Improved Spectrometer for Long Path Length Absorbance

OTT ID# 1207

APPLICATION

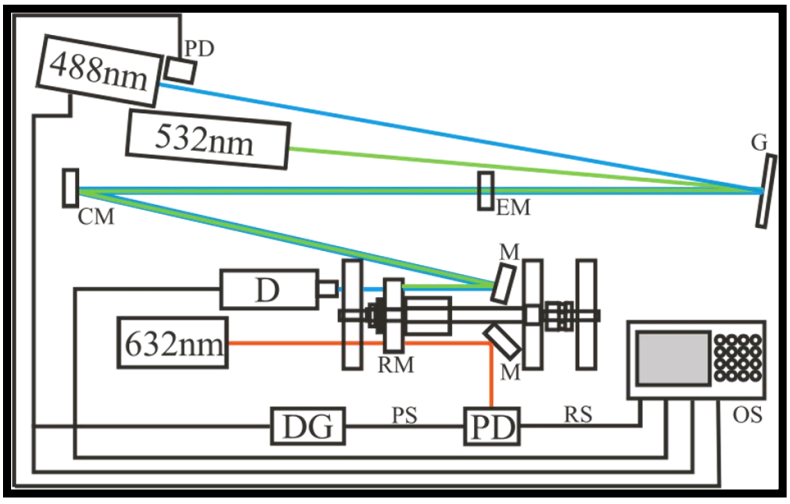
Absorbance Spectroscopy, Chemical And Analytical Lab Research Tools, Flow Injection, Gas Chromatography, Liquid Chromatography, Capillary Electrophoresis, HPLC etc.,

TARGET PROBLEMS

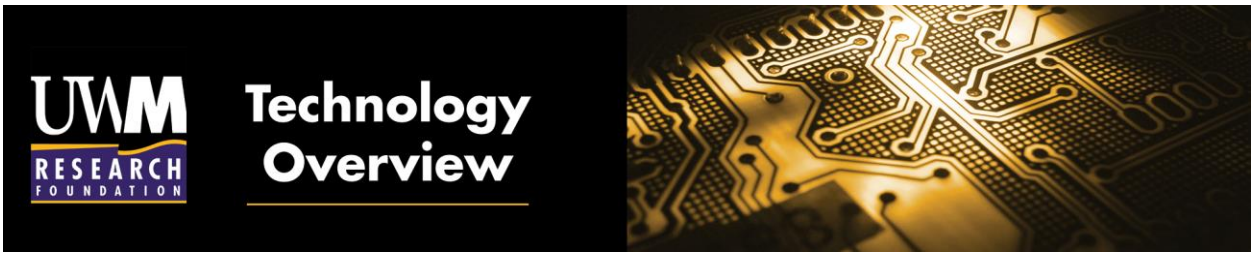
- Conventional spectrometer configuration have limited narrow range of measureable concentrations.
- Limited path length that limits the sample range.

TECHNOLOGY

Inventors at University of Wisconsin - Milwaukee (UWM) have developed an improved approach to abosorbance spectroscopy. This technology improves the optical configuration of spectrometers for long path length absorbance measurements for gass and condensed phase. The current technology uses a compact optical cavity with a rotating mirror to control the beam path length.



Long path length spectrometers are conventionally constructed of two parallel fixed mirrors with the sample to be measured between the mirrors. The amount of energy absorbed by the gaseous or liquid sample is measured and converted to sample concentration. The longer the beam path through the sample, the more energy is absorbed, and, consequently, the lower the concentration levels that can be measured. Conventional spectrometer configurations are typically limited to a narrow range of measurable concentrations because of limited sample path length. This new technology increases the effective path length by incorporating a unique beam delivery mechanism with an electronic controller. Additionally, in contrast to conventional spectrometers, this system has a dynamic optical path length that allows a very wide range of concentrations to be measured, which may prove to extend from femtomolar (~10^{-15}) to millimolar (~10^{-3}) levels. HPLC is an example of a technique that could benefit from this unprecedented capability in measuring a wide range of concentrations, e.g., samples containing both ultra-trace as well as relatively high levels could be measured in the same chromatographic run. The proof of concept of the technology was successfully demonstrated using a prototype.



KEY BENEFITS

- **WIDE SAMPLE CONCENTRATIONS:** Allows for measurement of extremely dilute samples and adjustable path length also allows for measurement of high concentration samples
- **LOW COST:** Design uses standard optics and off-the-shelf spectrometer components
- **FLEXIBLE DESIGN and VARIABLE PATH LENGTH:** The dove prism configuration allows for liquid flow-through spectroscopy and evanescent wave measurements of condensed phase samples

INTELLECTUAL PROPERTY

US Patent 9,013,700

Variable path length photon trapping spectrometer

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Please reference: OTT ID. 1207