

PROCEEDINGS OF SPIE

International Conference on Quantum, Nonlinear, and Nanophotonics 2019 (ICQNN 2019)

Alexander A. Dreischuh

Tony Spassov

Isabelle Staude

Dragomir N. Neshev

Editors

2–5 September 2019

Sofia, Bulgaria

Organized by

Sofia University St. Kliment Ohridski (Bulgaria)

The Australian National University (Australia)

Friedrich-Schiller-Universität Jena (Germany)

Sponsored by

Office of Naval Research Global

Sofia University St. Kliment Ohridski (Bulgaria)

Published by

SPIE

Volume 11332

Proceedings of SPIE 0277-786X, V. 11332

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

International Conference on Quantum, Nonlinear, and Nanophotonics 2019 (ICQNN 2019), Alexander A. Dreischuh, Tony Spassov, Isabelle Staude, Dragomir N. Neshev, Eds., Proc. of SPIE Vol. 11332, 1133201 · © 2019 SPIE
CCC code: 0277-786X/19/\$21 · doi: 10.1117/12.2565519

Proc. of SPIE Vol. 11332 1133201-1

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 *International Conference on Quantum, Nonlinear, and Nanophotonics 2019 (ICQNN 2019)*, edited by Alexander A. Dreischuh, Tony Spassov, Isabelle Staude, Dragomir N. Neshev, Proceedings of SPIE Vol. 11332 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510634312
ISBN: 9781510634329 (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

Copyright © 2019, 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 \$21.00 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/19/\$21.00.

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

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

METASURFACES

- 11332 02 **Sensing through the optical radiation pattern in dielectric metastructures (Invited Paper)** [11332-20]
11332 03 **Microwave characteristics of thin Al₂O₃ membranes as metasamples for optical applications (Invited Paper)** [11332-4]

NANOMATERIALS

- 11332 04 **Nanocomposite of polymer liquid crystal/single wall carbon nanotubes: isothermal and non-isothermal phase kinetics (Invited Paper)** [11332-3]
11332 05 **Formation of stable and horse head-like shape platinum nanoparticles at the air/water interface (Invited Paper)** [11332-10]
11332 06 **Synthesis and catalytic properties of nanoporous Pd-based alloys: chemical vs. electrochemical de-alloying of Pd-Ni-Si glasses** [11332-14]
11332 07 **Colorimetric detection of iron(III) based on sensitive and selective plasmonic response of starch-coated silver nanoparticles** [11332-17]
11332 08 **Laser beam reflection by nano-designed two-layer nanostructured carbonic material formed in transparent hydrocarbon polymer by ion implantation** [11332-1]
11332 09 **Constrained droplet eigenfrequency approach in nanodroplets research** [11332-5]

NANOTECHNOLOGY

- 11332 0A **Laser-induced break down spectroscopy for quantitative analysis of electrolytes (Na, K, Ca, Mg) in human blood serum (Invited Paper)** [11332-7]
11332 0B **A novel construction of Z-scheme CuO/g-C₃N₄ heterojunction for visible-light-driven photocatalysis in natural seawater (Invited Paper)** [11332-8]

- 11332 0C **Preparation and optical properties of functionalized hydrophobic aerogel granules (Invited Paper)** [11332-9]
- 11332 0D **Synthesis and characterization of As(V)-imprinted smart polymer gel for selective adsorption of As(V) ions** [11332-15]
- 11332 0E **Viability of zone melting on a micro scale using a focused electron beam (Invited Paper)** [11332-19]

PLASMONICS

- 11332 0F **An ellipsometrical study of SPR of ferritin on gold surface** [11332-6]
- 11332 0G **Plasmonic nanowires embedded in electrospun PVA nanofibers (Invited Paper)** [11332-12]

NONLINEAR OPTICS

- 11332 0H **Four-photon parametric mixing in CW and pulse regimes in single mode optical fibers** [11332-13]

BEAM SHAPING

- 11332 0I **Longitudinal optical force of laser pulses in continuous media (Invited Paper)** [11332-16]
- 11332 0J **Multi-spot focal pattern formation and beam reshaping by mixing square-shaped and hexagonal vortex lattices** [11332-18]
- 11332 0K **Transformation of a circularly obstructed Bessel beam by a fork-shaped grating** [11332-2]

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.

Andreeva, Andreana I., 09
Andreeva, Z., 0H
Balashev, K., 05
Baratto, Camilla, 02
Bardarov, Krum V., 0A
Bekir, Rasim, 09
Buchvarov, Ivan, 0A
Carletti, Luca, 02
Dakova, A., 0H
Dakova, D., 0H
Dakova, Ivanka, 0D
Danchova, Nina, 0C
Dankov, P., 03
De Angelis, Costantino, 02
Dimitrova, Igljika M., 09
Dobrev, Stéfan, 07
Dreischuh, A., 0J
Enseling, David, 0C
Exner, Ginka K., 04
Genkov, Kaloyan V., 0E
Georgiev, Peter A., 0A
Georgieva, D., 0H
Georgieva, Denitsa K., 0G
Grozev, N., 05
Gutzov, Stoyan, 0C
Hadjichristov, Georgi B., 04, 08
Inoue, A., 06
Jüstel, Thomas, 0C
Karadjova, Irina, 07, 0D
Kovachev, L., 0H, 0I
Krishna Prasad, Subarao, 04
Lilova, Bela M., 0G
Lyubenova, L., 06
Maleshkov, G., 0J
Marinov, Yordan G., 04
Mihaylov, L., 06
Mihova, Gergana M., 09
Mircheva, K., 05
Nedyalkova, M., 05
Paulus, G. G., 0J
Pérez, Ernesto, 04
Rocco, Davide, 02
Russev, Stoyan C., 0E, 0G
Shandurkov, Dimitar, 0C
Slavchev, V., 0H
Spasov, Tony, 06, 0B
Stefanov, Ivan L., 08, 0J
Stoyanov, L., 0J
Todorov, Petar I., 0E
Tognazzi, Andrea, 02
Topuzoski, S., 0K
Tsutsumanova, Gichka G., 0G
Tsvetkov, Martin, 0B
Tzaneva, B., 03
Tzvetkov, George, 05, 0B
Vasileva, Penka, 07
Vassileva, E., 06
Videkov, V., 03
Vladimirova-Mihaleva, L. S., 0F
Yelamaggad, Channabasaveshwar V., 04
Yordanova, Tanya, 0A, 0D
Zaharieva, Joana, 0B
Zhekova, M., 0J
Zografov, Nikolay N., 09
Zyapkov, Anton D., 0G

Conference Committee

Conference Chairs

Alexander A. Dreischuh, Sofia University St. Kliment Ohridski (Bulgaria)
Tony Spassov, Sofia University St. Kliment Ohridski (Bulgaria)
Isabelle Staude, Friedrich-Schiller-Universität Jena (Germany)
Dragomir N. Neshev, The Australian National University (Australia)

Program Committee

Dragomir N. Neshev, The Australian National University (Australia)
Isabelle Staude, Friedrich-Schiller-Universität Jena (Germany)
Tony Spassov, Sofia University St. Kliment Ohridski (Bulgaria)
Alexander A. Dreischuh, Sofia University St. Kliment Ohridski (Bulgaria)

Session Chairs

Igal Brener, Sandia National Laboratories (United States) and Center for Integrated Nanotechnologies (United States)
Roberto Morandotti, Institut National de la Recherche Scientifique (Canada)
Dragomir N. Neshev, The Australian National University (Australia)
Alexander A. Dreischuh, Sofia University St. Kliment Ohridski (Bulgaria)
Gerhard Paulus, Friedrich-Schiller-Universität Jena (Germany)
Andrey Sukhorukov, The Australian National University (Australia)
Costantino De Angelis, University of Brescia (Italy)
Isabelle Staude, Friedrich-Schiller-Universität Jena (Germany)
Andon Rangelov, Sofia University St. Kliment Ohridski (Bulgaria)
Tony Spassov, Sofia University St. Kliment Ohridski (Bulgaria)

Introduction

The International Conference on Quantum, Nonlinear and Nanophotonics (ICQNN'2019) and the satellite symposium of Nanomaterials and Nanotechnologies (SNN'2019) were held from 2–5 September 2019 in Sofia, Bulgaria. The conference scope covered the investigation of basic physical phenomena of light interaction with different natural materials and artificial structures, as well as the technological applications of such phenomena, novel devices, instruments, and methods. The topics included quantum and nonlinear optics, nano-optics, and meta-optics. Leading scientists delivered three plenary and 22 invited talks on the newest development in these research areas. The conference and the symposium served as a meeting place for 62 researchers from 15 countries (Australia, Canada, China, France, Germany, Israel, Italy, Kazakhstan, Macedonia, Serbia, Spain, Switzerland, the Netherlands, United States, and Bulgaria).

The host organization was Sofia University St. Kliment Ohridski, the first higher education institution in Bulgaria. The first step towards its foundation was in 1887. For 130 years Sofia University has been the national foremost center for university education and research. Today it is the largest university in Bulgaria with more than 120 degree-programs offered by 16 faculties.

The conference and the symposium were jointly organized by Friedrich-Schiller-Universität Jena (Institut für Angewandte Physik, and Institut für Optik und Quantenelektronik, Jena, Germany), The Australian National University (ANU College of Science, Canberra, Australia), and Sofia University St. Kliment Ohridski (Faculty of Physics and Faculty of Chemistry and Pharmacy, Sofia, Bulgaria). The organizers acknowledge the financial support from the Office of Naval Research Global.

Alexander A. Dreischuh
Tony Spassov
Isabelle Staude
Dragomir N. Neshev

