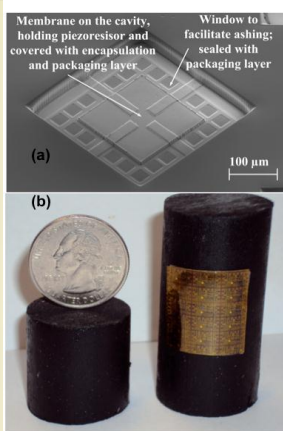




MEMS Sensors on Flexible Substrates for Healthcare Applications

PI: Z. Celik-Butler



(a) SEM micrograph of an absolute pressure sensor showing only the active piezoresistors on the membrane (b) a 2x2 cm² piece of flexible substrate containing an array of 48 pressure sensors.

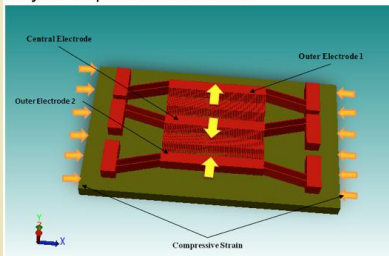


(left) An optical micrograph of a z-axis accelerometer fabricated on a polyimide substrate. (right) A flexible polyimide die containing six z-axis and lateral axis accelerometers, conformally resting on a finger.

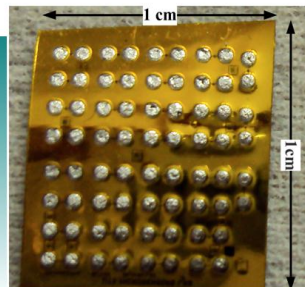
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Characteristics

- Miniature, compact, light-weight, low-power, reliable sensors
- Conformal to a 1 cm radius of curvature or better
- Multifunctional integrated sensors
 - Force/pressure
 - Acceleration
 - Strain
 - Temperature
 - Acoustic
- self-packaged, ready to be integrated with electronics on flexible circuit boards
- Applications in prosthetics, fluid flow measurements, pressure measurements, and other health monitoring instrumentation.

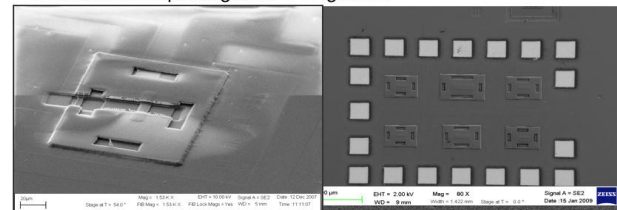


Schematic of a capacitive MEMS strain sensor



Array of temperature sensors embedded in a flexible substrate

Device-level vacuum packaging of sensors. (left) The package is cut to assess the integrity of the underlying cavity. (right) Six MEMS sensors packaged as a single die.





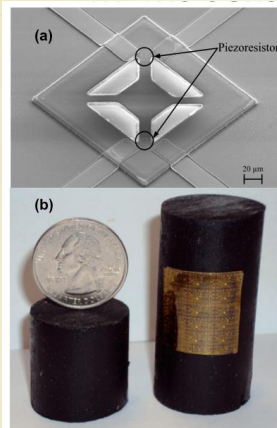
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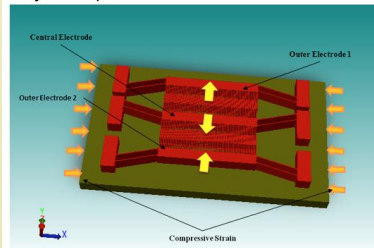
MEMS Sensors on Flexible Substrates for Structural Health Monitoring

PI: Z. Celik-Butler

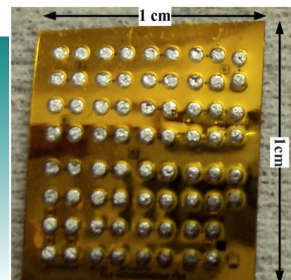
Sponsored in part by AFOSR and Lockheed Martin Aeronautics



(a) SEM micrograph of the relative pressure sensor showing only the active piezoresistors on the membrane (b) a 2x2 cm² piece of flexible substrate containing an array of 48 pressure sensors.

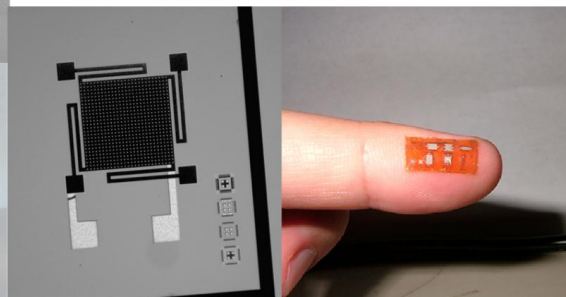


Schematic of a capacitive MEMS strain sensor



Array of temperature sensors embedded in a flexible substrate

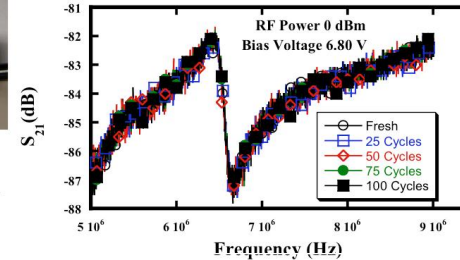
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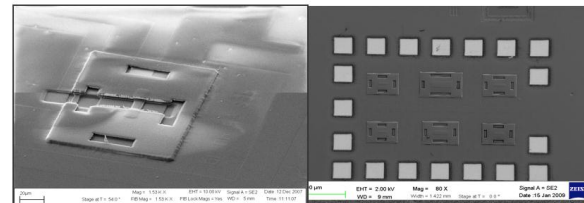
(left) An optical micrograph of a z-axis accelerometer fabricated on a polyimide substrate. (right) A flexible polyimide die containing six z-axis and lateral axis accelerometers, conformally resting on a finger.

Characteristics

- Miniature, compact, light-weight, reliable
- Conformal to a 1 cm radius of curvature
- Multifunctional integrated sensors
 - Force/pressure
 - Acceleration
 - Strain
 - Temperature
 - Acoustic
- Can be self-packaged



Temperature cycling reliability test performed on self-packaged MEMS resonators show no degradation in vacuum characteristics.



Device-level packaging of rf MEMS resonators. (left) The package is cut to assess the integrity of the underlying cavity. (right) Six MEMS resonators packaged as a single die.