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Film Bulk Acoustic-Wave Resonator Based Ethanol Sensor

Breath alcohol analyzers have been used as a quick and reliable testing device at sobriety checkpoints for individuals suspected of driving under the influence of alcohol. Acetone is typically considered the only endogenous volatile organic compound that can potentially prevent an accurate reading from being produced. It is naturally in a person's breath and is present in increased levels during prolonged fasting or in people with diabetes. The metal oxide sensors commonly used in practice are relatively inexpensive and easy to use, but experience a similar decrease in resistivity as they detect both ethanol and acetone gas. Ethanol and acetone can be differentiated by commercial electrochemical or infrared instruments, but those are complex, expensive, and require extensive training.

Researchers at Arizona State University have created a zinc oxide based Film Bulk Acoustic-wave Resonator (FBAR) that can be used to measure ethanol concentration in the environment. This method can distinguish between ethanol and acetone gas, which is the one failure of current ethanol sensors. The resonant frequency increases with acetone concentration and decreases with ethanol concentration under this approach. A more precise reading eliminates the need for more extensive breath analysis at the police station. FBAR is also well established in wireless communication technology, which could lend it the opportunity to be employed as a wireless passive sensor.

Potential Applications

- Breath Alcohol Analyzers
- Ethanol Sensor
- Filters
- High Sensitivity Mass Sensors
- Ultraviolet Radiation Detection

Benefits and Advantages

- Selectivity between acetone and ethanol
- Cost Effective
- Easy to Use