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NASA TECH BRIEF

Ames Research Center

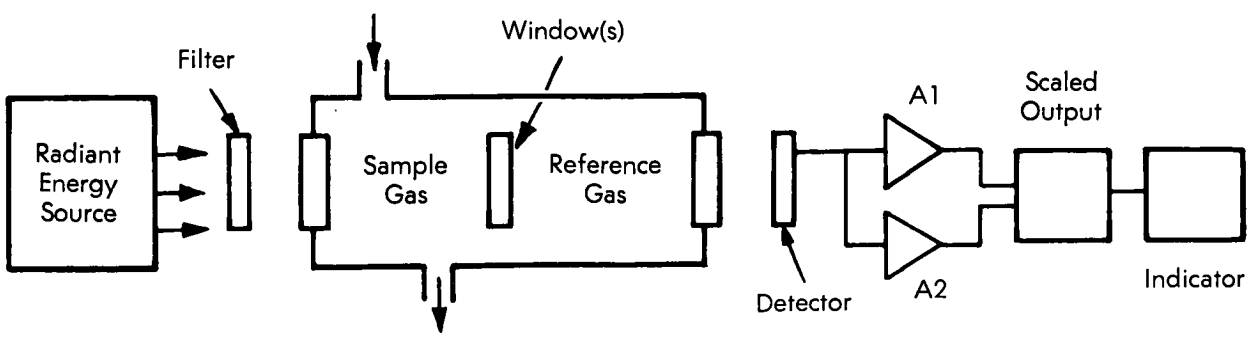
Improved Nondispersive Infrared Analyzer

A nondispersive infrared analyzer for gases, based on absorption-modulation ratios of known and unknown samples, has been described previously (see Reference). In essence, the densities of a reference gas and the unknown gas mixture are modulated in such a way that a mixing of absorption effects in light energy passing through the gases to a photodetector produces a signal component that is related to the absorption caused by the reference-gas component in the unknown gas mixture.

Continued development of the analyzer has led to an improved design which is depicted in the diagram. As indicated, light from the radiant energy source passes through the filter and through the sample and reference gas chambers to the detector. The sample gas chamber can be filled and emptied as required for a number of determinations. The reference gas chamber is sealed; it contains an amount of the gas to be measured in the sample in a quantity sufficient to provide an appropriate density in admixture with other gases that are optically neutral, e.g., helium and nitrogen. The filter is selected to transmit light in that portion of the infrared region where the gas to be measured is absorbed; it may be a gelatinous, interference, dispersive, or negative-gas filter, as required.

The amount of absorption of radiant energy by the sample gas and by the reference gas is dependent, through Beer's law, on the product of the path length and the partial density of each gas in its chamber. That product is changed by varying the density sinusoidally by means of an acoustic driver and resonator, moving mirrors, or application of other modulation devices. The intensity of light reaching the detector will be altered by the periodically fluctuating absorptions of the gases present in the gas chambers. Typically, the length of the sample gas chamber would be chosen so that the absorption by the sample gas would reduce the intensity of the spectral lines of interest by a factor of approximately two at the maximum expected density; modulation, in turn, would be approximately 5% of the initial energy in the band of interest.

The output resulting from the modulation of the sample gas is amplified by a frequency selective amplifier (A1) tuned to the modulation frequency f_1. Simultaneously, the output at the reference, f_2, is amplified by amplifier A2. The resulting signals are proportional to the fluctuating densities of the gases in the two chambers. Comparison of the two signals provides a reading on the indicator that is directly proportional to the ratio of the concentration of the reference gas in the sample mixture to its concentration in the reference chamber.



(continued overleaf)

Reference:

Dimeff, J., *et al.*: Nondispersive Infrared Analyzer for Specific Gases in Complex Mixtures. NASA Tech Brief B72-10198.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

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Reference: B74-10243

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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