PROCEEDINGS OF SPIE

Optical Microlithography XXXII

Jongwook Kye Soichi Owa Editors

26–27 February 2019 San Jose, California, United States

Sponsored and Published by SPIE

Volume 10961

Proceedings of SPIE 0277-786X, V. 10961

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 *Optical Microlithography XXXII*, edited by Jongwook Kye, Soichi Owa, Proceedings of SPIE Vol. 10961 (SPIE, Bellingham, WA, 2019) Seven-digit Article CID Number.

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

ISBN: 9781510625693 ISBN: 9781510625709 (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

V Vii	Authors Conference Committee
	MACHINE LEARNING AND COMPUTATIONAL LITHOGRAPHY I
10961 05	Automatic correction of lithography hotspots with a deep generative model (Invited Paper) [10961-3]
10961 07	Investigation on MBOPC convergence improvement with location-dependent correction factors aided by machine learning [10961-6]
	MACHINE LEARNING AND COMPUTATIONAL LITHOGRAPHY II
10961 09	Pairing wafer leveling metrology from a lithographic apparatus with deep learning to enable cost effective dense wafer alignment metrology (Invited Paper) [10961-7]
10961 0A	Improved wafer alignment model algorithm for better on-product overlay [10961-8]
10961 OB	Efficient search of layout hotspot patterns for matching SEM images using multilevel pixelation [10961-9]
	RESIST MODELING AND PROCESS CONTROL
10961 0D	Analytical solutions for the deformation of a photoresist film [10961-11]
10961 OF	Compact modeling of negative tone development resist with photo decomposable quencher [10961-13]
10961 OH	Thin-film characterization for advanced patterning [10961-15]
	LITHOGRAPHY EQUIPMENT
10961 01	A study on stepper's performance enhancements [10961-16]
10961 OK	Holistic feedforward control for the 5 nm logic node and beyond [10961-18]

10961 0M Automatic parameter setting for lens aberration control during product lot exposure [10961-20]

POSTER SESSION

10961 00	Optimal feature vector design for machine learning based computational lithography [10961-21]
10961 OP	SRAF rule extraction and insertion based on inverse lithography technology [10961-23]
10961 OR	Localized source and mask optimization with narrow-band level-set method [10961-25]
10961 OS	An OPC approach to improve logic gate features corner fidelity [10961-27]
10961 OT	A programmable UVLED array with a collimated optics as transform lens as light field adjustable source [10961-28]
10961 OV	Modeling of dynamic image performance for lithographic projection lens [10961-30]
10961 OW	Productivity improvement by module life extension with software approach using Availability MAXimization (AMAX) functionality [10961-32]
10961 OZ	Robust alignment mark design for DRAM using a holistic computational approach [10961-38]
10961 10	Improvement of spectrum measurement accuracy by high resolution spectrometer for DUV laser [10961-35]