

Simulation of Piezoelectric Nanofibers for Harvesting Energy Applications

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Abstract

Energy Harvesters are the devices that convert mechanical energy which is the vibration to electrical one. These systems are very promising, they may, for example, provide an essential energy in remote or inaccessible locations and even within the human body. Energy harvesters provide a very small amount of power for low-energy electronics.

In this work, we have taken a model which is simulated using COMSOL Multiphysics®. It was used as a tool to design, characterize and to simulate an example which is nanofibers based piezoelectric energy generators. The results are compared with other available sources but using with another materials.

The nanogenerator device consists of piezoelectric nanofibers which are deposited on the interdigitated electrodes of copper fine wires, which were assembled on a silicon substrate.

Selected materiel in our study of piezoelectric nanofibers is Lead Zirconate Titanate (PZT 5H) because of good benefit and especially when it offers high sensitivity and good response. A soft and polymer Polyethylene high density (PEHD) was applied on top of the PZT nanofibers.

After applying a pressure on the top of surface of nanogenerator, the output parameters (voltage and Strain) are studied according to the input one (frequency).

Reference

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2. Jiyoung Chang and al, Piezoelectric nanofibers for scavenging applications, ELSEVIER science direct, Nano Energy, 356-371(2012).
3. Jian Fang and al , Enhanced mechanical energy harvesting using needleless electrospun poly(vinylidene fluoride) nanofibre webs,Energy & Environmental Science Issue 7,Energy Environ. Sci.,6, 2196-2202(2013).

Figures used in the abstract

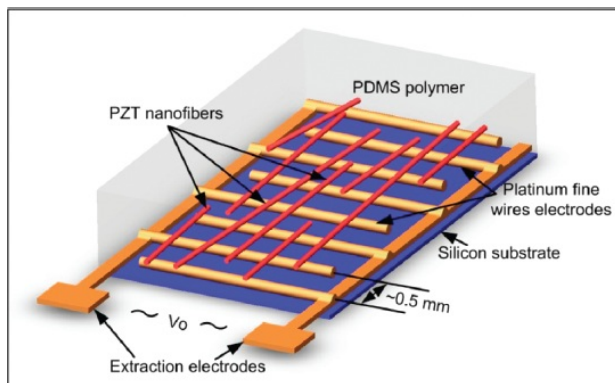


Figure 1: Schematic view of the model used of the PZT nanofibers generator

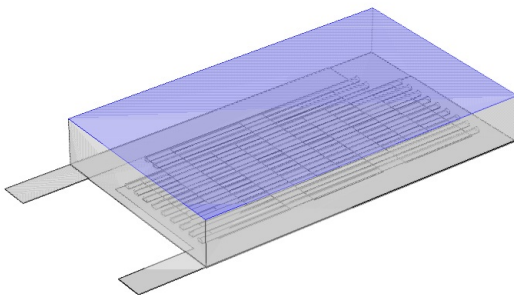


Figure 2: Schematic view of the model using the Comsol Multiphysics