Design and Simulation of Piezoelectric MEMS Cantilever

R. Shah[1], A. Nayak[1], B. D. Pant[2]

[1]Birla Institute of Technology & Science, Pilani, Rajasthan
[2]CSIR - CEERI, Pilani, Rajasthan

Abstract

A Micro-Electro-Mechanical System (MEMS) energy harvester is developed, using the phenomenon of Piezoelectricity. Zinc Oxide (ZnO) was chosen as the piezoelectric material. A multi - d31 mode cantilever design was used, with varying dimensions of cantilever, to form an array. The individual cantilevers can be either connected in series or in parallel to achieve different output characteristics. Present paper focuses on providing power for remote operations like vehicle tyre pressure sensors by harnessing the vibrations of the vehicle and converting it into electrical energy. An array of cantilevers of varying length and thickness of the piezoelectric material was thus designed and simulated to harness different vibrational frequencies. Simulations performed on COMSOL Multiphysics software revealed a wide range of resonance frequencies between 1kHz to 150kHz.

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Figures used in the abstract

Figure 1: Schematic Diagram of Cantilever Design.

Figure 2: Effect of Road Surface on Piezo Energy Harvester.

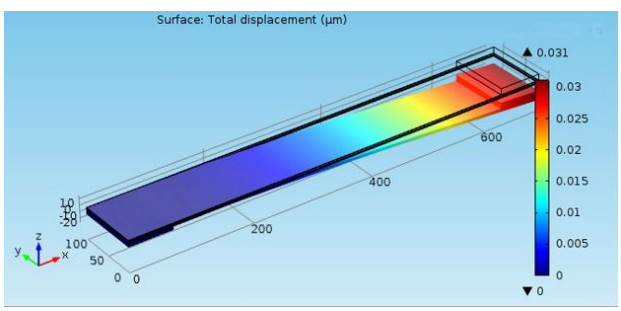

Figure 3: Simulation Result.

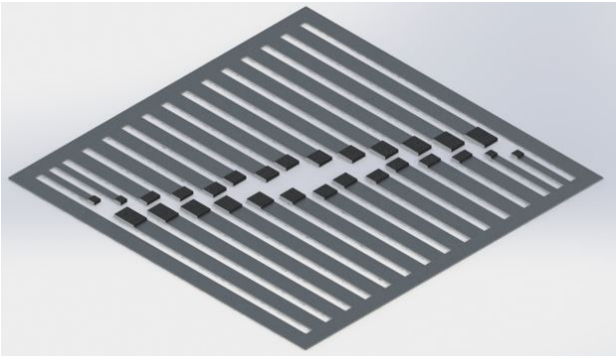

Figure 4: 3D Model of Array of Energy Harvester.