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Highly Sensitive Uncooled, Narrowband, Infrared Detector

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Uncooled Infrared Detectors

Current uncooled infrared detectors are broadband devices that are not sensitive enough to use narrow spectral lines to detect trace amounts of material. Their performance is fundamentally limited by excessive background noise levels. Uncooled infrared detectors have traditionally been limited to detecting single gases because they need special wavelength-selective filters.

Narrowband Sensor is Highly Sensitive

The thermal radiation limit is bypassed using a low emissivity thermal detector which used alone greatly reduces the sensitivity; however, this new design is optimized to couple light into a sensor. Light oscillates at greater amplitude when it is coupled with the sensor (on-resonance), while the light of a different frequency than the sensor is optimized for (off-resonance) is substantially reflected away. Light that strikes from an angle off the optical cavity axis only interacts minimally with the sensor because of the reduced absorption characteristics of the sensor. Such narrowband sensors can gain as much as 100% of the signal from one direction and spectral band, while receiving a fraction of radiation noise from all spectral bands and directions.

Thermal Detector Provides Functionality with Less Cost

This detector can recognize unique absorption spectra of gases which allows the detector to “see” the chemical fingerprint region of the gas as easily as cooled sensors (without the cost, weight, and overhead associated with external cooling), and can scan any desired set of wavelengths across the infrared spectrum without the limitations of fixed filters.

The thermal detector has applications in multi-gas, handheld detection equipment for first responders and can provide a “point and click” method of chemical detection.

FEATURES AND BENEFITS OF UNCOOLED INFRARED DETECTOR:

- The uncooled infrared detector has much higher sensitivity than existing uncooled devices (at least an order of magnitude)
- The uncooled infrared detector is lightweight, low-power, and portable compared to cooled devices - which get maximum performance using liquid nitrogen or marginal performance using high-power thermoelectrics.
- The uncooled infrared detector allows trace chemical detection from a distance using a “point and click” method.

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Category
Engineering & Physical Sciences/Instrumentation, Sensors & Controls

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