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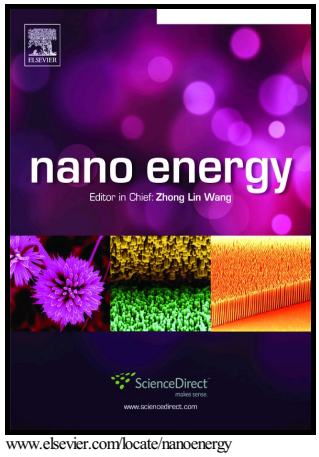

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A Flexible Hybridized Electromagnetic-Triboelectric Multi-Purpose Self-Powered Sensor

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Abstract

This paper presents a novel hybridized flexible electromagnetic-triboelectric generator that consists of a round/square shaped coil and magnet, and also, highly flexible, mechanically and thermally durable, and cost-effective polymeric materials. The reported hybridized nano generator is capable of converting external mechanical load to electricity. Using a systematic optimization approach results in an optimal configuration and size for the electromagnetic components of the self-powered sensor. Combination of the electromagnetic and triboelectric components provides several advantages for the proposed self-powered device including high resolution and power density even in low frequency and small amplitude of the excitations. We probe the sensitivity of the fabricated self-powered sensor considering different amplitude and frequency of excitations as well as external resistors. After providing a general performance analysis for the proposed self powered sensor, we show its potential for different specific applications including human motion based energy harvesting and sensing, tire condition monitoring, and pressure sensing. The utilization of the proposed self-powered sensor can provide a sustainable energy source for wireless sensor nodes, and also overcomes the battery capacity limitation that restricts the life time durability of mobile electrical devices.

Keywords: Hybridized nano generator, Electromagnetism, Triboelectricity, Self-powered sensor, Tire condition monitoring.

1. INTRODUCTION

The efficient powering of wireless and embedded systems is still a major problem due to the dependence of such systems to batteries. For the systems with long operation time,

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