SILICON CARBIDE PASSIVATED MEMS CAPACITIVE STRAIN GAUGE

Tech ID: 18033 / UC Case 2009-031-0

ABSTRACT

By 2010, more than 10% of the MEMS market will be devoted to harsh environment sensors. Embedded sensors have increasingly become more popular among the industries that require accurate monitoring of the current phenomena in their physical systems. A range of physical conditions such as variable temperature, fluctuating pressure and external forces induce internal stresses and strains which may lead to fatigue, brittle failure, plastic and permanent deformations in a solid.

Because sensors must be placed as closely as possible to the incident in order to provide accurate readout, they are exposed to harsh and aggressive environmental constraints, which can alter their resolution and accuracy. Current sensor technology includes piezoresistive gauges, surface acoustic wave sensors and fiber Bragg-grating strain sensors. However, each of these technologies has serious limitations like material degradation when exposed to humidity, temperature sensitivity, and dependence on bulky light sources and electronics for output readout.

To address these problems, Researchers at UC Berkeley have developed a high-resolution sensor, which can continuously measure the strain in substrate under aggressive environments such as extreme temperature, corrosive media and high-g shocks. It has a sub-millimeter gauge length capable of precise assessment of strain fields. The device has a novel structural design which performs as a function generator to magnify the applied strain in the desired direction while attenuating the cross-axis strain effect to less than 10% of the readout signal.

APPLICATIONS

» automotive and aerospace.
» oil-well lodging and drilling.

ADVANTAGES

» performs with sensitivity of 45 aF/me over applied strain range of 1-1000 me
» mechanical bandwidth of 535 Hz
» has survived the corrosive ambient test and successfully operated at 370°F in air and dry steam
» nominal cost of SiC coating process (vs. wafers or thick film deposition)

PATENT STATUS

<table>
<thead>
<tr>
<th>Country</th>
<th>Type</th>
<th>Number</th>
<th>Dated</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States Of America</td>
<td>Issued Patent</td>
<td>8,342,031</td>
<td>01/01/2013</td>
<td>2009-031</td>
</tr>
</tbody>
</table>

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Improved Photodetection for Mobile Sensing Applications
- Microfluidic Reagent Delivery System By Hydrogel Dehydration Through A Porous Encapsulant
- Microfluidic Flow Lysometer Device, System And Method
- Direct Patternning Of Materials By Microcapillary Molding
- Metal And Metal Core, Oxide Shell Nanoparticles
- Nano-Aggregate Thin-Film Ultracapacitor Module (N-Atum)
- A Zero-Power, High Throughput Micro, Nanoparticle Printing Via Gravity-Surface Tension Mediated Formation Of Picoliter-Scale Droplets
- MEMS Nanowire Ion Sensor
- Pyroelectric MEMS Infrared Sensor with Numerous Wavelength Absorptions