PROCEEDINGS OF SPIE

Advanced Manufacturing Technologies for Micro- and Nanosystems in Security and Defence II

Andrea Camposeo
Yuris Dzenis
Maria Farsari
Luana Persano
Editors

9–10 September 2019
Strasbourg, France

Sponsored by
SPIE

Cooperating Organisations
European Optical Society
Cranfield University (United Kingdom)

Published by
SPIE

Volume 11168

Proceedings of SPIE 0277-786X, V. 11168

Advanced Manufacturing Technologies for Micro- and Nanosystems in Security and Defence II
edited by Andrea Camposeo, Luana Persano, Proc. of SPIE Vol. 11168, 1116801
 · doi: 10.1117/12.2554469

The papers 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. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers 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 these proceedings:
Author(s), "Title of Paper," in *Advanced Manufacturing Technologies for Micro- and Nanosystems in Security and Defence II*, edited by Andrea Camposeo, Yuris Dzenis, Maria Farsari, Luana Persano, Proceedings of SPIE Vol. 11168 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

ISSN: 0277-786X
ISSN: 1996-756X (electronic)

ISBN: 9781510630390
ISBN: 9781510630406 (electronic)

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

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

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

SPIE. DIGITAL LIBRARY
SPIEDigitalLibrary.org

Paper Numbering: *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of 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 and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five 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.

Contents

Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Conference Committee

Symposium Chairs

Ric Schleijpen, TNO Defence, Security and Safety (Netherlands)
Karin U. Stein, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Symposium Co-chair

Catherine Barrat, HGH Systèmes Infrarouges (France)

Conference Chairs

Andrea Camposeo, Istituto Nanoscienze, CNR (Italy)
Yuris Dzenis, University of Nebraska-Lincoln (United States)
Maria Farsari, Foundation for Research and Technology-Hellas (Greece)
Luana Persano, Istituto Nanoscienze-CNR (Italy)

Conference Programme Committee

Tommaso Baldacchini, Newport Corporation (United States)
Lynda E. Busse, U.S. Naval Research Laboratory (United States)
John T. Fourkas, University of Maryland, College Park (United States)
Jesper Glückstad, Technical University of Denmark (Denmark)
Andreas Heinrich, Hochschule Aalen - Technik und Wirtschaft (Germany)
Natalia Vladimirovna Kamanina, S.I. Vavilov State Optical Institute (Russian Federation)
Eunkyoung Kim, Yonsei University (Korea, Republic of)
Norihisa Kobayashi, Chiba University (Japan)
Beata Luszczynska, Lodz University of Technology (Poland)
Andreas Ostendorf, Ruhr-Universität Bochum (Germany)
Alberto Piqué, U.S. Naval Research Laboratory (United States)
Dario Pisignano, Università di Pisa (Italy)
Bastian E. Rapp, Karlsruher Institut für Technologie (Germany)
Haizheng Zhong, Beijing Institute of Technology (China)

Session Chairs

1 Advanced Nanofabrication
Andrea Camposeo, Istituto Nanoscienze (Italy)

2 Smart Structures and Interfaces
Sara Cavaliere, Institut Charles Gerhardt Montpellier (France)

Introduction

The second edition of the conference Advanced Manufacturing Technologies for Micro- and Nanosystems in Security and Defence was held in Strasbourg, France, 9-10 September 2019, within the framework of SPIE Security + Defence 2019. The conference aims to establish a platform for the most innovative and advanced manufacturing technologies, which can have an impact on the fabrication of photonic and optoelectronic devices for security and defense applications. In this context, there is an increasing interest in novel manufacturing technologies which might enable the fabrication and assembly of devices by autonomous systems, capable of operating in harsh and hostile environments, possibly by remote control. The emerging 3D printing technologies and self-assembly nanotechnologies in combination with smart and functional materials can provide interesting new routes towards self-assembling, self-repairing and self-powering devices for defence and security.

The conference's two days of technical sessions gave us an updated overview of the state-of-the-art of the most advanced manufacturing technologies for photonic and optoelectronic devices, which included high resolution 3D printing technologies, electrospinning, additive manufacturing of optical components, 4-dimensional printing, surface patterning and treatment, solid state lasers and novel application of electrospun fibers.

This volume highlights the papers presented at the conference, which include the use of ultrashort ring-airy laser beams for the fabrication of 3D structures on large areas with high resolution by using multiphoton polymerization and the treatment of optical surfaces by plasma chemical vaporization machining. In addition, DNA-based nanofabrication approaches are reviewed and demonstrated to be a valuable tool for high resolution pattering.

The conference chairs acknowledge all authors for their contributions to the symposium. Special thanks go to the members of the Program Committee for their valuable contribution and to the invited speakers for their exciting and inspiring presentations. We also thank the SPIE staff for their efforts and outstanding service in preparing the conference and publishing the proceedings.

Andrea Camposeo
Luana Persano