Wearable Sensor for Medical Applications (2019-004)

Biocompatible wearable sensor device for monitoring pressures and detecting body movements.

Market Overview

The wearable sensor market share is expected to reach over $1.387 million in the next few years. To date, several materials systems and device configuration have been investigated to develop wearable sensors for their applications in health care, gait analysis, smart monitoring systems, and skin electronics. Clemson University researchers have created an inexpensive and simple fabrication process with a highly sensitive, flexible, and biocompatible method that is suitable for the wearable electronics market. It utilizes a novel graphene heterostructure and is capable of detecting body movements and pressures with good reliability, highlighting its potential application invivo medical pressure sensors.

Technical Summary

This device utilizes a novel graphene/P(VDF-TrFE) heterostructure based highly sensitive, flexible and biocompatible piezoresistive pressure/strain sensor device through a facile and lowcost fabrication technique. The sensor device is completely self-powered and requires no additional power to operate. The high piezoelectric coefficient of P(VDF-TrFE) coupled with
outstanding electrical properties of graphene makes the sensor device highly sensitive, with a maximum sensitivity of 0.89 kPa-1, a gauge factor 482, and signal-to-noise ratio of 26.4
dB in the range of pressure up to 45 mmHg. An additional attribute of our sensor is that it can be attached to human body such as wrist and knee to detect the human activity (e.g.,
multi-joint movement, standing, walking, and running) in a given sequence with a fast response time in the ms region. Keeping in mind its high sensitivity, ultra-thin nature, flexibility
and biocompatibility, it can be easily integrated in fabrics for truly wearable sensor applications, which is a rapidly expanding field. Moreover, the sensor is a strong candidate for
medical applications such as in vivo cardiovascular, blood, urinary bladder pressure, glucose pressure monitoring.

Application

Wearable Sensor, Implatable Biomedical Sensor, Flexible Sensor, Self-powered Sensor

Development Stage

Preliminary Prototype

Advantages

- Device is highly sensitive, flexible, biocompatible, and self-powered with fast response time
- Contains a novel structure and is composed of graphene/P(VDF-TrFE) heterostructure
- Device is simple to fabricate and is inexpensive

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Provisional	United States	62/865,433	N/A	2019-004	Dr. Goutam Koley

About the Inventors

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Dr. Goutam Koley received his Ph.D. in Electrical Engineering from Cornell University and has co-authored more than 50 refereed journal articles, 2 book chapters, and more than 110 conference proceedings and presentations. During his research career, Koley has obtained 3 issued patents, and produced 4 invention disclosures. Koley's research has been supported by a number of federal agencies, including the National Science Foundation from which he earned NSF Career Award in 2009. He is the co-founder of 3 start-up companies, a senior member of the Institue of Electrical and Electronics Engineers (IEEE) and a member of the American Physical Society (APS).

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