Low g and Low frequency Piezoelectric VEH: fabrication and characterization

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Abstract

The presented work discusses the design fabrication and characterization of an MEMS vibration energy harvester using Aluminium Nitride (AlN) piezoelectric layer energy harvester for low frequency and low-g applications. The harvester was fabricated on SOI wafer of 30µm device silicon layer which serves as the structural beam on which AlN layer of 0.5µm was sandwiched between the bottom titinium and top aluminium electrode. The handle silicon of 535µm serves as the proof mass. The dimensions of the beam are 2mm x 0.75 mm and the mass are 5.1 mm x 2.3 mm. The harvester has the measured resonant frequency of 112.97Hz and an average output power of 54nW measured at optimal load (4.3MΩ) and low level of acceleration of 27 mili-g. The 3D FEM model of the harvester was simulated in COMSOL Multiphysics and obtained results are in close agreement with the measured data. At present, an electrical equivalent model is being worked out to explain the results.

Biodata

Prof. Anurekha Sharma is Professor and Chairperson, Department of Electronic Science, Kurukshetra University. She has been a position holder throughout her academic career. She was 6th in University merit among 1000 students at graduation level and gold medalist at postgraduation. She obtained her M.Tech in Electronics and Communication from NIT Kurukshetra and Ph.D in Electronic Science with research area in MEMS from Kurukshetra University. She was one of the co-ordinators of NPMASS MEMS design centre at department of Electronic Science, Kurukshetra University and was instrumental in starting the MEMS course at M.Sc and M.Tech level. She has been one of the active participants in Community chip initiative undertaken through NPMASS. She has been the active user of the INUP programme and at present she is the member of governing council of ISSS. She has guided around 30 M.Sc, M.Tech and B.Tech projects in the area of MEMS and has been successfully motivated her students to go for higher studies, one of her students is at present enrolled for Ph,D in CENSE. She has about dozen of publications in reputed journals and is guiding Ph.D in the field of MEMS Design and fabrication In 2014, she was the recepient of prestigious Faculty for the future fellowship instituted by Schlumberger Foundation Netherlands. As part of this fellowship she chose to work on AlN Vibration Energy harvesters at Tyndall National Institute, University College Cork, Ireland for one year.