

PROCEEDINGS OF SPIE

***Chemical, Biological,
Radiological, Nuclear, and
Explosives (CBRNE) Sensing XVI***

Augustus W. Fountain III
Editor

21–23 April 2015
Baltimore, Maryland, United States

Sponsored and Published by
SPIE

Volume 9455

Proceedings of SPIE 0277-786X, V. 9455

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Sensing XVI*, edited by Augustus W. Fountain III, Proceedings of SPIE Vol. 9455 (SPIE, Bellingham, WA, 2015) Article CID Number.

ISSN: 0277-786X

ISBN: 9781628415711

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time)- Fax +1 360 647 1445

SPIE.org

Copyright © 2015, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/15/\$18.00.

Printed in the United States of America

Publication of record for individual papers is online in the SPIE Digital Library.

SPIE
Digital Library

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print. Papers are published as they are submitted and meet publication criteria. A unique citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages.

Contents

- vii *Authors*
- ix *Conference Committee*
- xi *Introduction*

RADIOLOGICAL DETECTION

- 9455 02 **Neutron spectroscopy using III-V semiconductor scintillators** [9455-1]
- 9455 03 **Subwavelength films for standoff radiation dosimetry** [9455-2]
- 9455 04 **Dehydration of uranyl nitrate hexahydrate to the trihydrate under ambient conditions as observed via dynamic infrared reflectance spectroscopy** [9455-3]
- 9455 05 **Effects of sample preparation on the infrared reflectance spectra of powders** [9455-4]
- 9455 06 **Use of CLYC spectrometer in counter-terrorism applications** [9455-5]

BIOLOGICAL DETECTION

- 9455 07 **Quartz crystal microbalance biosensor for rapid detection of aerosolized microorganisms** [9455-10]
- 9455 08 **Standoff detection and classification procedure for bioorganic compounds by hyperspectral laser-induced fluorescence (Best Paper Award 2nd Place)** [9455-11]
- 9455 09 **Bioaerosol detection and classification using dual excitation wavelength laser-induced fluorescence** [9455-12]
- 9455 0A **Analysis of protective antigen peptide binding motifs using bacterial display technology** [9455-13]
- 9455 0B **Multisense chip: continuously working air monitoring system: An integrated system for the detection of airborne biological pathogens on molecular and immunological level** [9455-14]

ALGORITHMS FOR CBRNE SENSING

- 9455 0D **Bio-inspired digital signal processing for fast radionuclide mixture identification** [9455-17]
- 9455 0E **Single-wavelength lidar retrieval algorithm of particulate matter concentration using CELIS (Compact Eyesafe Lidar System) a 1.5 μm elastic lidar system** [9455-18]

- 9455 OF **Maximum discrimination approach for classification of nearly identical signatures** [9455-19]
- 9455 OG **Non-specific sensor arrays for chemical detection** [9455-20]
- 9455 OH **Removal of nonresonant background in MCARS spectra using Fourier filtering** [9455-21]
- 9455 OI **Trace explosives detection using photo-thermal infrared imaging spectroscopy (PT-IRIS): theory, modeling, and detection algorithms** [9455-22]

CHEMICAL SENSING I

- 9455 OK **New plasmonic materials and fabrication tools for near- and mid-infrared sensing and spectroscopy (Invited Paper, Best Paper Award 1st Place)** [9455-24]
- 9455 OL **Detection of chemical clouds using widely tunable quantum cascade lasers** [9455-25]
- 9455 OM **Detecting liquid contamination on surfaces using hyperspectral imaging data** [9455-26]
- 9455 ON **The development of a wide-field, high-resolution UV Raman hyperspectral imager** [9455-27]
- 9455 OO **Advanced shortwave infrared and Raman hyperspectral sensors for homeland security and law enforcement operations** [9455-28]

EXPLOSIVES SENSING

- 9455 OQ **Single-shot stand-off detection of explosives precursors using UV coded aperture Raman spectroscopy** [9455-30]
- 9455 OR **Advances in sublimation studies for particles of explosives** [9455-32]

CHEMICAL SENSING II

- 9455 OS **Experimental examination of ultraviolet Raman cross sections of chemical warfare agent simulants** [9455-33]
- 9455 OT **Photoacoustic chemical sensing: layered systems and excitation source analysis** [9455-34]
- 9455 OU **Cooperative use of standoff and UAV sensors for CBRNE detection** [9455-35]
- 9455 OV **Detection of munitions grade g-series nerve agents using Raman excitation at 1064 nm** [9455-36]

CHEMICAL SENSING III

- 9455 OW **A molecularly imprinted polymer (MIP)-coated microbeam MEMS sensor for chemical detection** [9455-37]

- 9455 OX **A study of single-beam femtosecond MCARS in trace material detection** [9455-38]
- 9455 OY **Differential excitation spectroscopy for detection of chemical threats: DMMP and thiodiglycol** [9455-39]
- 9455 OZ **Breadboard sized photo-acoustic spectroscopy system using an FPGA based lock-in amplifier** [9455-40]