Ultrasensitive and Self-powered PDVF Nanofiber Strain Sensors

Technology #17485

Applications

- Wearable electronics
- Sport performance monitoring and human motion capture
- Structural health monitoring and rehabilitation
- Artificial limbs

Problem Addressed

With the advent of artificial limb and advanced human motion capturing technology, stretchable, self-powered and ultrasensitive nano-sensors exhibiting strong piezoelectric behavior are requisite. Current sensor technology relies on expensive and externally-powered sensors with complex designs and low stretchability.

Technology

The invention utilizes special properties of Polyvinylidene fluoride (PVDF)-derived sensor technology to produce an inexpensive, self-powered and ultrasensitive strain sensor with a high response speed, high stretchability, and strong piezoelectric behavior. Utilizing a new fabrication process and a special synthetic polymer substance, PVDF, the inventors developed a strain sensor with novel characteristics. The simple fabrication method retains the innate flexibility of PVDF, while guaranteeing strong piezoelectric behavior, reliability in manufacture and high yields in fabrication. The resulting strain sensor is ultrasensitive, flexible and self-powered, making it an ideal candidate for wearable electronics applications, with potential for use in large area arrays.

Advantages

- High response speed and stretchability with strong piezoelectric behavior
- Simple and inexpensive fabrication process ensures reliability and repeatability
- Self-powered design ideal for wearable electronics applications

Categories For This Invention:

Materials
Micro & Nanotech
MEMS/NEMS (Materials)
Nanotechnology
Photonics
Sensors (Photonics)
Life Sciences
Biomaterials

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Prosthetic
Chemicals
Polymers (Chemicals)

Intellectual Property:

Electrical device and method of manufacturing an electrical device
PCT
2016-111649

Inventors:

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Publications:

Ultra-sensitive and Stretchable Strain Sensor Based on Piezoelectric Polymeric Nanofibers
28th IEEE International Conference on Micro Electro Mechanical Systems (MEMS)
January 18, 2015
Soft-polymer Membrane Micro-sensor Arrays Inspired by the Mechanosensory Lateral-line on the Blind Cavefish
Journal of Intelligent Material Systems and Structures
February 17, 2014
Flexible and Surface Mountable Piezoelectric Sensor Arrays for Underwater Sensing in Marine Vehicles
IEEE Sensors Journal
August 30, 2013
Energy Management in Sensor Networks
Philosophical Transactions of the Royal Society A
November 28, 2011
A Novel Strain Sensor Based on the Campaniform Sensillum of Insects
Philosophical Transactions of the Royal Society A
February 15, 2002

External Links:

Center for Environmental Sensing and Modeling
http://censam.mit.edu/Pages/default.aspx
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http://oceans.mit.edu/

Image Gallery:

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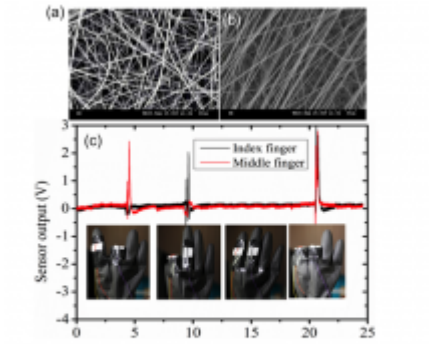

Electrospun nanofiber strain sensors (a) Nanofibers collected on a stationary substrate (b) Aligned nanofibers collected by mounting the substrate on a rotating mandrel (c) Proof-of-concept experiments that demonstrate motion sensing for improving the functionality of robotic limbs. Each case shows the response of the strain sensor to the bending of corresponding finger.

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