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Generation of Electricity Using Triboelectric Nanogenerator

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Abstract: The purpose of this paper is to provide a solid explanation for the generation of a reliable amount of power by using the conversion of mechanical energy into electrical energy using triboelectric materials. The aim is to find a suitable and efficient source of electrical energy by using our surroundings. I've used the mechanical energy produced from our wearable devices in order to produce a sufficient and reliable amount of energy.

Key words - Triboelectricity, triboelectric effect, TENG, energy conversion.

INTRODUCTION

Triboelectricity refers to the electrification of dissimilar objects or materials that occurred due to the collision resulting in the phenomenal flow of electrons from one material to other balancing A type of contact electrification known as the triboelectric effect occurs when some chemicals are separated from another substance with which they are associated, causing them to become electrically active. The potential difference. Ex glass, nylon, dry skin.

Now a day's triboelectric is a familiar concept in the aircraft industry. Static charge

TRIBOELECTRIC NANOGENERATOR (TENG)

This triboelectric nanogenerator is a small size of electronics that operates at ultralow power. So, you can see from here that ultralow power consumption can be powered by energy harvesting from our living environment.
It is an energy harvesting device. Basically it converts the external mechanical energy into electricity by a conjunction of triboelectric effect and the electrostatic induction, so that is a combination of two. One is called the triboelectric effect, and the other is electrostatic induction.

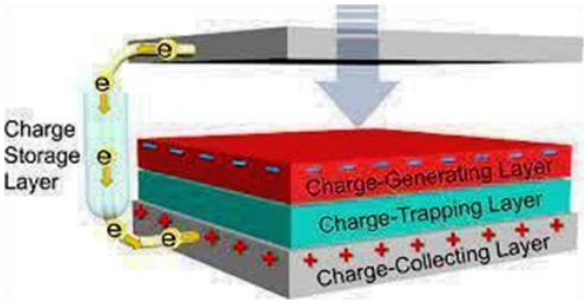

Fig1. triboelctric energy generation

This new type of generator was firstly developed by Prof. Zhong Lin Wang. He is working basically in Georgia Institute of Technology, he is very famous in this particular area, and he has published lots of publications and patents and books. And he invented the technology in the year of 2012.
A TENG is made of two sheets of materials that have distinctly different triboelectric characteristics with one easy to gain electrons and the other one easy to lose electrons.
The working principle of TENG can be described by the coupling of "contact electrification and electrostatic induction".

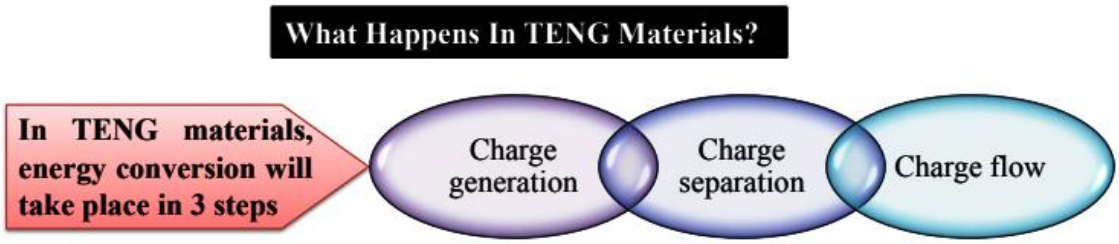

Fig2. Energy conversion in TENG material

Modes of Triboelctric Nanogenrators

Different modes present in triboelectric nanogenerator are

(a) Vertical contact-separation mode
(b) Contact-Sliding mode
(c) Single-electrode mode
(d) Freestanding triboelectric layer mode

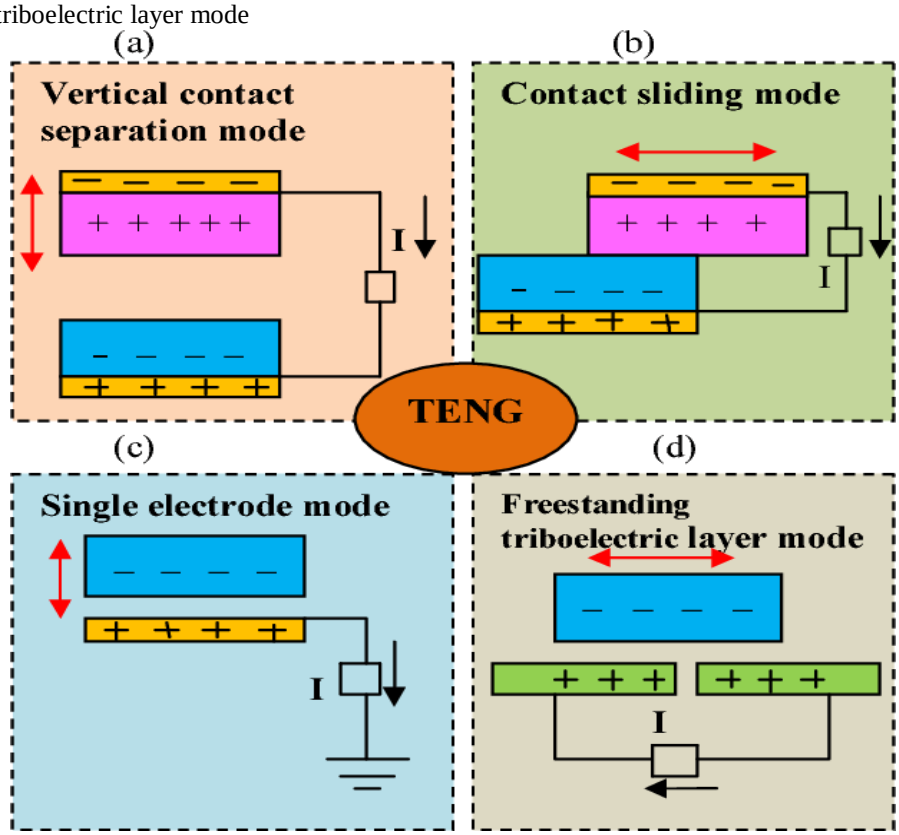

Fig3. modes of triboelctric nanogenrators

Vertical contact-separation mode

In this paper, the fundamental working rule, theoretical analysis, and several other representative prototype structures of the TENG in vertical contact-separation working mode are introduced, which is the most fundamental and frequently-used mode for TENG.
This working mode has facile and scalable fabrications, simple design strategy, high instantaneous output power, and simple to proportion with multiple layer integrations.
The TENGs at this working mode are usually driven by an external mechanical impact, and a critical factor affecting its output voltage is that the amplitude of the separation distance between the 2 triboelectric layers (or contact surfaces), while the output current is dictated by the speed at which the 2 surfaces being contacted or separated. plenty of unique structures are developed for various purposes, like powering portable electronics and self-powered active sensors.

- Two dissimilar dielectric films face one another, and therefore there are electrodes being deposited on the highest and the bottom surfaces of the stacked structure.

- A physical contact between the 2 dielectric films creates oppositely charged surfaces.

- Once the 2 surfaces are separated by a tiny low gap under the lifting of an external force, a potential drop is made.

- When the gap is closed, the potential formed by the triboelectric charge vanishes and the electrons return.

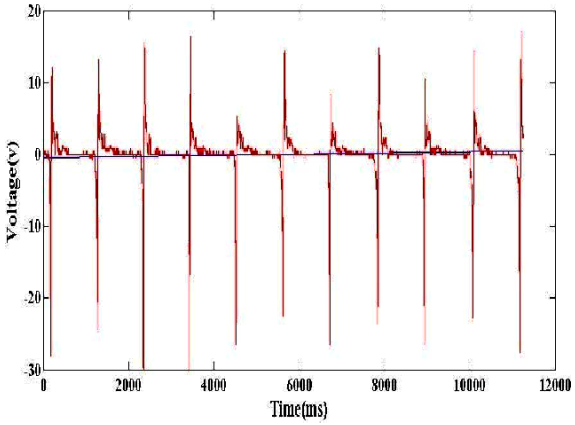

Fig4. V-t plot

APPLICATION

The triboelectric nanogenerator is used as a switch sensor for smart home lighting. At present, the sunshine switch within the smart home can he lamps controlled by these two switches within the smart home have to be automatically turned off for a period of your time when turned on, which ends within the consumption and waste of voltage. Suppose TENG is split into voice control switch and lightweight control switch.

However, tde into a wooden floor as a switch sensor, the energy of individuals walking may be harvested and converted into power, it doesn't require external power, so there's no need for a light-weight switch. It can effectively avoid the matter that the lighting time is longer than the particular time, and effectively save energy.

CONCLUSION

The triboelectric nanogenerator (TENG) and piezoelectric nanogenerator (PENG) are two recently developed technologies for effective harvesting of ambient energy for the creation of self-powered systems.

The benefits of TENGs and PENGs which include large open-circuit output voltage, low cost, simple fabrication, and high conversion efficiency enable their application as new flexible sensors, wearable devices, soft robotics, and machines. this angle provides an outline of the present state of the art in triboelectric and piezoelectric devices that are used as self-powered sensors and energy harvesters for soft robots and machines; hybrid approaches that combine the benefits of both mechanisms are discussed. to boost system performance and efficiency, the potential of providing self-powered soft systems with a degree of multifunctionality is investigated.

This includes optical sensing, transparency, self-healing, water resistance, photo-luminescence, or a capability to work in hostile environments like temperature, high humidity, or high strain/stretch. Finally, areas for future research directions are identified.

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