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LLNL-TR-747180

Development of Fluorescence Lifetime Diagnostic Final Report CRADA No. TSB-1449-97

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Disclaimer

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

DEVELOPMENT OF FLUORESCENCE LIFETIME DIAGNOSTIC

Project Accomplishments Summary (Attachment I)
CRADA No. TSB-1449-97

Date: 2/18/98 Revision: 1

LLNL--9900131

A. Parties

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and Optiphase, Inc.

University of California
Lawrence Livermore National Laboratory
7000 East Avenue, L-399
Livermore, CA 94550

Optiphase, Inc
7652 Haskell Ave.
Van Nuys, CA 91406
Technical Contact - Dr. Pepe Davis
(818)782-0997ext112

B. Background

Fiber-optic-based sensors are excellent candidates for detecting the presence and monitoring the levels of degradation products in stockpiled weapons. Specifically, fluorescence-based sensors are extremely sensitive, can have high specificity for compounds of interest, and are "electrically inert". In addition to their applications in the enhanced surveillance program, fiber optic sensors are important for remote sensing, environmental remediation, and medical diagnostics.

Optiphase Inc. has developed inexpensive technology for extremely precise measurement of phase shifts of interferometric optical and electrical signals. The company was interested in applying this capability in the rapidly expanding field of fluorescence lifetime spectroscopy, but lacked the expertise and resources associated with fluorescence chemistry and instrumentation. LLNL's fiber-optic sensor group had significant expertise in these areas, but had previously concentrated its efforts on the chemistry, sensitivity, and selectivity of fluorescence *amplitude-based* sensors. Stability is a well known issue with this type of sensor whereas *lifetime-based* sensors exhibit excellent stability, a critical factor for the efficacy of sensors employed in the long-term monitoring of stockpiled weapons. Cooperation with the company afforded LLNL access to enabling, proprietary technology which could simplify and acceleratethe transition to the next level of Enhanced Surveillance Program (ESP) sensor sophistication, namely fluorescence lifetime based sensors.

C. Description

LLNL and Optiphase researched fiber optic based fluorescence lifetime instrumentation which, through the incorporation of innovative technology supplied by Optiphase Inc., could lead to a reliable, simplified, and low-cost system mutually compatible with future interests of the company and the long-term stability requirements of ESP sensors.

D. Expected Economic Impact

Optiphase is continuing to pursue development of fiber optic based fluorescence sensors based on the results obtained from this initial research.

E. Benefits to DOE

Fiber-optic-based sensors are excellent candidates for detecting the presence and monitoring the levels of degradation products in stockpiled weapons. Specifically, fluorescence-based sensors are extremely sensitive, can have high specificity for compounds of interest, and are "electrically inert". In addition to their applications in the enhanced surveillance program, fiber optic sensors are important for remote sensing, environmental remediation, and medical diagnostics. Aiding in this research thus supported strategic R&D goals for enhanced surveillance.

F. Industry Area

Fiber optic fluorescence sensors

G. LLNL Point of Contact for Project Information

Matt Everett, Bldg 132, Rm. 2715, Phone 424-5854

H. Company Size and Point(s) of Contact

Size of Optiphase - Approximately 10 employees

Contact:
Dr. Pepe Davis
Tel: (818) 782-0997 ext. 112
Fax: (818) 782-0999

I. Project Examples

None

J. Release of Information

Matt Everett, Physicist, Medical Technology Program, Lasers, Bldg 132, Rm. 2715, Phone #4-5854

Attachment I

RELEASE OF INFORMATION

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Pepe Davis — 8-6-98

Dr. Pepe Davis
Optiphase, Inc.
Senior Research Scientist

Date

RELEASE OF INFORMATION

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

Karena McKinley, Director
Industrial Partnerships
and Commercialization

10/7/98
Date