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Micro-Cavity Enhanced Surface Acoustic Wave Devices

Researchers at the University of South Florida have developed Shear-Horizontal Surface Acoustic Wave Sensors for better sensitivity and lower power consumption.

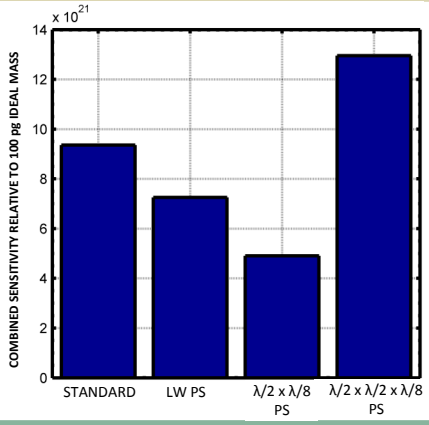
Sensitivity and power consumption are two critical factors in the development of sensors. For Surface Acoustic Wave (SAW) devices, sensitivity is very critical and is improved by decreasing the operational wavelength. It can also be improved through the addition of a guiding layer to create Love-Wave devices. Power consumption is particularly important for sensors with increasing demand for personal and remote sensing applications. Common methods of decreasing insertion loss in SAW devices include utilization of reflective gratings, grooves and corrugated gratings and wave-guides.

Our inventors have developed SAW devices by combining features from these methods to improve SAW device characteristics. To accomplish the same, substrates are etched with square patterns of λ/2, λ/4, λ/8 dimensions of varying depths, referred to as micro-cavities, to increase the dispersion and bulk to surface wave conversion. The micro-cavities are then filled with polystyrene to produce an inhomogeneous waveguide for additional entrapment of wave energy near the device surface. The best-case micro-cavities reduce insertion loss by 19.25 dB from 33.28 dB and exhibit velocity sensitivity 4.83 times larger than that of the standard SAW sensor. Therefore this technology has been proven to show greater energy transmission and sensor sensitivity in comparison to existing structures.

ADVANTAGES:

- **Increases sensitivity**
- **Lowers power consumption**
- **Micro-cavities increase dispersion and bulk to surface wave conversion**
- **Polystyrene acts as an energy waveguide**

Low –Power Sensors With Increased Sensitivity



Comparison of Combined Velocity and Voltage Mass Sensitivities

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