

## Summary

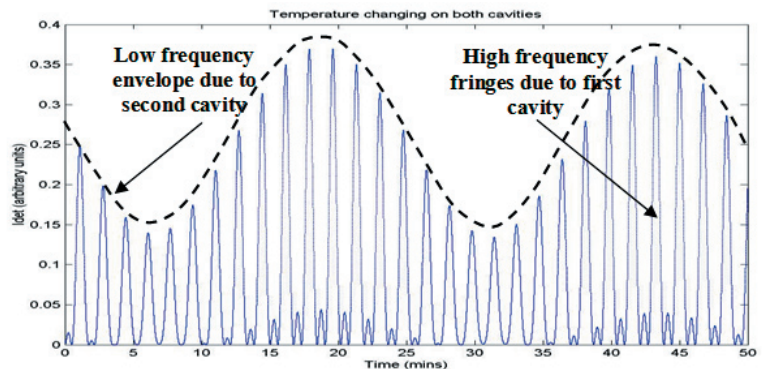
We have designed a novel three-mirror sensor that measures two independent parameters such as hydrogen concentration and the temperature simultaneously. The three-mirror sensor has the ability to extract two sets of parameter measurements simultaneously with a single sensor head and single wavelength, thereby minimizing system cost and complexity and increasing accuracy since both parameters are measured at the same spatial location.

## The Technology

Our sensor has two resonant optical cavities. In a typical application, such as the measurement of hydrogen concentration and temperature, both cavities are made sensitive to temperature, but only one cavity is sensitive to hydrogen. Palladium (Pd) or palladium alloys are usually used in hydrogen sensors since hydrogen induces electrical, optical and structural changes in these materials. When designed so the rate of change of volume with temperature is orders of magnitude different than the rate of change of volume with hydrogen, the output signal from the sensor will be a sinusoid modulated by an envelope of a different frequency.

The two signals, having different frequencies, are separated and the effect of temperature and hydrogen on the sensor separated. This architecture allows for the simultaneous detection of hydrogen and temperature while eliminating the need to have multiple sensors.

This sensor can be designed for any application that requires the monitoring of two independent parameters, for example pressure-temperature, strain-temperature, and in chemical and biological sensing, etc. Since most sensors are sensitive to other variables besides the desired one, our technique is beneficial to almost all sensing applications. Because the sensor is ultra sensitive, it can be used for leak detection applications as well as hydrogen monitoring applications.



Corporate Research and Technology Transfer  
 Florida Institute of Technology  
 150 W. University Blvd.  
 Melbourne, FL 32901  
 Phone: (321) 674-8960 | Fax: (321) 674-8969

**Inventor: Barry G. Grossman and Sachin Dekate**  
**Contact: (321) 674-7429 and (321) 674-7051**  
**E-mail: grossman@fit.edu and sdekate@gmail.com**