



Piezo Film Sensors

Technical Manual

Internet Version

Part 15 of 18

Future Applications
Active Vibration Damping
Sensors on Silicon
Smart Skin

FUTURE APPLICATIONS

Piezo film research is underway into an exciting new array of applications. A sampling of this R&D activity is highlighted below:

Active Vibration Damping

Piezo film sensor and actuator pairs are in development for active vibration damping. In this application, a piece of piezo film is employed as a strain gauge to detect vibration and another piece of piezo film is employed as an actuator to dampen the vibrational noise by applying a 180 degree phase-shifted signal. Wide coverage of piezo film, with distributed electrode patterns, can be used to create individual sensor/actuator pairs. Critical damping has been achieved with this piezo film laminate by researchers at Massachusetts Institute of Technology and elsewhere.

The applications for this technology include the reduction in harmful vibrations in space-based structures, fuselage for aircraft to cancel engine noise, quiet cars, quiet appliances, and a wide range of other possibilities.

Sensors on Silicon

Piezoelectric polymers can be solution cast (spin coated) onto silicon, polarized in place, metallized in pattern arrays, and interconnected with the integrated circuits on the chip. Minor modifications to wafer processing make the silicon suitable for the piezo Polymer Sensor-On-Silicon (PSOS). Early work in PSOS technology at Stanford University was frustrated by the need to adhesively bond thin sheet piezo film onto silicon. The adhesive layer was difficult to apply to the silicon, introducing air bubbles, wrinkles, nonuniform thickness layers, etc. The advent of new piezo polymer processing that eliminates the adhesive makes the PSOS technology practical. R&D work at MSI and elsewhere includes the development of pyroelectric arrays for infrared cameras and thermal imaging devices, ultrasound arrays for high resolution invasive medical imaging, and integrated accelerometers for microminiature components.

Smart Skin

Piezoelectric film can both sense surface energy and can microdeflect the surface. These capabilities may be of interest in active surfaces for sound cancellation, extension of laminar to turbulent flow boundaries, etc. Considerable work is under way at university and government laboratories in these and related applications.