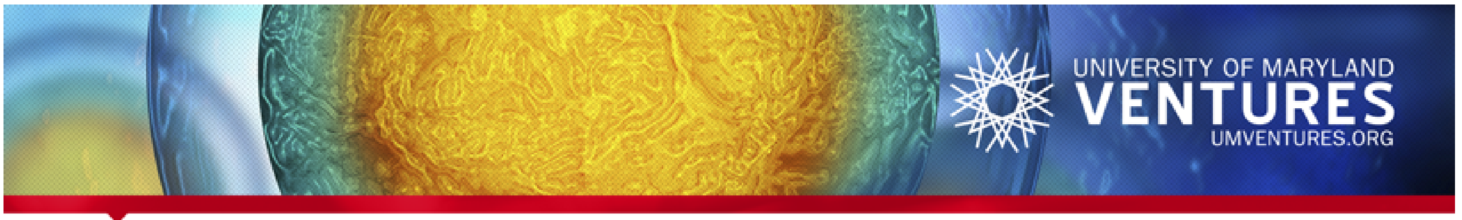

TECHNOLOGY

MEMS Accelerometer for High Acceleration Levels and Extreme Environmental Applications

OVERVIEW

A number of different MEMS accelerometer designs exist and many are commercially available. The variations between these devices include the material used in their fabrication, the geometry of the device, and the method employed to facilitate the acceleration measurement. Different materials are selected based upon factors such as fabrication requirements, device performance requirements, and the environmental conditions where the accelerometer is to be used. The different geometries of MEMS accelerometer are chosen to enhance device performance, to facilitate the selected sensing method, and to comply with the limitations of available fabrication procedures. Three of the most common sensing methods utilized by MEMS accelerometer are based on the use of electrostatic sensing, use of a piezoresistive material, and use of a piezoelectric material.

The present invention provides a micro-scale accelerometer fabricated by using MEMS manufacturing technology. It provides excellent performance even in high acceleration levels and extreme environmental conditions. The invention describes the method of designing the accelerometer and calculating the acceleration with quantitative analysis.
The flexibility of the design facilitates the tuning of the performance characteristics through simple modification of the device's dimensions. Accelerometer fabrication is illustrated using piezoresistive and piezoelectric sensing techniques along with micro-machining processes for this micro-scale device. The major advantages that could be derived from this invention are as follows:
(i) No capacitive sensing required hence
" Less electronic to convert acceleration into electronic signal (saves space).
" Extended limits on accelerometer's ability to function in harsh environments.
" Flexibility to use piezoresistive and piezoelectric sensing depending on environmental conditions
(ii) Design simplicity and two dimensional structure benefits:
" Easily fabricated at the MEMS scale by using standard micro-machining methods.
" At micro-scale level, the accelerometer can accommodate high level of acceleration.

The design, fabrication, and experimental characterization for the accelerometer are also presented. This new topology provides the foundation for a new design approach to accelerometers.

For additional information please contact the Office of Technology Commercialization, University of Maryland. Phone: 301-405-2555.

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Additional Information

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Microelectronics
- Devices
- Aerospace

EXTERNAL RESOURCES

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