



Docket Number
20121205

Laser Identification of Matter Through Induced Splitting LIMITIS

Patent Pending

Recent studies suggest that a mirror cavity can be used to amplify infinitesimal birefringence induced in a material. This opens up a means to identify minute even highly degraded samples of a specific material based on its optical properties.

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Key Features:

Identification of material samples that are degraded through inducing changes in a sample's optical properties.

Field:

Physics & Chemistry

Technology:

Non-invasive, potential stand-off means of identifying airborne contaminants.

Stage of Development:

Initial

Status:

Seeking further research & development support and/or licensing partner.

Patent Status:

Pending

Background:

Numerous applications exist for the development of a quick test for toxins and chemical hazards. Traditional methods use the emission and absorption spectra to determine the chemical compositions of samples. These methods are limited by the size of the sample and the strength of the probing electromagnetic field. The method proposed here looks to amplify the changes in an electromagnetic field due to a sample material through utilizing a mirror cavity system along with an oscillating excitation of the material. This can allow materials to be identified even where considerable degradation has occurred. Furthermore, this technology can determine if significant contaminants exist in an area by meticulously detecting changes in or displacement of oxygen in an area.

Statement of Problem:

Currently, there is much interest in developing systems that can detect chemical or biological hazards. In the industry, LiDAR and spectroscopy provide the major detection mechanism to determine what chemicals are present in a given sample. Both of these solutions are limited by the amount of a contaminant that must be present and subject to the need for considerable infrastructure and time to make a determination. For use in the field a more compact system is needed.

Potential Solution:

FAMU has developed and is in the process of patenting a system that could offer considerable advantages in identifying the presence of chemical contaminants. This system was originally designed to detect minute changes in the optical properties of atmosphere even down to vacuum levels of $\sim 10^{-9}$ Torr. In standard atmospheric conditions, it can be scaled to a small, hand-held device and still offer an unprecedented range of detection. In a post-9/11 world, this type of solution could provide the much-needed ability to detect minute quantities of a designated contaminant.

Commercialization Status:

The system described here, Laser Identification of Matter Through Induced Splitting (LIMITIS) is currently in the early development stage, and support for further R&D is currently being sought through the Department of Defense and the Department of Energy. Future work will focus on the identification of known samples and calibration of the detector, understanding the limits presented by sample size and degradation as well as the development of a small, hand-held device for potential field use. These studies will further determine efficacy of the technology under field conditions. We are seeking collaborative partners or licensees in the remote sensing and detection industry to take these developments into commercialization.