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Infrared Gas Sensor

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INFRARED GAS SENSOR

THE NEED

In recent years, the rapid development of monitoring and detecting technology of indoor air quality have been observed. We have seen the two major streams of detection technology introduced so far: Acoustic wave sensor and Infrared gas sensor. The use of a gas monitoring system in the case of that dangerous levels of gases are detected, can help to prevent an explosion or can help to prevent worker injury or exposure to toxic gases. Action can be taken, and initiated automatically by the gas monitor, to help prevent the gas level from rising further. Such action could be the automatic shutoff of gas valves, turning on a ventilation fan, shutting down a process, or audible and visual alarms to alert and evacuate personnel. In some situations, the gas monitor is used for process control. Different with acoustic wave sensors which were described at the website (http://www.ect-purdue.org/ECT/Other/AcousticWaveSensor), infrared gas sensors were created and have been developed on the basis of the fact that most gases have unique infrared signatures in the 2-14 micron wavelength region and each gas has a unique infrared absorption line.

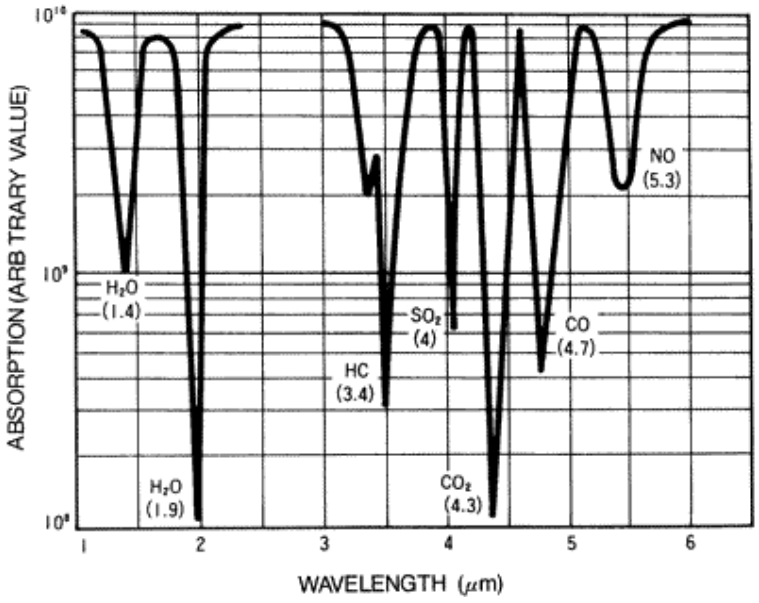

FIGURE 1 INFRARED ABSORPTION OF COMMON GASES

Sensors – Security

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THE TECHNOLOGY

Most gases will absorb infrared (IR) light over certain wavelengths. The wavelengths absorbed by a particular gas, and the intensity of the absorption, are very distinct for each gas, sort of like a "fingerprint" for the gas. An Infrared gas sensor makes use of this physical aspect of gases.

An infrared sensor typically consists of a chamber which the sample gas is passed through. At one end of the chamber there is an IR source, which is a amp bulb or heater which produces IR energy.

At the other end of the chamber is an IR detector element. This IR detector measures the amount of IR energy that reaches it, and produces a signal output proportional to the amount of this energy.

Generally there is an IR filter in the IR path, which allows the detector only to look at a particular wavelength region of IR energy. If gas which absorbs this particular wavelength or IR energy is present in the sample flowing through the detection chamber, it will reduce the amount of IR energy that reaches the detector. The measuring circuit compares this IR energy to the energy that is present when fresh air is in the chamber (or when the IR source is turned off), and interprets the signal and processes it as a measured reading of the detected gas.

Optical measurements are the most accurate and most reliable method for gas analysis. Until now, optical instruments have been big, complex, and expensive. Ion Optics' unique patented optical technology platform can shrink a high quality optical sensor onto a tiny silicon chip. The key breakthrough is the ability to control optical wavelengths in a flat, two-dimensional structure which is built through conventional silicon processing. This tunable wavelength capability is the heart of Ion Optics' optical technology platform.

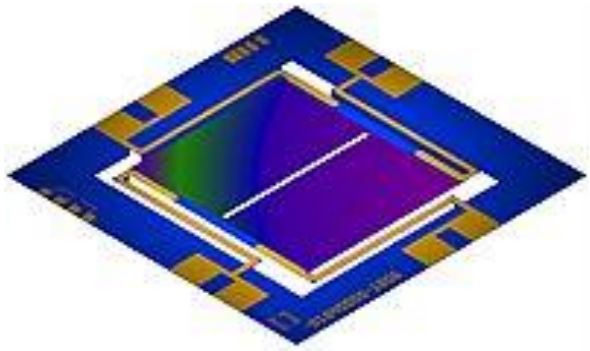

FIGURE 2 ION OPTICS SENSORCHIP
(COURTESY OF ION OPTICS INC.)

The SensorChip is a wavelength-tuned, Microelectromechanical Systems (MEMS) - based micro-bridge element. The key innovation is MEMS-based micro-bridge elements that are wavelength-tuned emitters and wavelength-tuned detectors. Using photonic bandgap (PBG) technology, the micro-bridge emits and absorbs efficiently in a narrow waveband centered on the signature wavelength of the target gas. Ion Optics

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tunes the infrared wavelength (like an LED) during production using standard, stable semiconductor manufacturing techniques.

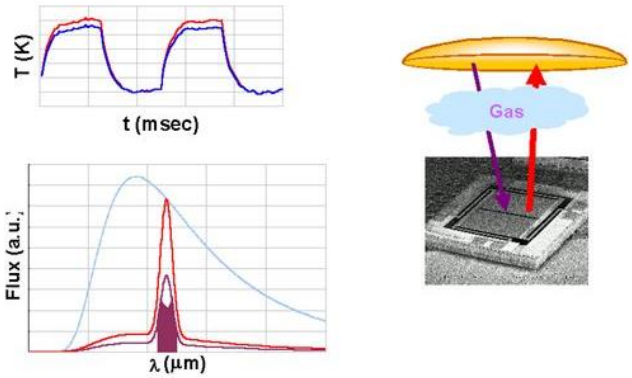

FIGURE 3 HOW IT WORKS

THE BENEFITS

Conventional infrared gas sensors, on the other hand, are very accurate and reliable. But they have historically been big, complicated and expensive because they are actually a cabinet full of several discrete components which are usually hand-selected and hand-assembled. This has limited the role of infrared gas sensors to laboratory and industrial settings.

Ion Optics' patented optical technology platform allows us to build all the optical components -- emitter, filter, detector -- onto a single silicon chip. Since this chip is designed according to standard microelectronics design practices, we can build the chip in standard semiconductor foundries.

STATUS

The infrared gas sensor technology has been applied to various markets: Carbon monoxide (CO) detection which is estimated as 71% of 102 M housing units are heated using a combustion process, and Air quality monitoring. In addition, automobile exhaust monitoring, automobile "cabin" air quality, gasoline vapor emissions monitoring, oil quality monitoring, gas leak detectors, home food spoilage monitors, home fire/burnt cooking detectors, water quality monitoring and non-invasive blood glucose monitoring have became major markets for the infrared gas sensor.

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