Dual-Gas Microcavity Raman Sensor and Method of Use

Researchers at the University of South Florida have developed an invention that consists of an ultra-sensitive Raman chemical sensor based on enhanced spontaneous emission.

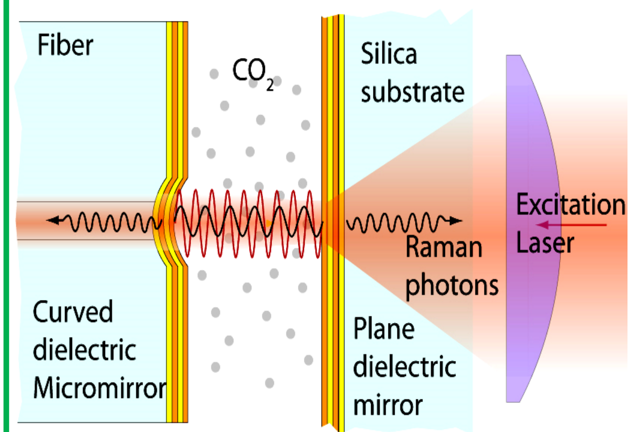
The sensors with resonators have cavity spacing less than a wavelength. The resonators are only stable for certain conditions. The effective finesse decreases with increasing cavity length for real laser beams with finite widths. This is because the double resonance was achieved through an off-axis orientation of the excitation beam. This type of geometry is incompatible for other types of study. Hence, there is a need for a sensor that can do simultaneous measurement of the density of both the first species of interest and the second species of interest that are fluids.

Researchers at USF have developed an invention that has highly stable microcavity by using concave micro mirrors. This helps the invention to have much longer cavity spacing. A sample containing a species of interest is introduced into a microcavity having a microcavity length dependent upon the Raman emission of the species of interest. An excitation laser signal having a wavelength determined by the microcavity length is then introduced into the microcavity. The Raman emission of the sample is then measured to determine the concentration of the species of interest within the sample. The microcavity arrangement is capable of sustaining the double resonance condition with high finesse for Raman scattering in fluids.

ADVANTAGES:

- Capable of sustaining the double resonance condition
- Simultaneous measurement
- High degree of accuracy

High Finesse Microcavity



A Schematic of Microcavity Raman Sensor

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