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# THE PIEZOELECTRIC ZnO-PVDF NANOCOMPOSITE FOR REALISTIC FLEXIBLE ENERGY HARVESTING DEVICE FABRICATION

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ABSTRACT

In this study, we developed an innovative, fexible, nanogenerator, which was used to drive a self-powered based nano generator. Polyvinylidene fluoride (PVDF) films, filled with ZnOnanocomposite (ZPN) to fabricate the high performance of flexible energy harvester to generates an open circuit voltage up to 20 V and short circuit current reached up to 220 nA by simple vibration of finger trapping. This study demonstrates the feasibility of using a energy harvester as a self-powered device that can be extended for use as bio medical devices for environmental monitoring or as a smart, wearable, vibration sensor, in future applications. Dielectric properties have been studied to understand the role of molecular kinetic and interfacial polarization occurs at different applied frequency at room temperature.

**Keywords**: ZnO Nanoparticles, PVDF, Nanogenerator, Piezoelectric Energy harvester, Tactile sensors.

# INTRODUCTION

Recently, energy requirements have intensified exponentially due to highly populations and industrial growth, but at the same time; fossil fuel availability has steadily decreased. Thus, scientists have been focused on increasing the utilization of renewable (wind, sound, friction, motion, and thermal)energy sources in an effective way. Energy harvesting is critical to achieve independent and sustainable operations of electronic devices, aiming at building of self-powered electronic systems (where no batteries are required) for environmental monitoring and sensing, wearable electronic applications [1─2]. Taking the forms of irregular air flow or vibration, ultrasonic waves, body movement, and hydraulic pressure, mechanical energy is ubiquitously available in our living environment. For the past few decades, energy harvesting from environmental noise, friction, biomechanical, thermal, and low-frequency mechanical deformation has huge impact on the energy sector of the scientific community. One such device is the nanogenerator, which converts low-frequency vibration and environmental activities (e.g., wind, sound, friction, motion, and thermal energy) into electrical energy through piezoelectric, triboelectric, and pyroelectric effects [3]. In this study, the solution casting PVDF films were prepared by selecting DMAC as the solvent and ZnO nanoparticle was incorporated for the preparation of the PVDF Nano composite films. We demonstrated the fabricated energy harvester showed higher performance under simple finger imparting, without electric poling.