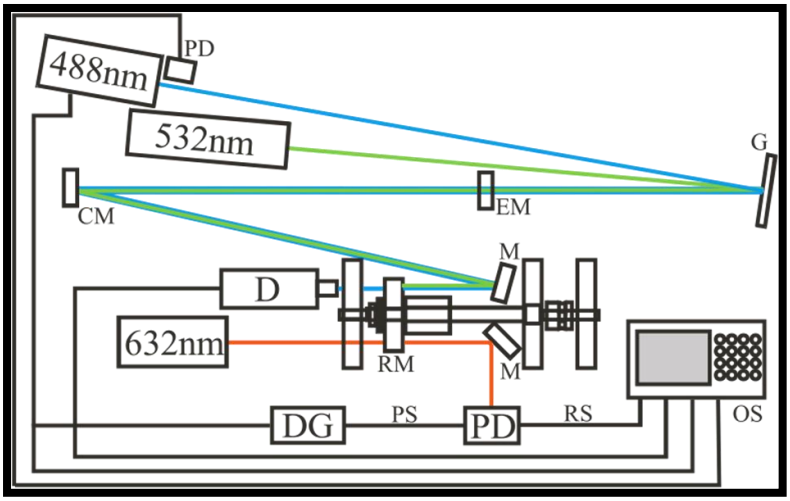
Improved Spectrometer for Long Path Length Absorbance

OTT ID# 1207

TECHNOLOGY

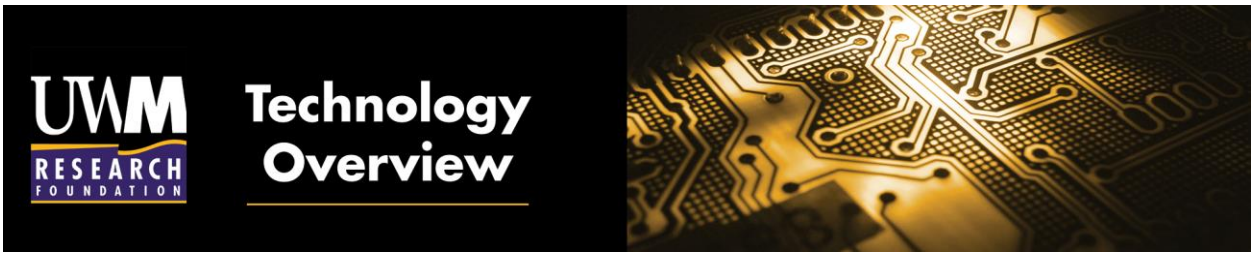
This technology improves the optical configuration of spectrometers for long path length absorbance measurements for gases and condensed phases. Developed by Drs. Aldstadt & Geissinger as an improved approach to absorbance spectroscopy, this technology uses a compact optical cavity with a rotating mirror to control the beam path length. Based on this technology a prototype was constructed and successfully demonstrated the proof of concept.



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.

FEATURES/BENEFITS

- Allows for measurement of extremely dilute samples
- Adjustable path length also allows for measurement of high concentration samples
- Design uses standard optics and off-the-shelf spectrometer components
- 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.

MARKETS

Spectrometry plays very important role in the chemical analytical industry and life sciences. The spectrometry market caters to several end user segments such as life sciences, biotechnology, petrochemical, food and safety, and forensics among several others.This technology may also be applied to flow injection, gas chromatography, liquid chromatography, and capillary electrophoresis. BCC Research reports that the global spectrometry market increased from $7.8 billion in 2011 to $8.5 billion in 2012 and is expected to reach $14.8 billion in 2017, a compound annual growth rate (CAGR) of 11.7% for the forecast period of 2012 to 2017. Increasing applications of spectrometry devices in toxicology and proteomics and disease marker is contributing wide range of growth in global spectrophotometer market.

INVENTORS

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Dr. Joseph Aldstadt is an Associate Professor in the Department of Chemistry & Biochemistry at UW-Milwaukee. His laboratory research encompasses studies of analytical instrument design and environmental trace analysis. These include methods (Atomic Absorption Spectroscopy, Stripping Potentiometry) for better understanding the speciation, transport, and fate of metals (As, Pb) in environmental solids (soils, sediments) and long-pathlength approaches to molecular absorbance spectroscopy (Photon Trapping Spectroscopy) in collaboration with Prof. Geissinger.

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