Wearable High-Dielectric-Constant Polymers with Core-shell Liquid Metal Inclusions for Biomechanical Energy Harvesting and Self-powered User Interface

Track Code: 2019-WU-68431

Categories:
- Biomedical Engineering
- Materials and Manufacturing

Keywords:
- Biomedical Engineering
- Materials and Manufacturing
- Polymers
- Triboelectric Nanogenerators
- Wearable Electronics

Deformable energy devices capable of efficiently scavenging mechanical signals enable the promise of self-powered micro-/nano-systems. An assortment of technologies has been developed to transform the otherwise wasted ambient mechanical energy into electrical power through mechanisms such as electrostatic, piezoelectric, and recently, triboelectric processes. Triboelectric nanogenerators (TENG) could efficiently harvest mechanical energy for power electronics and sensors. The secondary-phase additive materials used for dielectric engineering in TENGS are exclusively solid type with limited deformability. The rigid nature of these materials result in issues such as undesirable stress concentrations and layer delamination, leading to deteriorated bulk deformability and long-term durability.

Researchers at Purdue University have developed a wearable high-dielectric-constant polymer with core-shell liquid metal inclusions for biomechanical energy harvesting and self-powered user interface. The liquid-metal-inclusion based TENG (LMI-TENG) consists of a layer of liquid metal embedded functional silicone sandwiched between two Ecoflex layers. Compared to LMI-TENG devices with 0 wt% liquid metal particles (LMP), the output performance of LMI-TENG with 50 wt% LMP is boosted with an enhancement of 300%. Experimentation has demonstrated potential application in human-integrated technology. LMI-TENG enables the high performance of TENGs with more desirable deformability.

Advantages:
-Increased deformability
-Good sensitivity in low pressure region

Potential Applications:
-Wearable electronics

People:

- Wu, Wenzhuo (Project leader)
- Gao, Shengjie

Intellectual Property:

Application Date: October 7, 2019
Type: Utility Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Application Date: November 26, 2018
Type: Provisional-Patent
Country of Filing: United States
Patent Number: (None)
Issue Date: (None)

Contact OTC:

Purdue Office of Technology Commercialization
The Convergence Center
101 Foundry Drive, Suite 2500
West Lafayette, IN 47906

Phone: (765) 588-3475
Fax: (765) 463-3486
Email: otcip@prf.org