

PROCEEDINGS OF SPIE

Photonic Crystal Materials and Devices X

Hernán Ruy Míguez
Sergei G. Romanov
Lucio Claudio Andreani
Christian Seassal
Editors

16–19 April 2012
Brussels, Belgium

Sponsored by
SPIE

Cosponsored by
B-PHOT—Brussels Photonics Team (Belgium)
Brussels-Capital Region (Belgium)
FWO—Fonds Wetenschappelijk Onderzoek (Belgium)
ICO—International Commission for Optics
Ville de Bruxelles (Belgium)

Cooperating Organisations
CBO-BCO (Belgium)
EOS—European Optical Society (Germany)
IET—The Institution of Engineering and Technology
(United Kingdom)
IOP—Institute of Physics (United Kingdom)
Photonics4Life (Germany)
Photonics@be (Belgium)
Photonics 21 (Germany)
PromOptica (Belgium)

Published by
SPIE

Volume 8425

Proceedings of SPIE, 0277-786X, v. 8425

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

Photonic Crystal Materials and Devices X, edited by Hernán Ruy Míguez, Sergei G. Romanov,
Lucio Claudio Andreani, Christian Seassal, Proc. of SPIE Vol. 8425, 842501 · © 2012 SPIE
CCC code: 0277-786X/12/\$18 · doi: 10.1117/12.977712

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 *Photonic Crystal Materials and Devices X*, edited by Hernán Ruy Míguez, Sergei G. Romanov, Lucio Claudio Andreani, Christian Seassal, Proceedings of SPIE Vol. 8425 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN 0277-786X

ISBN 9780819491176

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 © 2012, 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/12/\$18.00.

Printed in the United States of America.

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

The logo for SPIE Digital Library features the word "SPIE" in a bold, sans-serif font above the words "Digital Library" in a smaller, similar font. To the right of the text is a stylized graphic consisting of three vertical bars of increasing height from left to right, with a curved line above them.

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent 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. Numbers in the index correspond to the last two digits of the six-digit CID number.

Contents

xi	<i>Conference Committee</i>
xv	<i>Introduction</i>

SESSION 1 SLOW WAVES AND NONLINEAR EFFECTS IN PHOTONIC CRYSTALS

- 8425 03 **Nonlinear slow light propagation in photonic crystal slab waveguides: theory and practical issues** [8425-02]
P. Kanakis, National and Kapodistrian Univ. of Athens (Greece); T. Kamalakis, Harokopio Univ. of Athens (Greece); T. Sphicopoulos, National and Kapodistrian Univ. of Athens (Greece)
- 8425 04 **Slow light in slot photonic crystal waveguides by dispersion engineering** [8425-03]
C. Caer, X. Le Roux, D. Marris-Morini, L. Vivien, E. Cassan, Institut d'Électronique Fondamentale, Univ Paris-Sud, CNRS (France)
- 8425 05 **Enhancement of a nanocavity lifetime using slow light propagation** [8425-04]
P. Grinberg, K. Bencheikh, M. Brunstein, A. M. Yacomotti, Lab. de Photonique et de Nanostructures, CNRS (France); Y. Dumeige, Univ. Européenne de Bretagne, CNRS Foton (France); J. A. Levenson, Lab. de Photonique et de Nanostructures, CNRS (France)

SESSION 2 APPLICATIONS OF PHOTONIC CRYSTALS TO BIOSENSING AND PHOTODETECTION

- 8425 07 **Slotted photonic crystals for biosensing applications (Invited Paper)** [8425-06]
M. G. Scullion, T. F. Krauss, A. Di Falco, Univ. of St. Andrews (United Kingdom)
- 8425 08 **Luminescent photonic crystal cavities for fiber-optic sensors, coupled dissimilar cavities and optofluidics** [8425-07]
M. A. Dündar, Eindhoven Univ. of Technology (Netherlands); B. Wang, Eindhoven Univ. of Technology (Netherlands) and Zhejiang Univ. (China); T. Sahaan, J. A. M. Voorbraak, N. W. L. Speijcken, R. Nötzel, Eindhoven Univ. of Technology (Netherlands); M. J. van der Hoek, VanderHoekPhotonics (Netherlands); S. He, Zhejiang Univ. (China); A. Fiore, R. W. van der Heijden, Eindhoven Univ. of Technology (Netherlands)
- 8425 09 **Plasmonic device using backscattering of light for enhanced gas and vapour sensing** [8425-08]
M. Lobet, O. Deparis, Facultés Univ. Notre-Dame de la Paix (Belgium)
- 8425 0A **Optimized photonic crystal design for quantum well infrared photodetectors (Best Student Paper Award)** [8425-09]
P. Reininger, S. Kalchmair, R. Gansch, A. M. Andrews, H. Detz, T. Zederbauer, S. I. Ahn, W. Schrenk, G. Strasser, Vienna Univ. of Technology (Austria)

SESSION 3 PHOTONIC CRYSTAL CAVITIES AND LIGHT-MATTER INTERACTION I

- 8425 0C **Single and coupled L3 photonic crystal cavities for cavity-QED experiments** [8425-11]
C. Bonato, Leiden Institute of Physics (Netherlands); J. Hagemeyer, Univ. of California, Santa Barbara (United States); D. Gerace, Univ. di Pavia (Italy); S. M. Thon, Univ. of California, Santa Barbara (United States) and Univ. of Toronto (Canada); H. Kim, Univ. of California, Santa Barbara (United States) and Univ. of Maryland (United States); G. Beirne, M. Bakker, Leiden Institute of Physics (Netherlands); L. C. Andreani, Univ. di Pavia (Italy); P. M. Petroff, Univ. of California, Santa Barbara (United States); M. P. van Exter, Leiden Institute of Physics (Netherlands); D. Bouwmeester, Leiden Institute of Physics (Netherlands) and Univ. of California, Santa Barbara (United States)

SESSION 4 PHOTONIC CRYSTAL CAVITIES AND LIGHT-MATTER INTERACTION II

- 8425 0H **Dual-wavelength laser for THz generation by photo-mixing** [8425-16]
K. Kusiaku, J. L. Leclercq, P. Regreny, P. Rojo-Romeo, C. Seassal, P. Viktorovitch, X. Letartre, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS (France) and Ecole Centrale de Lyon (France); L. Chusseau, F. Disanto, Institut d'Électronique du Sud, CNRS, Univ. Montpellier 2 (France); F. Philippe, LIRMM, CNRS, Univ. Montpellier 2 (France); E. Augendre, CEA, LETI, Minatec (France)
- 8425 0I **All-optical dynamic frequency conversion in silicon photonic crystal cavities** [8425-17]
M. Castellanos Munoz, A. Y. Petrov, M. Eich, Technische Univ. Hamburg-Harburg (Germany)

SESSION 5 PHOTONIC-PHONONIC CRYSTALS

- 8425 0K **Photon and acoustic phonon coupling in phoxonic crystals (Invited Paper)** [8425-19]
V. Laude, Institut FEMTO-ST, Univ. de Franche-Comte, CNRS (France)
- 8425 0M **Acousto-optic interaction enhancement in dual photonic-phononic cavities** [8425-21]
N. Papanikolaou, Institute of Microelectronics, NCSR (Greece); G. Gantzounis, California Institute of Technology (United States); E. Almpanis, Institute of Microelectronics, NCSR (Greece); N. Stefanou, Univ. of Athens (Greece)
- 8425 0N **Phoxonic crystal sensor** [8425-22]
R. Lucklum, Otto-von-Guericke-Univ. Magdeburg (Germany); Y. Pennec, A. Kraych, Institut d'Electronique, de Microélectronique, et de Nanotechnologie, Univ. de Lille (France); M. Zubtsov, Otto-von-Guericke-Univ. Magdeburg (Germany); B. Djafari-Rouhani, Institut d'Electronique, de Microélectronique, et de Nanotechnologie, Univ. de Lille (France)

SESSION 6 PHOTONIC STRUCTURES FOR PHOTOVOLTAIC CELLS

- 8425 0Q **Tailoring the absorption in a photonic crystal membrane: a modal approach** [8425-25]
R. Peretti, G. Gomard, C. Seassal, X. Letartre, E. Drouard, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS-INS-CLUCBL (France)

- 8425 OR **Absorbing photonic crystals for mono-crystalline silicon thin film solar cells** [8425-26]
X. Meng, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS-INSA-ECL-UCBL (France); V. Depauw, IMEC (Belgium); G. Gomard, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS-INSA-ECL-UCBL (France); O. El Daif, C. Trompoukis, IMEC (Belgium); E. Drouard, C. Jamois, A. Fave, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS-INSA-ECL-UCBL (France); F. Dross, I. Gordon, IMEC (Belgium); C. Seassal, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS-INSA-ECL-UCBL (France)

SESSION 7 NANOPARTICLE-BASED PHOTONIC CRYSTALS

- 8425 OU **Optical diffraction from opal-based photonic structures: transition from 2D to 3D regimes** [8425-29]
I. S. Sinev, M. V. Rybin, A. K. Samusev, K. B. Samusev, E. Y. Trofimova, D. A. Kurdukov, V. G. Golubev, M. F. Limonov, Ioffe Physico-Technical Institute (Russian Federation)
- 8425 OV **Interplay of Mie and Bragg resonances in partly ordered monolayers of colloidal spheres** [8425-30]
S. G. Romanov, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Ioffe Physico-Technical Institute (Russian Federation); S. Orlov, Max Planck Institute for the Science of Light (Germany); A. V. Korovin, Lashkarev Institute of Semiconductor Physics (Germany); O. Zhuromskyy, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); N. Vogel, K. Landfester, C. K. Weiss, Max-Planck-Institut für Polymerforschung (Germany); U. Peschel, Univ. of Erlangen-Nuremberg (Germany)

SESSION 8 CONTROLLING LIGHT PROPAGATION AND COLLIMATION IN PHOTONIC CRYSTALS

- 8425 OX **Experimental demonstration of waveguiding in honeycomb and square-lattice silicon photonic crystal membranes** [8425-32]
D. Puerto, A. Griol, J. M. Escalante, Univ. Politécnica de Valencia (Spain); B. Djafari-Rouhani, Y. Pennec, Institut d'Electronique, de Microelectronique et de Nanotechnologie, CNRS (France); V. Laude, J.-C. Beugnot, Institut FEMTO-ST, Univ. de Franche-Comte, CNRS (France); A. Martínez, Univ. Politécnica de Valencia (Spain)
- 8425 OY **Experimental demonstration of light bending effect at optical wavelengths in a non-homogenizable graded photonic crystal** [8425-33]
K. V. Do, X. Le Roux, D. Marris-Morini, L. Vivien, E. Cassan, Institut d'Electrique Fondamentale, Univ. Paris Sud, CNRS (France)
- 8425 OZ **Photonic crystal waveguide created by selective infiltration** [8425-34]
A. Casas Bedoya, P. Domachuk, C. Grillet, The Univ. of Sydney (Australia); C. Monat, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS (France); E. C. Mägi, E. Li, B. J. Eggleton, The Univ. of Sydney (Australia)
- 8425 10 **From zero-average index metamaterials to zero-dispersion curvature photonic crystal superlattices for self-collimation of light** [8425-35]
J. Arlandis, E. Centeno, R. Pollès, A. Moreau, Institut Pascal, Univ. Blaise Pascal, CNRS (France)

- 8425 11 **Woodpile photonic crystal for beam collimation** [8425-36]
L. Maigyte, J. Trull, Univ. Politècnica de Catalunya (Spain); V. Mizeikis, Shizuoka Univ. (Japan); M. Malinauskas, Vilnius Univ. (Lithuania); S. Juodkasis, Swinburne Univ. of Technology (Australia); C. M. Cojocaru, Univ. Politècnica de Catalunya (Spain); M. Rutkauskas, Vilnius Univ. (Lithuania); M. Peckus, Ctr. for Physical Sciences and Technology (Lithuania); V. Sirutkaitis, Vilnius Univ. (Lithuania); K. Staliunas, Univ. Politècnica de Catalunya (Spain) and ICREA (Spain)

SESSION 9 NOVEL EFFECTS IN PHOTONIC CRYSTAL STRUCTURES

- 8425 12 **Resonant photonic crystals and quasicrystals (Invited Paper)** [8425-37]
A. N. Poddubny, Ioffe Physical-Technical Institute (Russian Federation)
- 8425 13 **Bistable photonic nanostructures based on molecular spin crossover complexes** [8425-38]
G. Molnár, Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France);
I. A. Gural'skyi, Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France) and National Taras Shevchenko Univ. (Ukraine); L. Salmon, W. Nicolazzi, C. Quintero, A. Akou, K. Abdul-kader, G. Félix, Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France); T. Mahfoud, Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France) and Moroccan Foundation for Advanced Science, Innovation and Research (Morocco); C. Bergaud, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); C. Bartual-Murgui, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France) and Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France); C. Thibault, C. Vieu, Lab. d'Analyse et d'Architecture des Systèmes, CNRS, Univ. de Toulouse (France); A. Bousseksou, Lab. de Chimie de Coordination, CNRS, Univ. de Toulouse (France)
- 8425 14 **Hybrid architectures: enabling 4-dimensional plasmonic-photonic crystals** [8425-39]
S. G. Romanov, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Ioffe Physico-Technical Institute (Russian Federation); A. V. Korovin, M. Reza Bahrami, U. Peschel, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany)

SESSION 10 NOVEL MATERIALS AND TECHNOLOGIES

- 8425 16 **High-Q (>750,000) photonic crystal nanocavities fabricated from chalcogenide glass fully embedded in an index matched cladding** [8425-41]
X. Gai, B. Luther-Davies, T. P. White, The Australian National Univ. (Australia)
- 8425 18 **Photonic crystal cavity definition by electron beam bleaching of chromophore doped polymer cladding** [8425-43]
S. Prorok, J. H. Wülbern, A. Y. Petrov, M. Eich, Technische Univ. Hamburg-Harburg (Germany); J. Luo, A. K. Jen, Univ. of Washington (United States)
- 8425 19 **3D optical micro-resonators by curving nanostructures using intrinsic stress** [8425-44]
C. Sieutat, C. Chevalier, A. Danescu, G. Grenet, P. Regreny, P. Viktorovitch, X. Letartre, J. L. Leclercq, Univ. de Lyon, Institut des Nanotechnologies de Lyon, CNRS, Ecole Centrale de Lyon (France)

SESSION 11 EFFECTS OF DISORDER IN PHOTONIC CRYSTALS

- 8425 1B **Random lasers ensnared (Invited Paper)** [8425-46]
M. Leonetti, C. López, Instituto de Ciencia de Materiales de Madrid (Spain)
- 8425 1D **Spatial control of second-harmonic light from a disordered structure** [8425-48]
F. J. Rodríguez, C. Yao, ICFO - Institut de Ciències Fotòniques (Spain); J. Bravo-Abad, Univ. Autònoma de Madrid (Spain); J. Martorell, ICFO - Institut de Ciències Fotòniques (Spain) and Univ. Politècnica de Catalunya (Spain)

POSTER SESSION

- 8425 1E **Band-edge lasing and miniband lasing in 1-D dual-periodic photonic crystal** [8425-49]
C.-F. Ying, W.-Y. Zhou, Y. Li, Q. Ye, C.-P. Zhang, J.-G. Tian, Nankai Univ. (China)
- 8425 1G **Microwave properties of nonlinear one-dimensional quasiperiodic photonic crystals** [8425-51]
Y. Trabelsi, M. Kanzari, El Manar Univ. (Tunisia)
- 8425 1J **Micro- and nano-scale photonic lattices induced by Bessel beam technique in doped lithium niobate crystals** [8425-54]
A. Badalyan, R. Hovsepyan, V. Mekhitarian, P. Mantashyan, R. Drampyan, National Academy of Sciences of Armenia (Armenia)
- 8425 1L **Double cavity refractive index photonic crystal sensor temperature calibrated** [8425-56]
M. De Laurentis, A. Irace, G. Breglio, Univ. degli Studi di Napoli Federico II (Italy)
- 8425 1M **Diffraction-compensated dispersion-accumulated superprism based on two cascaded photonic crystals** [8425-58]
E. Cassan, Institut d'Électronique Fondamentale, Univ. Paris Sud, CNRS (France); M. Casale, Institut d'Électronique Fondamentale, Univ. Paris Sud, CNRS (France) and IMEP-LAHC (France); D. Marris-Morini, L. Vivien, Institut d'Électronique Fondamentale, Univ. Paris Sud, CNRS (France)
- 8425 1O **Group delay tuning in three-beam interferometers: an alternative to photonic crystals for generating slow and fast light** [8425-60]
J. Arias, A. Sánchez-Meroño, M. M. Sánchez-López, I. Moreno, Univ. Miguel Hernández de Elche (Spain)
- 8425 1P **Anomalous giant soliton formation near boundary of nonlinear layered PC and its propagation across the PC** [8425-61]
V. A. Trofimov, T. M. Lysak, Lomonosov Moscow State Univ. (Russian Federation)
- 8425 1Q **Manifestation of spatial filtering performed by 3D photonic crystals** [8425-62]
L. Maigyte, Univ. Politècnica de Catalunya (Spain); T. Gertus, Vilnius Univ. (Lithuania) and Altechna Co. Ltd. (Lithuania); M. Peckus, Ctr. for Physical Sciences and Technology (Lithuania); J. Trull, C. M. Cojocar, Univ. Politècnica de Catalunya (Spain); V. Sirutkaitis, Vilnius Univ. (Lithuania); K. Staliunas, Univ. Politècnica de Catalunya (Spain) and Institutio Catalana de Reserca i Estudis Avancats (Spain)

- 8425 1R **Tuning the properties of colloidal magneto-photonic crystals by controlled infiltration with superparamagnetic magnetite nanoparticles** [8425-63]
P. J. Demeyer, M. Bloemen, T. Verbiest, K. Clays, Katholieke Univ. Leuven (Belgium)
- 8425 1S **Group velocity control of reflected pulses in asymmetric Fabry-Perot filters** [8425-64]
A. Sánchez-Meroño, M. M. Sánchez-López, J. Arias, I. Moreno, Univ. Miguel Hernández de Elche (Spain)
- 8425 1T **A silicon photonic quasi-crystal structure obtained by interference lithography** [8425-65]
S. Lis, A. Zakrzewski, J. Gryglewicz, W. Oleszkiewicz, S. Patela, Wroclaw Univ. of Technology (Poland)
- 8425 1W **Erbium doped two dimensional photonic crystals for band edge lasing** [8425-68]
J. A. S. Morton, J. Marques-Hueso, B. S. Richards, Heriot-Watt Univ. (United Kingdom)
- 8425 1Z **Design of an effective energy storage cavity in two-dimensional photonic crystal slab** [8425-72]
Y. Liu, Kavli Institute of Nanoscience, Technische Univ. Delft (Netherlands) and Foundation for Fundamental Research on Matter (Netherlands); H. W. M. Salemink, Kavli Institute of Nanoscience, Technische Univ. Delft (Netherlands)
- 8425 20 **Tunable resonant narrow-band filter based on electro-optic materials** [8425-73]
D. Shu, A.-L. Fehrembach, E. Popov, Institut Fresnel, CNRS, Aix-Marseille Univ., Ecole Centrale Marseille (France)
- 8425 21 **Fano resonances in kagome fibers** [8425-74]
L. Vincetti, V. Setti, M. Zoboli, Univ. of Modena and Reggio Emilia (Italy)
- 8425 22 **Elliptical hollow tube waveguides** [8425-75]
L. Vincetti, V. Setti, M. Zoboli, Univ. of Modena and Reggio Emilia (Italy)
- 8425 23 **Numerical investigation of electrostrictive forces in submicron phoxonic waveguide** [8425-76]
J.-C. Beugnot, V. Laude, Institut FEMTO-ST, Univ. de Franche-Comté, CNRS (France)
- 8425 25 **Multiple Bragg diffraction effects in angle-resolved reflection and transmission spectra of opaline photonic crystal films** [8425-78]
V. G. Fedotov, Saint Petersburg State Univ. (Russian Federation); T. A. Ukleev, Ioffe Physical-Technical Institute (Russian Federation); A. Y. Men'shikova, N. N. Shevchenko, Institute of Macromolecular Compounds (Russian Federation); A. V. Sel'kin, Saint Petersburg State Univ. (Russian Federation) and Ioffe Physical-Technical Institute (Russian Federation)
- 8425 26 **Excitation of Surface Plasmon Polaritons on sinusoidally corrugated metal-dielectric interface fabricated using interference lithography** [8425-80]
P. Ryba, S. Lis, W. Macherzynski, S. Patela, Wroclaw Univ. of Technology (Poland)
- 8425 28 **Enhancement of negligible transmission band using hybrid periodic/Fibonacci photonic crystal in near infrared and microwave domains** [8425-82]
A. Mouldi, M. Kanzari, El-Manar Univ. (Tunisia)

8425 2C

Inverted Yablonovite-like 3D photonic crystals fabricated by laser nanolithography

[8425-95]

I. I. Shishkin, K. B. Samusev, M. V. Rybin, M. F. Limonov, National Research Univ. for Information Technology (Russian Federation) and Ioffe Physical - Technical Institute (Russian Federation); Y. S. Kivshar, National Research Univ. for Information Technology (Russian Federation) and Australian National Univ. (Australia); A. Gaidukeviciute, R. V. Kiyas, B. N. Chichkov, Laser Zentrum Hannover e.V. (Germany)

Author Index

Conference Committee

Symposium Chairs

Francis Berghmans, Vrije Universiteit Brussel (Belgium)
Ronan Burgess, European Commission (Belgium)
Jürgen Popp, Institut für Photonische Technologien e.V. (Germany)
Peter Hartmann, SCHOTT AG (Germany)

Honorary Symposium Chair

Hugo Thienpont, Vrije Universiteit Brussel (Belgium)

Conference Chairs

Hernán Ruy Míguez, Consejo Superior de Investigaciones Científicas (Spain)
Sergei G. Romanov, Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)
Lucio Claudio Andreani, Università degli Studi di Pavia (Italy)
Christian Seassal, Ecole Centrale de Lyon (France)

Programme Committee

Kurt Busch, Karlsruher Institut für Technologie (Germany)
Eric Cassan, Institut d'Électronique Fondamentale (France)
Emmanuel Centeno, Université d'Auvergne Clermont-Ferrand I (France)
Richard M. De La Rue, University of Malaya (Malaysia) and University of Glasgow (United Kingdom)
Romuald Houdré, Ecole Polytechnique Fédérale de Lausanne (Switzerland)
Sven Hoefling, Julius-Maximilians-Universität Würzburg (Germany)
Thomas F. Krauss, University of St. Andrews (United Kingdom)
Kobus Kuipers, FOM Institute for Atomic and Molecular Physics (Netherlands)
Mikhail F. Limonov, Ioffe Physico-Technical Institute (Russian Federation)
Cefe López, Consejo Superior de Investigaciones Científicas (Spain)
Barry Luther-Davies, The Australian National University (Australia)
Jordi Martorell, ICFO-Institut de Ciències Fotòniques (Spain)
Adriana Passaseo, Università del Salento (Italy)
Min Qiu, Royal Institute of Technology (Sweden)
Anne Sentenac, Institut Fresnel (France)

Diederik S. Wiersma, Universita degli Studi di Firenze, Laboratory For Nonlinear Spectroscopy (Italy)

Alejandro M. Yacomotti, Centre National de la Recherche Scientifique/Laboratoire De Photonique et de Nanostructures (France)

Session Chairs

- 1 Slow Waves and Nonlinear Effects in Photonic Crystals
Hernán Ruy Míguez, Consejo Superior de Investigaciones Científicas (Spain)
Christian Seassal, Ecole Centrale de Lyon (France)
- 2 Applications of Photonic Crystals to Biosensing and Photodetection
Christelle Monat, Ecole Centrale de Lyon (France)
- 3 Photonic Crystal Cavities and Light-Matter Interaction I
Christian Seassal, Ecole Centrale de Lyon (France)
Sergei G. Romanov, Friedrich-Alexander-Universität Erlangen-Nürnberg (Germany)
- 4 Photonic Crystal Cavities and Light-Matter Interaction II
Yasuhiko Arakawa, The University of Tokyo (Japan)
- 5 Photonic-Phononic Crystals
Søren Stobbe, University of Copenhagen (Denmark)
- 6 Photonic Structures for Photovoltaic Cells
Hernán Ruy Míguez, Consejo Superior de Investigaciones Científicas (Spain)
Lucio Claudio Andreani, Universita degli Studi di Pavia (Italy)
- 7 Nanoparticle-based Photonic Crystals
Alejandro Giacomotti, Laboratoire de Photonique et de Nanostructures (France)
- 8 Controlling Light Propagation and Collimation in Photonic Crystals
Alexander N. Poddubny, Ioffe Physico-Technical Institute (Russian Federation)
- 9 Novel Effects in Photonic Crystal Structures
Andrew I. Haines, University of Cambridge (United Kingdom)
- 10 Novel Materials and Technologies
Cefe López, Consejo Superior de Investigaciones Científicas (Spain)
Georg von Freymann, Nanoscribe GmbH (Germany)

- 11 Effects of Disorder in Photonic Crystals
Christian Seassal, Ecole Centrale de Lyon (France)
Sergei G. Romanov, Friedrich-Alexander-Universität Erlangen-Nürnberg
(Germany)

Introduction

The 2012 edition of the Photonic Crystal Materials and Devices Conference held in Brussels once again confirmed the importance of this research field. Photonic crystals represent a matured branch of nanophotonics evidenced by the growing number of submissions and participants. We aimed at the tradition of a program combining works focused on the theoretical description of materials and devices with their actual realization and characterization. We achieved a good balance of presentations held in well-established research areas, such as self-assembled photonic crystals or light propagation in photonic crystal waveguides, with sessions devoted to research aspects introduced in the last 2010 Conference, for example, photonic crystals for photovoltaic or sensing applications. A great interest was generated by the session on disorder-related optical effects, an area which is currently developing a high impact on photonic crystal research. A full new session was established to highlight the emergent area of photonic-phononic (so-called phoXonic) crystals, in appreciation of the growing interest for simultaneous control on different collective excitations by using periodic architectures.

Prospective applications

We must emphasize the continuous trend towards implementation of photonic crystals in optical devices. This year the Conference was inaugurated by the invited talk of Christelle Monat (Ecole Centrale de Lyon). Her presentation introduced the extraordinary developments that photonic crystal waveguides have experienced in the last years. The large number of follow-up presentations accentuated the attention to this topic, which involves the engineering of slow light modes and generation of non-linear interactions as issues of primary interest.

Reflecting the growing attention to applications of photonic crystals, the conference covered the exciting subject of novel biological and chemical sensing devices. Based on multifunctional photonic crystal structures this field evolves owing to the converging scientific expertise from different areas. A presentation on sensing devices based on slotted photonic crystal waveguides, offered by Andrea di Falco (University of Saint Andrews), opened a session in which we were introduced to novel proposals on gas detection by ordered ensembles of plasmonic rods or on photonic crystal cavity-enabled optofluidics.

The continuing involvement of photonic crystals in photon management in photovoltaic devices was highlighted in the invited talk by Ralf Wehrspohn, who presented the systematic investigation of exploiting silicon- and ZnO-inverted opals in tandem solar cells. The effect of periodic structuring on the light-to-current conversion efficiency of dyes was also discussed. Overall, the need in improving the solar-to-electric power conversion efficiency generates great interest to this research area. Photonic crystals offer light localization, slow propagating modes and optimized coupling towards enhancing the optical absorption. Current state of the art allows us to foresee exciting results in the next years.

Novel materials and effects

The mounting interest towards achieving photonic crystals with novel functionalities was inaugurated in the invited presentation given by Alexander Poddubny (Ioffe Institute of St. Petersburg). He presented theoretical insight in two issues, the photonic

crystals operating on combined electromagnetic excitations, like exciton-polaritons, and prospects of quasi-crystals as building blocks of future nanophotonic architectures. The following talks supported this vision by discussing photonic crystals exploiting plasmonic and magnetic excitations.

The enormous impact on the field made by novel material structuring techniques, such as two-photon polymerization, was well illustrated by the work of Georg von Freymann (University of Kaiserslautern) presented on the last day of the conference. By executing precise control on the degree of structural disorder and by bringing the quasi-crystal ordering, a systematic study of the optical response was made possible. Fundamental cross-correlations can be established between the effects of controllably introduced disorder in self-assembled opal-like materials, as presented by Cefe López (Spanish Research Council) and those observed from crystals, quasi-crystals, and disordered structures realized by laser writing techniques.

We were honored by the speech of Yasuhiko Arakawa (University of Tokyo), who opened an exciting session on photonic crystal cavities. From his talk and follow-up presentations we learned about recent advances in quantum electrodynamics of active nanocavities such as the design of high quality factor microresonators, special characterization techniques, coupling devices and studies of "photonic molecules".

Traditional discussion of recent findings in preparation and studies of self-assembled photonic crystals was also supported by this Conference. The audience was impressed by the methods of large scale preparation based on roll-to-roll self-assembly of polymeric core-shell particles, presented by Andrew Haines (University of Cambridge), which certainly advances these traditionally lab scale materials closer to commercialization. A series of talks on fundamental studies, like that given by Mikhail Limonov (Ioffe Institute of St. Petersburg) on the transition from 2D to 3D diffraction in colloidal crystals, or that devoted to modification of absorption by plasmonic nanoparticles, complemented this session.

With the active participation of the members of the FP7 European Project "FoxTail" a full session was newly introduced on the subject of photonic-phononic crystals. We were acquainted to this field in the opening talk by Vincent Laude. The relevance and technological potential of controlling the acousto-optic interaction in periodic lattices was highlighted in the different presentations on the subject.

The poster session on Wednesday 18 April was very lively, with a number of interesting papers on various fundamental and applied aspects of photonic crystal research. We are glad that many poster presentations, as well as oral ones, are represented by manuscripts in this volume.

In summary, the year 2012 Photonic Crystal Materials and Devices Conference (8425) became a forum for exchange of the latest information and establishing scientific collaborations. The quality of presented papers, stimulating discussions, and wide international attendance with many young faces in the audience, bring confidence in the future of this field.

Sergei Romanov
Christian Seassal
Lucio Andreani
Hernán Míguez