PROCEEDINGS OF SPIE

Tenth International Conference on Thin Film Physics and Applications (TFPA 2019)

Junhao Chu Jianda Shao Editors

19–22 May 2019 Qingdao, China

Sponsored by SPIE SIOM—Shanghai Institute of Optics and Fine Mechanics (China) Chinese Physical Society (China) Shanghai Physical Society (China)

Organized by Chinese Laser Press Qingdao University (China) Shandong Society for Optical Engineering (China)

Cooperating Organizations Chinese Academy of Sciences The National Natural Science Foundation of China Qingdao Physical Society (China)

Published by SPIE

Volume 11064

Proceedings of SPIE 0277-786X, V. 11064

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 Tenth International Conference on Thin Film Physics and Applications (TFPA 2019), edited by Junhao Chu, Jianda Shao, Proceedings of SPIE Vol. 11064 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510628182 ISBN: 9781510628199 (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/\$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

vii ix	Authors Conference Committee
SESSION 1	THIN FILM MATERIALS I
11064 02	Influence of transition layer on the surface scattering of unmodified silicon carbide [11064-55]
SESSION 2	TECHNOLOGY OF THIN FILMS I
11064 03	Thickness dependence of Cr-doped VO $_2$ thin films deposition by reactive pulsed magnetron sputtering [11064-45]
SESSION 4	TECHNOLOGY OF THIN FILMS II
11064 04	Preparation of silica thin film by hot pressing process for passive radiative cooling [11064-22]
SESSION 5	THIN FILM MATERIALS II
11064 05	Optical functions of fishnet metamaterial embedded in dielectrics [11064-54]
11064 06	Optical and electrical characteristics of radio frequency sputtered ITO and In-free transparent conductors (Invited Paper) [11064-6]
11064 07	Investigation on tuning of WS_2/SiC band gap with an external electric field [11064-17]
11064 08	Enhance anti-water ability of high transmittance film in mid-infrared band [11064-14]
11064 09	Performance of a spectral beam combining grating with YAG substrate [11064-48]
SESSION 6	APPLICATION OF THIN FILMS I

11064 0A Efficient broadband light absorption enhancement in InP/ZnO core-shell nanocone arrays for photovoltaic application [11064-11]

SESSION 7 PHYSICS OF THIN FILMS II

11064 OB	Energy flow difference structure design based on micro hemisphere structure [11064-23]
11064 OC	A lift-off of pattern structures on the heat-mode resists [11064-19]
11064 0D	Positive and negative properties of laser heat-mode resists [11064-33]
SESSION 8	APPLICATION OF THIN FILMS II
11064 OE	Wide-incident angle and low polarization aberration edge filter [11064-24]
11064 OF	Subwavelength periodic nanostructures fabricated by femtosecond laser in metal, dielectric and metal-dielectric-metal coating [11064-53]
	POSTER SESSION 11064
11064 0G	Employing Ni-Cr co-doping to prepare low phase transition temperature VO ₂ film [11064-57]
11064 OH	Annealing effects on optical and structural properties of TiO_2 thin films deposited by ion beam sputtering [11064-18]
11064 OI	Broadband chirped volume Bragg grating for one-hundred-femtosecond pulse compression [11064-50]
11064 OJ	Broadband polarization beam splitter based on subwavelength grating in Terahertz [11064-5]
11064 OK	Comparison of mechanical properties evolution of polyimide films in space radiation environment [11064-4]
11064 OL	Correlation between the structure and laser damage properties of ion assisted HfO_2 thin films [11064-12]
11064 OM	Design and fabrication of antireflective surface microstructures on lithium triborate [11064-51]
11064 ON	Design of linear polarizer in 3- 13µm broad infrared region with multilayer nanostructures [11064-30]
11064 00	Effect of MgF ₂ deposition temperature on AI mirrors in vacuum ultraviolet [11064-42]
11064 OP	Effect of temperature on optical properties of CeO_X film being irradiated by Co^{60} prepared by RF magnetron sputtering [11064-8]
11064 OQ	Effects of different oxygen flow on refractive index and absorption characteristics of Ta_2O_5 film [11064-37]

based on laser polymerization size analysis [11064-34] 11064 OS Electrical property of OSR second surface mirror in space radiation environments [11064-3] 11064 OT Experimental observation and numerical analysis for dynamical output in free-running multilongitudinal mode erbium doped fiber ring laser [11064-15] 11064 OU Green vegetables derived simultaneously carbon dots as sensitizer and carbon particles as counter electrode for dye-sensitized solar cells [11064-26] 11064 OV Improvement on fluorescent properties of photonic crystals filled by quantum dots based on multi-layer films [11064-2] 11064 OW Oblique incidence reflectance of resonators based on suspended two-dimensional membranes [11064-40] 11064 OX Optical design of perovskite/silicon laminated solar cells based on grating structure [11064-58] 11064 OY Optimization of morphology and electrochemical characteristics of nickel film by sputtering pressure [11064-38] 11064 OZ Photoelectric properties of transparent conductive metal mesh films based on crack template and its application in Perovskite solar cells [11064-46] 11064 10 Preparation and physical properties of germanium thin films [11064-25] Research on the time and mechanism of laser-induced air plasmas ignition [11064-36] 11064 11 11064 13 Study on band gap and dispersion model of Al_2O_3 thin films with different oxygen flow rates by ion beam sputtering [11064-32] 11064 14 Study on preparation process and shielding effectiveness of graphene films [11064-35] Annealing effects on the optical and structural properties of Y2O3 thin films deposited by 11064 15 thermal evaporation technique [11064-29] 11064 16 Development of transparent oxide thin films for flexible devices [11064-21] 11064 17 Influence of deposition temperature and precursor pulse time on properties of SiO₂, HfO₂ monolayers deposited by PEALD [11064-39]

Efficient method for determination of laser conditions adopted in laser-induced micro-lithology

11064 OR