PROCEEDINGS OF SPIE

2D Photonic Materials and Devices II

Arka Majumdar Carlos M. Torres Jr. Hui Deng Editors

6–7 February 2019 San Francisco, California, United States

Sponsored and Published by SPIE

Volume 10920

Proceedings of SPIE 0277-786X, V. 10920

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

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 2D Photonic Materials and Devices II, edited by Arka Majumdar, Carlos M. Torres Jr., Hui Deng, Proceedings of SPIE Vol. 10920 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510624825 ISBN: 9781510624832 (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 \$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/19/\$18.00.

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.



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

vii Conference Committee

ATOMICALLY THIN CLASSICAL AND QUANTUM LIGHT SOURCES

10920 05 Developing ultrathin light emitters and metalenses based on Van der Waals materials (Invited Paper) [10920-4]

2D MATERIAL EXCITON-POLARITON

10920 07 Manipulating valley-sensitive light-matter states in monolayer transition metal dichalcogenides (Invited Paper) [10920-6]

GRAPHENE OPTOELECTRONICS

10920 OF Crumple nanostructuring of atomically thin 2D materials for flexible optoelectronic devices and plasmonic metamaterials [10920-14]

2D MATERIAL OPTOELECTRONICS + INTEGRATED NANOPHOTONICS |

Carrier dynamics in TMDCs for optical applications [10920-17]
Low-power four-wave mixing in graphene-on-SiN micro-ring resonator [10920-18]
Enhanced four-wave mixing in hybrid integrated waveguides with graphene oxide [10920-19]

2D MATERIAL OPTOELECTRONICS + INTEGRATED NANOPHOTONICS III

10920 OR Efficient defect healing of transition metal dichalcogenides by phthalocyanines [10920-28]

POSTER SESSION

10920 0X CNT micro-heater on SOI micro-ring resonator [10920-34]