I, Baker SE, Kim K, Wang Y, Esener SC, Sirbuly DJ. Profiling the evanescent field of nanofiber waveguides using self-assembled polymer coatings. Nanoscale 2013 Jan 21;5(2):552-5 - 12/12/2012
- Stimulus-responsive light coupling and modulation with nanofiber waveguide junctions Nano Lett. 12 , 1905-1911 (2012). - 03/26/2012

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,459,163	10/04/2016	2012-125

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OTHER INFORMATION

KEYWORDS

fiber optic, piconewton force transducer, force sensing, subwavelength waveguide, semiconductor nanowire, light modulation, evanescent field, sensor, nanophotonics

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Sensors & Instrumentation**
  - Analytical
  - Biosensors
  - Physical Measurement

RELATED CASES

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