A NOVEL SPIRAL TYPE MEMS POWER GENERATOR WITH SHEAR MODE

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Energy harvesting from the environment has been of great interest as a standalone power source of wireless sensor nodes for Ubiquitous Sensor Networks(USN). In particular, the piezoelectric energy harvesting from ambient vibration sources has intensively researched because it has a relatively high power density comparing with other energy scavenging methods. Through recent advances in low power consumption RF transmitters and sensors, it is possible to adopt a micro-power energy harvesting system realized by MEMS technology for the system-on-chip. However, the MEMS energy harvesting system has some drawbacks such as a high natural frequency over 300 Hz and a small power generation due to a small dimension. To overcome these limitations, we devised a novel power generator with a spiral spring structure as shown in the figure. The natural frequency of a cantilever could be decreased to the usable frequency region (under 300 Hz) because the natural frequency depends on the length of a cantilever. In this study, the natural frequency of the energy harvester was a lower than a normal cantilever structure and sufficiently controllable in 50 - 200 Hz frequency region as adjusting weight of a proof mass. Moreover, the MEMS energy harvester had a high energy conversion efficiency using a shear mode (d_{15}) is much larger than a 33 mode (d_{33}) and the energy conversion efficiency is proportional to the piezoelectric constant (d). We expect the spiral type MEMS power generator would be a good candidate for a standalone power generator for USN.

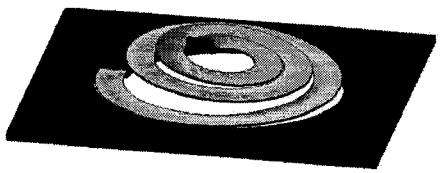

Figure. MEMS power generator with a spiral spring structure