

SPIE. PHOTOMASK
TECHNOLOGY



PHOTOMASK TECHNOLOGY TECHNICAL PROGRAM.

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CO-LOCATED WITH
SPIE SCANNING
MICROSCOPES 2014.

Conference: 16-18 September 2014

Exhibition: 16-17 September 2014

Monterey Conference Center
Monterey, California, USA

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SPIE • **PHOTOMASK TECHNOLOGY**

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Douglas J. Resnick, Canon
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Thomas Struck, Infineon
Technologies AG

Bala Thumma, Synopsys, Inc.

Jacek K. Tyminski,
Nikon Precision Inc.

Jim N. Wiley, ASML US, Inc.

Larry S. Zurbrick, Agilent
Technologies, Inc.



Keynote Presentation

Tuesday 16 September 2014
8:30 to 9:15 am



Many ways to shrink: The right moves to 10 nanometer and beyond

Martin van den Brink,
President and CTO, ASML

With mobile devices such as smartphones outpacing other market segments, the demand for low-power chips, enabled by continued device shrink, continues to be strong. The semiconductor industry's drive to innovate is relentless, R&D pipelines are filled, and IC manufacturers have multiple options to continue scaling. This presentation will examine the different technology options for the 10 nanometer node and beyond.

Martin van den Brink was appointed President and CTO on 1 July 2013. He joined ASML when the company was founded in early 1984. He held several positions in engineering and, since 1995, Mr. Van den Brink served as Vice President Technology. In 1999 Mr. Van den Brink was appointed as Executive Vice President Marketing & Technology and as a member of ASML's Board of Management.

SPECIAL EVENTS

Tuesday 16 September.

Tuesday Lunch

12:15 to 1:55 pm · Location: Marriott San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday. Admission is included with your paid Photomask registration. Extra guest tickets may be purchased at the SPIE Registration Desk onsite.

Poster Setup and Viewing

10:00 am to 4:00 pm, and 6:00 to 7:30 pm

Location: Marriott Serra Grand Ballroom

Poster authors may set up their poster papers between 10:00 am and 4:00 pm on Tuesday and will leave them up until Wednesday afternoon. Authors will be present during the Poster Reception 6:00 to 7:30 pm Tuesday to answer questions and provide in-depth discussion regarding their papers. Authors will leave their poster up until 3:00 pm Wednesday.

Poster/Exhibition Reception

6:00 to 7:30 pm

Location: Serra Grand
Ballroom

Symposium attendees are invited to attend the Poster/Exhibition Reception on Tuesday evening in the Serra Grand Ballroom. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers and interact with the authors, and visit the exhibition booths. Refreshments will be served.



Attendees are requested to wear their conference registration badges.

SPECIAL EVENTS

Wednesday 17 September.

Poster Viewing

10:00 am to 3:00 pm

Location: Marriott Serra Grand Ballroom

Posters will remain up until 3:00 pm Wednesday.

Wednesday Lunch

12:10 to 1:40 pm · Location: Marriott San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday. Admission is included with your paid Photomask registration. Extra guest tickets may be purchased at the SPIE Registration Desk onsite.

Photomask Reception

6:00 to 8:00 pm · Location: Marriott San Carlos Ballroom

Make plans to join your colleagues and friends at the annual Photomask Reception. This year's event focuses on good food, beverages, and plenty of time to socialize or talk business with fellow conference attendees. Awards, entertainment, and other presentations will be included in the evening.

Admission is included with your paid Photomask registration. Extra guest tickets may be purchased at the SPIE Registration Desk onsite.



Thursday 18 September.

PANEL DISCUSSION

Mask Complexity: How to Solve the Issues?

10:40 am to 12:30 pm · Location: Steinbeck Forum

Moderators: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. and **Paul W. Ackmann**, GLOBALFOUNDRIES Inc.

Panelists: Peter D. Buck, Mentor Graphics Corp; Shuichiro Ohara, Nippon Control System Corp.; Shusuke Yoshitake, NuFlare Technology, Inc.; Daniel Chalom, IMS Fabrication AG; Dong-Hoon Chung, Samsung Electronics Co., Ltd.; Laurent C. Tuo, Taiwan Semiconductor Manufacturing Co., Ltd.; Yalin Xiong, KLA-Tencor Corp.; Bala Thumma, Synopsys, Inc.

We are going to discuss following issues for mask complexity.

- **Issues on Multiple-exposure optical lithography, Data volume? Mask writing time? Too many masks per set? Overlay accuracy?**
- **EUVL will really simplify the mask complexity?**
- **How to reduce the mask writing time?**
- **Nanofabrication for mask writer throughput improvement with single and/or multiple beams**
- **Issues on Inspection/Metrology. Is EUV mask easier to inspect than complex optical mask? Is there any specific issue on the mask for DSA patterning?**

Panelists are EDA, mask writer, mask inspection, and mask supplier, plus mask users.

Thursday Lunch

12:10 to 2:00 pm · Location: Marriott San Carlos Ballroom

Buffet lunches are served Tuesday, Wednesday, and Thursday. Admission is included with your paid Photomask registration. Extra guest tickets may be purchased at the SPIE Registration Desk onsite.

PHOTOMASK DAILY EVENT SCHEDULE

TUESDAY 16 September	WEDNESDAY 17 September	THURSDAY 18 September
MORNING SESSIONS		
BREADS AND COFFEE BREAK, 7:30 to 8:30 am		
<p>SESSION 1: Keynote Session, 8:30 to 9:15 am, (Session Chairs: Paul W. Ackmann, Naoya Hayashi, Michael T. Postek)</p> <p>KEYNOTE PRESENTATION Many ways to shrink: The right moves to 10 nanometer and beyond, Martin van den Brink</p>	<p>SESSION 6: Metrology: Joint Session with Photomask and Scanning Microscopies, 8:00 to 10:00 am, (Session Chairs: Postek, Scherübl)</p>	<p>SESSION 10: Mask Patterning, 8:20 to 9:50 am, (Session Chairs: Saito, Cinque)</p>
<p>SESSION 2: Invited Session: Joint Session with Photomask and Scanning Microscopies, 9:15 to 10:15 am, (Session Chairs: Ackmann, Hayashi, Postek)</p>		<p>SESSION 11: PMJ 2014 Panel Discussion Overview, 9:50 to 10:10 am, (Session Chairs: Hayashi, Ackmann)</p>
COFFEE BREAK, 10:15 to 10:45 am		
<p>SESSION 3: Simulation, OPC, and Mask Data Prep I, 10:45 am to 12:15 pm, (Session Chairs: Fujimura, Wu)</p>	<p>SESSION 7: EUV Mask I, 10:30 am to 12:10 pm, (Session Chairs: Mangat, Kasprowicz)</p>	<p>PANEL DISCUSSION: Mask Complexity: How to Solve the Issues?, 10:40 am to 12:30 pm, Moderator: Naoya Hayashi</p>

 = Co-located Sessions with SPIE Scanning Microscopies.

TUESDAY 16 September	WEDNESDAY 17 September	THURSDAY 18 September
<p>LUNCH · Buffet lunches are served Tuesday - 12:15 to 1:45 pm, Wednesday - 12:10 to 1:40 and Thursday - 12:20 to 2:00 pm. Admission is included with your paid Photomask registration. Extra guest tickets may be purchased at the SPIE registration desk onsite.</p>		
AFTERNOON SESSIONS		
<p>SESSION 4: Simulation, OPC, and Mask Data Prep II, 1:45 to 3:35 pm, (Session Chairs: Buck, Wiley)</p>	<p>SESSION 8: Materials and Process II, 1:40 to 3:30 pm, (Session Chairs: Grenon, Dickey)</p>	<p>SESSION 12: EMLC 2014 Best Paper, 2:00 to 2:20 pm, (Session Chairs: Faure, Mangat)</p> <p>SESSION 13: EUV Mask II, 2:20 to 4:00 pm, (Session Chairs: Faure, Mangat)</p>
COFFEE BREAK, 3:35 to 4:05 pm		
<p>SESSION 5: Materials and Process I, 4:05 to 5:35 pm, (Session Chairs: Jee, Rausa)</p>	<p>SESSION 9: Simulation, OPC, and Mask Data Prep III, 4:00 to 5:10 pm, (Session Chairs: Pang, Lin)</p>	<p>SESSION 14: EUV Mask III, 4:00 to 5:20 pm, (Session Chairs: Dietze, Montgomery)</p>
EXHIBITION · 10:00 am TO 4:00 pm		
<p>POSTER/ EXHIBITION RECEPTION 6:00 to 7:30 pm</p>	<p>PHOTOMASK RECEPTION 6:00 to 8:00 pm</p>	



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CONFERENCE 9235

Tuesday–Thursday 16–18 September 2014
Proceedings of SPIE Vol. 9235

Photomask Technology 2014

Conference Chairs: **Paul W. Ackmann**, GLOBALFOUNDRIES Inc. (USA); **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. (Japan)

Program Committee: **Lucien Bouchard**, Photronics, Inc. (USA); **Ron R. Bozak**, RAVE LLC (USA); **William H Broadbent Jr.**, KLA-Tencor Corp. (USA); **Russell B. Cinque**, JEOL USA Inc. (USA); **Uwe Dietze**, SUSS MicroTec Inc. (USA); **Aki Fujimura**, D2S, Inc. (USA); **Emily E. Gallagher**, IBM Corp. (USA); **Rik Jonckheere**, IMEC (Belgium); **Shy-Jay Lin**, Taiwan Semiconductor Manufacturing Co. Ltd. (Taiwan); **Pawitter J. Mangat**, GLOBALFOUNDRIES Inc. (USA); **Linyong Pang**, Luminescent Technologies (USA); **Kenichi Saito**, NuFlare Technology, Inc. (Japan); **Thomas Scherübl**, Carl Zeiss SMS GmbH (Germany); **Steffen F. Schulze**, Mentor Graphics Corp. (USA); **Wolfgang Staud**, Consultant (USA); **Anna Tchikoulaeva**, Lasertec U.S.A., Inc. Zweigniederlassung Deutschland (Germany); **Banqiu Wu**, Applied Materials, Inc. (USA)

TUESDAY 16 SEPTEMBER

SESSION 1

Location: Steinbeck Forum Tue 8:30 am to 9:15 am

Keynote Session

Session Chairs: **Paul W. Ackmann**, GLOBALFOUNDRIES Inc. (USA);
Naoya Hayashi, Dai Nippon Printing Co., Ltd. (Japan);

Michael T. Postek, National Institute of Standards and Technology (USA)

Keynote Presentation



MANY WAYS TO SHRINK: THE RIGHT MOVES TO 10 NANOMETER AND BEYOND

Martin van den Brink,
ASML Netherlands B.V. (Netherlands) [9235-1]

LOCATION: STEINBECK FORUM

SESSION 2

Location: Steinbeck Forum Tue 9:15 am to 10:15 am

Invited Session

Joint Session with Photomask and Scanning Microscopies

Session Chairs: **Paul W. Ackmann**, GLOBALFOUNDRIES Inc. (USA);

Naoya Hayashi, Dai Nippon Printing Co., Ltd. (Japan);

Michael T. Postek, National Institute of Standards and Technology (USA)

9:15 am: **EUV mask infrastructure: Don't miss the train!** (*Invited Paper*), Oliver Kienzle, Carl Zeiss SMS GmbH (Germany). [9235-2]

9:45 am: **3D Monte Carlo modeling of the SEM: Are there applications to photomask metrology?** (*Invited Paper*), John S. Villarrubia, András E. Vladár, Michael T. Postek, National Institute of Standards and Technology (USA) [9236-1]

Coffee Break Tue 10:15 am to 10:45 am

SESSION 3

Location: Steinbeck Forum Tue 10:45 am to 12:15 pm

Simulation, OPC, and Mask Data Prep I

Session Chairs: **Aki Fujimura**, D2S, Inc. (USA);

Banqiu Wu, Applied Materials, Inc. (USA)

10:45 am: **Layout compliance for triple patterning lithography: an iterative approach** (*Invited Paper*), Bei Yu, The Univ. of Texas at Austin (USA); Gilda Garretton, Oracle (USA); David Z. Pan, The Univ. of Texas at Austin (USA) [9235-3]

11:15 am: **Double-patterning optimization in 20nm SRAM design**, Qi Lin, Toshiyuki Hisamura, Nui Chong, Hans Pan, Yun Wu, Jonathan Chang, Xin Wu, Xilinx, Inc. (USA). [9235-4]

11:35 am: **Pattern-based pre-OPC operation to improve model-based OPC runtime**, Piyush Verma, Fadi Batarseh, Shikha Somani, Jingyu Wang, Sarah McGowan, Sriram Madhavan, GLOBALFOUNDRIES Inc. (USA) [9235-5]

11:55 am: **Conducting OPC retargeting as guided by principles of classical dynamics**, Jingyu Wang, Piyush Verma, GLOBALFOUNDRIES Inc. (USA); Alexander Wei, Mentor Graphics Corp. (USA); William Wilkinson, GLOBALFOUNDRIES Inc. (USA) [9235-6]

Lunch/Exhibition Break Tue 12:15 pm to 1:45 pm

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SESSION 4

Location: Steinbeck Forum Tue 1:45 pm to 3:35 pm

Simulation, OPC, and Mask Data Prep II

Session Chairs: **Peter D. Buck**, Mentor Graphics Corp. (USA);
Jim N. Wiley, ASML US, Inc. (USA)

1:45 pm: **Evolution of mask data preparation** (*Invited Paper*), Aki Fujimura, D2S, Inc. (USA) [9235-7]

2:15 pm: **Model-based virtual VSB mask writer verification for efficient mask error checking and optimization prior to MDP**, Robert C. Pack, GuoXiang Ning, Todd Lukanc, Fadi Batarseh, Piyush Verma, GLOBALFOUNDRIES Inc. (USA); Aki Fujimura, D2S, Inc. (USA) . . . [9235-8]

2:35 pm: **Mask model calibration for MPC applications utilizing shot dose assignment**, Ingo Bork, Peter D. Buck, Mentor Graphics Corp. (USA); Sankaranarayanan Paninjath Ayyappan, Kushlendra Mishra, Mentor Graphics (India) Pvt. Ltd. (India); Christian Bürgel, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Gek Soon Chua, GLOBALFOUNDRIES Singapore (Singapore); Keith P. Standiford, GLOBALFOUNDRIES Inc. (USA) [9235-9]

2:55 pm: **Automated hotspot analysis with aerial image CD metrology for advanced logic devices**, Ute Buttgerit, Thomas Trautzsch, Carl Zeiss SMS GmbH (Germany); Min-Ho Kim, Jung-Uk Seo, Young-Keun Yoon, Hakseung Han, Dong-Hoon Chung, Chan-Uk Jeon, SAMSUNG Electronics Co., Ltd. (Korea, Republic of); Gary Meyers, Synopsys, Inc. (USA) [9235-10]

3:15 pm: **OPC-Lite™ for gridded designs at low k1**, Valery Axelrad, Sequoia Design Systems, Inc. (USA); Michael C. Smayling, Tela Innovations, Inc. (USA); Koichiro Tsujita, Koji Mikami, Canon Inc. (Japan); Hidetami Yaegashi, Tokyo Electron Ltd. (Japan) [9235-11]

Coffee Break Tue 3:35 pm to 4:05 pm

SESSION 5

Location: Steinbeck Forum Tue 4:05 pm to 5:35 pm

Materials and Process I

Session Chairs: **Mark T. Jee**, HOYA Corp. USA (USA);
Emmanuel Rausa, Plasma-Therm LLC (USA)

4:05 pm: **Plasma technology for advanced quartz mask etching** (*Invited Paper*), Munenori Iwami, Hirotsugu Ita, Yoshihisa Kase, Hidehito Azumano, Kazuki Nakazawa, Yoshie Okamoto, Hiroki Shirahama, Tomoaki Yoshimori, Makoto Muto, Shibaura Mechatronics Corp. (Japan) [9235-12]

LOCATION: STEINBECK FORUM

4:35 pm: **Increasing efficiency and effectiveness of processes related to airborne particles in reticle mask environments**, Allyn Jackson, CyberOptics Corp. (USA) [9235-13]

4:55 pm: **Performance of GFIS mask repair system for various mask materials**, Fumio Aramaki, Tomokazu Kozakai, Osamu Matsuda, Anto Yasaka, Hitachi High-Tech Science Corp. (Japan); Shingo Yoshikawa, Koichi Kanno, Dai Nippon Printing Co., Ltd. (Japan); Hiroyuki Miyashita, DNP Photomask Europe S.p.A. (Italy); Naoya Hayashi, Dai Nippon Printing Co., Ltd. (Japan) [9235-14]

5:15 pm: **Defects caused by blank masks and repair solution with nanomachining for 20nm node**, Hyemi Lee, ByungJu Kim, HoYong Jung, SangPyo Kim, DongGyu Yim, SK Hynix, Inc. (Korea, Republic of) . [9235-15]

POSTER/EXHIBITION RECEPTION

Location: Serra Grand Ballroom Tue 6:00 to 7:30 pm

Symposium attendees are invited to attend the Poster/Exhibition Reception on Tuesday evening in the Serra Grand Ballroom. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers and interact with the authors, and visit the exhibition booths.

Refreshments will be served.

Attendees are requested to wear their conference registration badges.

EUV Mask

Chemical stability of graphene as a EUV pellicle, An Gao, Univ. Twente (Netherlands); Erwin Zoethout, FOM Institute DIFFER (Netherlands); Jacobus M. Sturm, Univ. Twente (Netherlands) and Materials innovation institute (Netherlands); Chris J. Lee II, Fred Bijkerk, Univ. Twente (Netherlands) [9235-44]

Phase and amplitude measurements of EUV masks, Rene A. Claus, Univ. of California, Berkeley (USA); Iacopo Mochi, Markus P. Benk, Kenneth A. Goldberg, Lawrence Berkeley National Lab. (USA); Andrew R. Neureuther, Univ. of California, Berkeley (USA); Patrick P. Naulleau, Lawrence Berkeley National Lab. (USA); Laura Waller, Univ. of California, Berkeley (USA) [9235-45]

Impact of B4C capping layer for EUV mask on the sensitivity of patterned mask inspection using projection electron microscope, Susumu Iida, Ryoichi Hirano, Tsuyoshi Amano, Hidehiro Watanabe, EUVL Infrastructure Development Ctr., Inc. (Japan) [9235-46]

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Recent results from EUVL patterned-mask inspection using projection electron microscope system, Ryoichi Hirano, Susumu Iida, Tsuyoshi Amano, Tsuneo Terasawa, Hidehiro Watanabe, EUVL Infrastructure Development Ctr., Inc. (Japan); Masahiro Hatakeyama, Takeshi Murakami, Shoji Yoshikawa, Kenji Terao, EBARA Corp. (Japan) [9235-47]

Determination of line profile on nanostructured surfaces using EUV and x-ray scattering, Frank Scholze, Victor Soltwisch, Jan Wernecke, Anton Haase, Physikalisch-Technische Bundesanstalt (Germany); Jürgen Probst, Max Schoengen, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany); Michael Krümrey, Physikalisch-Technische Bundesanstalt (Germany); Jan Pomplun, Sven Burger, JCMwave GmbH (Germany) [9235-48]

Particle reduction and control in EUV etching process, Jea Young Jun, SK Hynix, Inc. (Korea, Republic of); TaeJoong Ha, SangPyo Kim, DongGyu Kim, SK Hynix (Korea, Republic of) [9235-49]

A new mask exposure and analysis facility, Edwin te Sligte, Norbert B. Koster, Alex Deutz, Wilbert Staring, TNO (Netherlands) [9235-77]

Business

A reusable framework for data-mining mask shop tools, Dan Meier, Photonics, Inc. (USA) [9235-50]

Inspection

Phase defect detection signal analysis: dependence of defect size and shape, Tsuyoshi Amano, Hidehiro Watanabe, EUVL Infrastructure Development Ctr., Inc. (Japan); Tsukasa Abe, Dai Nippon Printing Co., Ltd. (Japan) [9235-52]

Best-practice evaluation methods for wafer-fab requalification inspection tools, Chanseob Cho, GLOBALFOUNDRIES Inc. (USA) [9235-53]

Automatic classification of blank substrate defects, Tom Boettiger, MP Mask Technology Ctr., LLC (USA); Peter D. Buck, Mentor Graphics Corp. (USA); Sankaranarayanan Paninjath Ayyappan, Mark Pereira, Mentor Graphics (India) Pvt. Ltd. (India); Rob Ronald, Daniel L. Rost, MP Mask Technology Ctr., LLC (USA); Bhamidipati Samir, Mentor Graphics (India) Pvt. Ltd. (India) [9235-54]

Study of high-sensitivity DUV inspection for sub-20nm devices with complex OPCs, Sang-Hoon Han, Hong Yul Jung, Sunpyo Lee, In-Yong Kang, Gisung Yoon, Dong Hoon Chung, Chan-Uk Jeon, SAMSUNG Electronics Co., Ltd. (Korea, Republic of); Alexander Chereshnya, Applied Materials, Inc. (Israel); Chung ki Lyu, Applied Materials, Ltd. (Korea, Republic of); Ram Peltinov, Yair Eran, Applied Materials, Ltd. (Israel); Suk Woo Lee, Applied Materials, Ltd. (Korea, Republic of) [9235-75]

Material and Process

Development and characterization of advanced phase-shift mask blanks for 14nm node and beyond, Chang Jun Kim, Min Ki Choi, Kyu Jin Jang, Chul Kyu Yang, Jong Hwa Lee, Cheol Shin, Kee-Soo Nam, S&S TECH (Korea, Republic of) [9235-25]

New grade of 9-inch size mask blanks for 450mm wafer process, Noriyuki Harashima, Tatsuya Chishima, Hiroyuki Iso, ULVAC Coating Corp. (Japan). [9235-55]

The feasibility of the additional process for improving pattern collapse in develop process, JongHoon Lim, JaeSik Son, Eui-Sang Park, SangPyo Kim, DongGyu Yim, SK Hynix, Inc. (Korea, Republic of). [9235-56]

The patterned ferro-electrics for optical designs, Yiqiang Qin, Chao Zhang, Yongyuan Zhu, Nanjing Univ. (China) [9235-76]

Metrology

Further beyond: registration and overlay control enhancements for optical masks, Kujan Gorhad, Carl Zeiss SMS Ltd. (Israel); Dirk Beyer, Carl Zeiss SMS GmbH (Germany); Avi Cohen, Dan Avizemer, Erez Graitzer, Carl Zeiss SMS Ltd. (Israel); Ch. Ehrlich W. Degel, Markus Kirsch, Carl Zeiss Jena GmbH (Germany) [9235-58]

New critical dimension uniformity inspection method for multi-die logic reticles, Chang-Sheng Lo, William Chou, Shang-Hao Yeh, United Microelectronics Corp. (Taiwan); Mark M. Wylie, KLA-Tencor Idaho (USA); Yanwei Liu, KLA-Tencor California (USA); Carl E. Hess, Eric R. Chen, David Wu, Tetsuya Yamamoto, KLA-Tencor Corp. (USA) [9235-59]

A method of utilizing AIMS to quantify lithographic performance of high-transmittance mask, Chunseon Choi, Dong Sik Jang, Sunghyun Oh, Jae-Cheon Shin, SK Hynix, Inc. (Korea, Republic of); Byungho Nam, SK Hynix Inc. (Korea, Republic of); Tae-Joong Ha, SangPyo Kim, DongGyu Yim, SK Hynix, Inc. (Korea, Republic of). [9235-60]

On the benefit of high resolution and low aberrations for in-die mask registration metrology, Thomas Scherübl, Dirk Beyer, Dirk Seidel, Steffen Steinert, Sven Heisig, Susanne Töpfer, Carl Zeiss SMS GmbH (Germany) [9235-61]

Mask Data Preparation

Using rule-based shot dose assignment in model-based MPC applications, Ingo Bork, Peter D. Buck, Lin Wang, Mentor Graphics Corp. (USA); Uwe Mueller, Mentor Graphics (Deutschland) GmbH (Germany) [9235-62]

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Short feedback loop for OPC model based on wafer level CD, GuoXiang Ning, GLOBALFOUNDRIES Inc. (USA); Thomas Thaler, Kristian Schulz, Ute Buttgerreit, Carl Zeiss SMS GmbH (Germany); Peter Philipp, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Paul W. Ackmann, Lloyd C. Litt, Chin-Teong Lim, GLOBALFOUNDRIES Inc. (USA) [9235-63]

Shot overlap fracturing of pixel-based OPC layouts, Shangliang Jiang, Avidesh Zakhor, Univ. of California, Berkeley (USA). [9235-64]

Efficient model-based dummy-fill OPC correction flow for deep sub-micron technology nodes, Ayman M. Yehia Hamouda, Mohamed Salama, GLOBALFOUNDRIES Inc. (USA). [9235-65]

Calibration and application of a DSA compact model for grapho-epitaxy hole processes using contour-based metrology, Germain L. Fenger, Andrew Burbine, Mentor Graphics Corp. (Belgium); Juan Andres Torres, Yuansheng Ma, Yuri Granik, Mentor Graphics Corp. (USA); Polina Krasnova, Mentor Graphics Corp. (Russian Federation); Geert Vandenberghe, Roel Gronheid, Joost P. Bekaert, IMEC (Belgium) [9235-66]

Efficient full-chip QA Tool for design to mask (D2M) feature variability verification, Fadi Batarseh, Piyush Verma, Robert C. Pack, Shikha Somani, GLOBALFOUNDRIES Inc. (USA). [9235-67]

Full-Flow RET creation, comparison, and selection, Neal V. Lafferty, Mentor Graphics Corp. (USA); Mikhail Silakov, Mentor Graphics (Russian Federation); Yuan He, Toshikazu Endo, Mentor Graphics Corp. (USA); Omar H. El-Sewefy, Mentor Graphics Egypt (Egypt); Kostas Adam, John Sturtevant, Mentor Graphics Corp. (USA) [9235-68]

Patterning

Assessment of carbon layer growth induced by resists outgassing in multi e-beams lithography, Jean-Christophe Marusic, CEA (France) and Soitec S.A. (France); Marie-Line Pourceau, CEA-LETI (France); Armel-Petit Mebiene-Engohang, STMicroelectronics (France); Sylviane Cêtre, CEA-LETI (France); Sylvain J. P. David, Sébastien Labau, LTM/CNRS/UJF (France); Laurent Pain, CEA-LETI (France); Jumana Boussef-Said, LTM/CNRS/UJF (France) [9235-69]

General shot refinement technique on fracturing of curvy shape for VSB mask writer, Masakazu Hamaji, Takuya Tao, Nobuyasu Takahashi, Nippon Control System Corp. (Japan); Ji Soong Park, Sukho Lee, SungHoon Park, SAMSUNG Electronics Co., Ltd. (Korea, Republic of) [9235-70]

Yield Management

Impact of reticle writing errors on the on-product overlay performance, Richard J. F. van Haren, Hakki Ergun Cekli, Xing Lan Liu, Jan Beltman, ASML Netherlands B.V. (Netherlands); Anne Pastol, ASML Montbonnot (France); Jean Massin, Emilie Dupre La Tour, Maxime Gatefait, Frank Sundermann, STMicroelectronics (France) [9235-71]

The defect printability study for 28nm mode mask, Kuaixia Ren, Eric G. Guo, Irene Shi, Eric Tian, Semiconductor Manufacturing International Corp. (China) [9235-72]

Characteristics and issues of haze management in a wafer fabrication environment, Sungha Woo, Daeho Hwang, Goo-Min Jeong, Youngmo Lee, SangPyo Kim, DongGyu Yim, SK Hynix, Inc. (Korea, Republic of) . [9235-73]

Qualification of local advanced cryogenic cleaning technology for 14nm photomask fabrication, Ralf Taumer, Thorsten Krome, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Charles W. Bowers, Ivin Varghese, Tyler Hopkins, Eco-Snow Systems (USA); Roy L. White, Martin Brunner, Daniel Yi, RAVE LLC (USA) [9235-74]

WEDNESDAY 17 SEPTEMBER

SESSION 6

Location: Steinbeck Forum Wed 8:00 am to 10:00 am

Metrology

Joint Session with Photomask and Scanning Microscopies

Session Chairs: **Michael T. Postek**, National Institute of Standards and Technology (USA); **Thomas Scherübl**, Carl Zeiss SMS GmbH (Germany)

8:00 am: **Assessing the viability of multi-column electron-beam wafer inspection for sub-20nm defects** (*Invited Paper*), Brad Thiel, SEMATECH Inc. (USA) and SUNY College of Nanoscale Science and Engineering (USA); Michael J. Lercel, Brian C. Sapp, Benjamin D. Bunday, Abraham Arceo, SEMATECH Inc. (USA) [9236-14]

8:30 am: **PMJ Best Paper: Automated accurate on-device registration metrology for 14nm logic masks** (*Invited Paper*), Shunsuke Sato, Shinji Kunitani, Tatsuhiko Kamibayashi, Akira Fuse, Toppan Printing Co., Ltd. (Japan); Frank Laske, Slawomir Czerkas, KLA-Tencor MIE GmbH (Germany); Mehdi Daneshpanah, KLA-Tencor Corp. (USA); Yoshinori Nagaoka, KLA-Tencor Japan (Japan); Klaus-Dieter Roeth, KLA-Tencor MIE GmbH (Germany) [9235-16]

CONFERENCE 9235

9:00 am: **Photomask linewidth comparison by PTB and NIST**, Detlef Bergmann, Bernd Bodermann, Harald Bosse, Egbert Buhr, Gaoliang Dai, Physikalisch-Technische Bundesanstalt (Germany); Ronald G. Dixon, National Institute of Standards and Technology (USA); Wolfgang Hässler-Grohne, Hai Hahm, Physikalisch-Technische Bundesanstalt (Germany); John S. Villarrubia, Andras E. Vladár, National Institute of Standards and Technology (USA); Matthias Wurm, Physikalisch-Technische Bundesanstalt (Germany) [9236-15]

9:20 am: **The intra-field CDU map correlations between SEMs and aerial images**, GuoXiang Ning, GLOBALFOUNDRIES Inc. (USA); Jan P. Heumann, Stefan Meusemann, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Thomas Thaler, Carl Zeiss SMS GmbH (Germany); Lloyd C. Litt, GLOBALFOUNDRIES Inc. (USA); Martin Tschinkl, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Paul W. Ackmann, GLOBALFOUNDRIES Inc. (USA) [9235-17]

9:40 am: **Three-dimensional SEM metrology at 10nm**, Andras E. Vladár, John S. Villarrubia, Bin Ming, R. Joseph Kline, Michael T. Postek, National Institute of Standards and Technology (USA) [9236-16]

Coffee Break Wed 10:00 am to 10:30 am

SESSION 7

Location: Steinbeck Forum Wed 10:30 am to 12:10 pm

EUV Mask I

Session Chairs: **Pawitter J. Mangat**, GLOBALFOUNDRIES Inc. (USA);
Bryan S. Kasprovicz, Photonics, Inc. (USA)

10:30 am: **Imaging impact of multilayer tuning in EUV masks: experimental validation**, Vicky Philipsen, Eric Hendrickx, IMEC (Belgium); Erik A. Verduijn, Sudhar Raghunathan, Obert R. Wood II, GLOBALFOUNDRIES Inc. (USA); Victor Soltwisch, Frank Scholze, Physikalisch-Technische Bundesanstalt (Germany); Natalia V. Davydova, ASML Netherlands B.V. (Netherlands); Pawitter J. Mangat, GLOBALFOUNDRIES Inc. (USA) [9235-18]

10:50 am: **A broader view on EUV-masks: adding complementary imaging modes to the SHARP microscope**, Markus P. Benk, Ryan H. Miyakawa, Weilun Chao, Lawrence Berkeley National Lab. (USA); Yow-Gwo Wang, Univ. of California, Berkeley (USA) and Lawrence Berkeley National Lab. (USA); Antoine Wojdyla, Kenneth A. Goldberg, Lawrence Berkeley National Lab. (USA) [9235-19]

LOCATION: STEINBECK FORUM

11:10 am: **Phase-enhanced defect sensitivity for EUV mask inspection**, Yow-Gwo Wang, Univ. of California, Berkeley (USA) and Lawrence Berkeley National Lab. (USA); Ryan H. Miyakawa, Weilun Chao, Kenneth A. Goldberg, Lawrence Berkeley National Lab. (USA); Andrew R. Neureuther, Univ. of California, Berkeley (USA) and Lawrence Berkeley National Lab. (USA); Patrick P. Naulleau, Lawrence Berkeley National Lab. (USA) [9235-20]

11:30 am: **Capability of particle inspection on patterned EUV mask using model EBEYE M**, Masato Naka, Ryoji Yoshikawa, Shinji Yamaguchi, Motoki Kadowaki, Toru Koike, Takashi Hirano, Masamitsu Itoh, Toshiba Corp. (Japan); Kenji Terao, Masahiro Hatakeyama, Kenji Watanabe, Hiroshi Sobukawa, Takeshi Murakami, Kiwamu Tsukamoto, Takehide Hayashi, Ryo Tajima, Norio Kimura, EBARA Corp. (Japan); Naoya Hayashi, Dai Nippon Printing Co., Ltd. (Japan) [9235-21]

11:50 am: **AIMS™ EUV first light imaging performance**, Anthony D. Garetto, Krister Magnusson, Jan Hendrik Peters, Sascha Perlit, Ulrich Matejka, Carl Zeiss SMS GmbH (Germany); Dirk Hellweg, Markus R. Weiss, Carl Zeiss SMT GmbH (Germany); Michael Goldstein, SEMATECH Inc. (USA) [9235-22]

Lunch/Exhibition BreakWed 12:10 pm to 1:40 pm

SESSION 8

Location: Steinbeck ForumWed 1:40 pm to 3:30 pm

Materials and Process II

Session Chairs: **Brian J. Grenon**, RAVE LLC (USA);
Glenn R. Dickey, Shin-Etsu MicroSi, Inc. (USA)

1:40 pm: **Negative tone development process for ArF immersion extension** (*Invited Paper*), Kosuke Koshijima, Michihiro Shirakawa, So Kamimura, Keita Kato, FUJIFILM Corp. (Japan) [9235-23]

2:10 pm: **Characterization of a new polarity switching negative tone e-beam resist for 14nm and 10nm logic node mask fabrication and beyond**, Thomas B. Faure, Amy E. Zweber, Luisa D. Bozano, Martha I. Sanchez, Ratnam Sooriyakumaran, Linda K. Sundberg, IBM Corp. (USA); Yoshifumi Sakamoto, Toppan Photomasks, Inc. (USA); Steven C. Nash, IBM Corp. (USA); Masayuki Kagawa, Takeshi Isogawa, Toppan Photomasks, Inc. (USA); Tasuku Senna, Masahito Tanabe, Toru Komizo, Itaru Yoshida, Toppan Printing Co., Ltd. (Japan); Keiichi Masunaga, Satoshi Watanabe, Yoshio Kawai, Shin-Etsu Chemical Co., Ltd. (Japan); Joseph Malenfant Jr., Reginald R. Bowley Jr., IBM Corp. (USA) [9235-24]

CONFERENCE 9235

- 2:30 pm: **Increasing reticle inspection efficiency and reducing wafer print-checks at 14nm using automated defect classification and simulation**, Shazad Paracha, Eliot Goodman, Benjamin G. Eynon, Ben F. Noyes III, Steven Ha, SAMSUNG Austin Semiconductor LLC (USA); Anthony D. Vacca, Peter J. Fiekowsky, Daniel I. Fiekowsky, AVI-Photomask (USA); Young M. Ham, Douglas Uzzel, Michael J. Green, Susan S. MacDonald, Photonics, Inc. (USA) [9235-51]
- 2:50 pm: **Bringing mask repair to the next level**, Klaus Edinger, Thorsten Hofmann, Markus Waiblinger, Karsten Wolff, Hendrik Steigerwald, Jens Oster, Horst Schneider, Michael Budach, Carl Zeiss SMS GmbH (Germany) [9235-57]
- 3:10 pm: **Laser-written binary OMOG photomasks for high-volume non-critical 193-nm photolithographic layers**, Rémi Rivière, Selvi Gopalakrishnan, Martin Mazur, Nevzat Öner, Sven Mühle, Rolf Seltmann, GLOBALFOUNDRIES Dresden Module Two, GmbH & Co. KG (Germany) [9235-27]
- Coffee Break Wed 3:30 pm to 4:00 pm

SESSION 9

Location: Steinbeck Forum Wed 4:00 pm to 5:10 pm

Simulation, OPC, and Mask Data Prep III

Session Chairs: **Linyong Pang**, Luminescent Technologies (USA);
Shy-Jay Lin, Taiwan Semiconductor Manufacturing Co. Ltd. (Taiwan)

- 4:00 pm: **MDP challenges from a software provider's perspective** (*Invited Paper*), Shuichiro Ohara, Nippon Control System Corp. (USA) [9235-28]
- 4:30 pm: **Effective corner rounding correction in the data preparation for electron-beam lithography**, Kang-Hoon Choi, Fraunhofer-Institut für Photonische Mikrosysteme (Germany) and Fraunhofer-Ctr. Nanoelektronische Technologien (Germany); Clyde H. Browning, Thiago R. Figueiro, Asetla Nanographics (France); Christoph K. Hohle, Michael Kaiser, Fraunhofer-Institut für Photonische Mikrosysteme (Germany) and Fraunhofer-Ctr. Nanoelektronische Technologien (Germany); Patrick Schiavone, Asetla Nanographics (France) [9235-29]
- 4:50 pm: **Photonic curvilinear data processing**, Clyde H. Browning, Patrick Schiavone, Thomas Quaglio, Thiago R. Figueiro, Asetla Nanographics (France); Sébastien Pauliac, Jérôme Belledent, Aurélien Fay, CEA-LETI (France); Jean-Christophe Marusic, Soitec S.A. (France); Jessy Bustos, STMicroelectronics (France) [9235-30]

THURSDAY 18 SEPTEMBER

SESSION 10

Location: Steinbeck Forum Thu 8:20 am to 9:50 am

Mask Patterning

Session Chairs: **Kenichi Saito**, NuFlare Technology, Inc. (Japan);
Russell B. Cinque, JEOL USA Inc. (USA)

8:20 am: **Mask data processing in the era of multibeam writers** (*Invited Paper*), Frank E. Abboud, Michael Asturias, Maesh Chandramouli, Intel Corp. (USA); Yoshihiro Tezuka, Intel Kabushiki Kaisha (USA) . . . [9235-31]

8:50 am: **EBM-9000: EB mask writer for product mask fabrication of 16nm half-pitch generation and beyond**, Hidekazu Takekoshi, Takahito Nakayama, Kenichi Saito, Hiroyoshi Ando, Hideo Inoue, Noriaki Nakayamada, Takashi Kamikubo, Rieko Nishimura, Yoshinori Kojima, Jun Yashima, Akihito Anpo, Seiichi Nakazawa, Tomohiro Iijima, Kenji Ohtoshi, Hirohito Anze, NuFlare Technology, Inc. (Japan); Victor Katsap, Steven D. Golladay, Rodney A. Kendall, NuFlare Technology, Inc. (USA) . . . [9235-32]

9:10 am: **Study of heating effect in multi-beam mask writing**, Jongsu Kim, Jihoon Kang, Inhwan Noh, Sookhyun Lee, Soeun Shin, Sung-II Lee, Hyunchung Ha, Hojune Lee, Jin Choi, Sanghee Lee, Inkyun Shin, Shuichi Tamamushi, Chan-Uk Jeon, SAMSUNG Electronics Co., Ltd. (Korea, Republic of) . . . [9235-33]

9:30 am: **Resist charging effect correction function qualification for photomasks production**, Vadim Sidorkin, Michael Finken, Timo A. Wandel, Advanced Mask Technology Ctr. GmbH Co. KG (Germany); Noriaki Nakayamada, NuFlare Technology, Inc. (Japan); G. R. Cantrell, AMTC (Germany) . . . [9235-34]

SESSION 11

Location: Steinbeck Forum Thu 9:50 am to 10:10 am

PMJ 2014 Panel Discussion Overview

Session Chairs: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd. (Japan);
Paul W. Ackmann, GLOBALFOUNDRIES Inc. (USA)

9:50 am: **PMJ Panel Discussion Overview: EUV mask inspection technologies for the 10nm and beyond**, Kiwamu Takehisa, Lasertec Corp. (Japan); Jun Kotani, Toppan Photomasks, Ltd. (USA) . . . [9235-35]

Coffee Break Thu 10:10 am to 10:40 am

CONFERENCE 9235

PANEL DISCUSSION

Location: Steinbeck Forum Thu 10:40 am to 12:30 pm

Mask Complexity: How to Solve the Issues?

Moderators: **Naoya Hayashi**, Dai Nippon Printing Co., Ltd., and
Paul W. Ackmann, GLOBALFOUNDRIES Inc.

Panelists: **Peter D. Buck**, Mentor Graphics Corp; **Shuichiro Ohara**,
Nippon Control System Corp.; **Shusuke Yoshitake**, NuFlare Technology,
Inc.; **Daniel Chalom**, IMS Fabrication AG; **Dong-Hoon Chung**,
Samsung Electronics Co., Ltd.; **Laurent C. Tuo**, Taiwan Semiconductor
Manufacturing Co., Ltd.; **Yalin Xiong**, KLA-Tencor Corp.;
Bala Thumma, Synopsys, Inc.

We are going to discuss following issues for mask complexity.

- **Issues on Multiple-exposure optical lithography, Data volume? Mask writing time? Too many masks per set? Overlay accuracy?**
- **EUVL will really simplify the mask complexity?**
- **How to reduce the mask writing time?**
- **Nanofabrication for mask writer throughput improvement with single and/or multiple beams**
- **Issues on Inspection/Metrology. Is EUV mask easier to inspect than complex optical mask? Is there any specific issue on the mask for DSA patterning?**

Lunch Break Thu 12:30 pm to 2:00 pm

SESSION 12

Location: Steinbeck Forum Thu 2:00 pm to 2:20 pm

EMLC 2014 Best Paper

Session Chairs: **Thomas B. Faure**, IBM Corp. (USA);
Pawitter J. Mangat, GLOBALFOUNDRIES Inc. (USA)

2:00 pm: **EMLC 2014 Best Paper: Contact hole multiplication using grapho-epitaxy directed self-assembly: Process choices, template optimization, and placement accuracy**, Joost P. Bekaert, Jan Doise, Vijaya-Kumar Murugesan Kuppuswamy, Roel Gronheid, Boon Teik Chan, Geert Vandenbergh, IMEC (Belgium); Yi Cao, YoungJun Her, AZ Electronic Materials USA Corp. (USA) [9235-36]

LOCATION: STEINBECK FORUM

SESSION 13

Location: Steinbeck Forum Thu 2:20 pm to 4:00 pm

EUV Mask II

Session Chairs: **Thomas B. Faure**, IBM Corp. (USA);

Pawitter J. Mangat, GLOBALFOUNDRIES Inc. (USA)

2:20 pm: **EUV mask fabrication readiness and challenges for HVM**

(Invited Paper), Guojing Zhang, Pei-Yang Yan, Ted Liang, Kishore K.

Chakravorty, Seh-jin Park, John F. Magana, Su Xu, Brittany M. McClinton,

Robert J. Chen, Yongbae Kim, Intel Corp. (USA) [9235-37]

2:50 pm: **EUV mask black-border evolution**, Christina Turley, Ravi K. Bonam,

IBM Corp. (USA); Emily E. Gallagher, Jonathan Grohs, IBM Corp. (USA);

Masayuki Kagawa, Toppan Photomasks, Inc. (USA); Louis M. Kindt, IBM Corp.

(USA); Eisuke Narita, Toppan Photomasks, Inc. (USA); Steven C. Nash, IBM

Corp. (USA); Yoshifumi Sakamoto, Toppan Photomasks, Inc. (USA) . . [9235-38]

Coffee Break Thu 3:10 pm to 3:40 pm

3:40 pm: **Feasibility of EUV lithography for printing circuits with 4nm**

feature size, Michael S. Yeung, Fastlitho Inc. (USA); Eytan Barouch, Boston

Univ. (USA) [9235-39]

SESSION 14

Location: Steinbeck Forum Thu 4:00 pm to 5:20 pm

EUV Mask III

Session Chairs: **Uwe Dietze**, SUSS MicroTec Inc. (USA);

M. Warren Montgomery, SUNY College of Nanoscale Science

and Engineering (USA)

4:00 pm: **Capability of etched multilayer EUV-mask fabrication**, Kosuke

Takai, Koji Murano, Takashi Kamo, Toshiba Corp. (Japan); Naoya Hayashi,

Dai Nippon Printing Co., Ltd. (Japan) [9235-40]

4:20 pm: **Repairing native defects on EUV mask blanks**, Mark Lawliss,

Emily E. Gallagher, Michael S. Hibbs, IBM Corp. (USA); Kazunori Seki,

Takeshi Isogawa, Toppan Photomasks, Inc. (USA); Tod E. Robinson, Jeffrey

LeClaire, RAVE LLC (USA) [9235-41]

4:40 pm: **Carbon removal from trenches on EUV reticles**, Norbert B. Koster,

Kees-Peter Geluk, TNO (Netherlands); Thijs W. Versloot, European Space

Agency (Netherlands); Jochem Janssen, TNO (Netherlands);

Yves Fleming, Ctr. de Recherche Public - Gabriel Lippmann

(Luxembourg) [9235-42]

5:00 pm: **The study on EUV mask cleaning without Ru surface damage**,

Daisuke Matsushima, Kensuke Demura, Satoshi Nakamura, Masafumi

Suzuki, Katsuhiro Kishimoto, Makoto Muto, Shibaura Mechatronics Corp.

(Japan) [9235-43]

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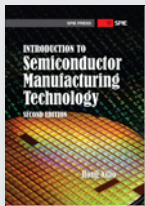
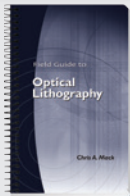
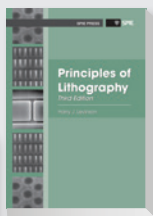
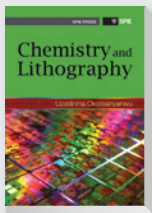
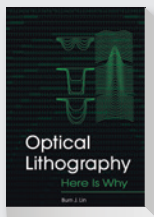
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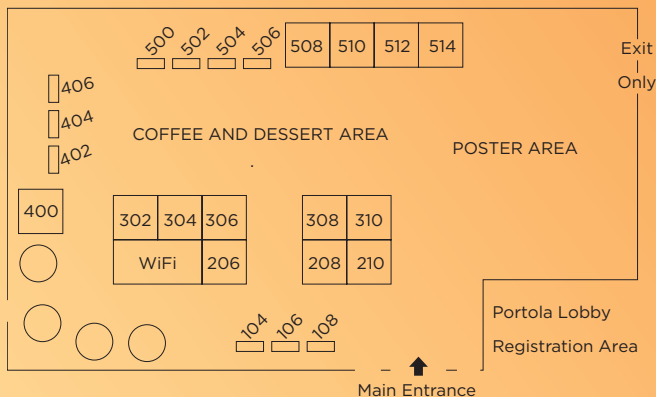
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Nippon Control System Corp has been providing fracturing tool to the industry over 20 years. As a successor of the famous PATACON, we have offered NDE Mask Manufacturable Suite (NDE-MS) which includes all applications required by mask manufactures from post-opc through pre-mask writing. The applications are NDE-Fracture, MRC, Select, Pattern-match, SCRD, PEC, MPC, and View. Contact: Shu Ohara, Director, oohara@nippon-control-system.co.jp

Coffee Break Sponsor

NuFlare Technology, Inc.

#514

8-1 Shinsugita-cho Isogo-ku, Yokohama, Kanagawa,
235-8522 Japan

+81 45 370 8933; fax +81 45 370 9936

info@nuflare.co.jp; www.nuflare.co.jp/english

Featured Product: EBM-9000 16 nm hp Mask Writer

NuFlare Technology, Inc. is a world-leading developer and manufacturer of electron beam mask writers, mask inspection systems, and epitaxial growth systems, all essential for enabling the growing sophistication of semiconductor devices. For more than thirty years, we have supported the semiconductor industry's quest for shrinking feature sizes with our electron beam mask writers. Today, we continue with technologies for identifying defects in printing patterns on photomasks and thick-film epi.

Pozzetta, Inc.

#308

3121 S Platte River Dr, Englewood, CO, 80110-2139 USA

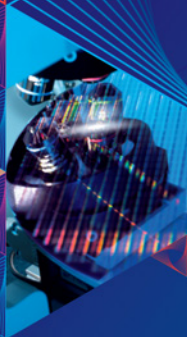
+1 303 783 3172; fax +1 303 374 7342

sales@pozzetta.com; www.pozzetta.com

Featured Product: Photomask Boxes, Reticle Pods, Reticle Storage, Wafer Carriers


Companies around the world trust Pozzetta to create secure environments for the handling, storage, and transport of photomasks, reticles, and wafers. Pozzetta will protect your valuable products from particles, ESD damage, outgassed components, and high costs. In order to meet the requirements of next-generation lithography Pozzetta photomask compacts are designed to reduce particles, prevent ESD, and reduce outgassing. By preventing random defects Pozzetta will increase yields and reduce costs Contact: Artemis Vasiliades, Account Executive, artemis@pozzetta.com; Scott Reese, Account Executive, scott.reese@pozzetta.com

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Contact: Roy White, Vice President of Sales & Marketing, roy.white@ravenano.com; Michael Archuletta, Director of Marketing, michael.archuletta@ravenano.com

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Solid State Technology

#108

1786 18th St, San Francisco, CA, 94107 USA
+1 415 255 0390; fax +1 415 255 9214
www.solid-state.com

Featured Product: Solid State Technology

Solid State Technology. The leader in covering semiconductor manufacturing and packaging technology, materials, products and news for over 50 years provides the same level of expertise and insights to decision makers for MEMs, display, LED and power electronics manufacturing-in our magazine, six e-Newsletters, comprehensive website and at The ConFab. Contact: Jenna Johnson, Marketing Manager, jjohnson@extensionmedia.com; Kerry Hoffman, Sales Manager, khoffman@extensionmedia.com

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Synopsys, Inc.

#310

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XYALIS

#304

SPIE Corporate
Member

BP 1510, World Trade Ctr Grenoble, Grenoble Cedex 01,
38025 France
+33 476 706 475
info@xyalis.com; www.xyalis.com

Featured Product: XYALIS GTwatermark stamps “golden” GDSII and OASIS layouts for higher security in design flow.

XYALIS offers advanced solutions for Mask Data Preparation (MDP) and Design For Manufacturing (DFM) that shorten time to manufacturing, increase yield, and remove errors during mask and wafer production. A proven integrated MDP solution automates frame generation, MPW design, maskset creation, and Mask Order Form management. A dummy fill engine for the most advanced processes combines power and accuracy of model-based approaches with simplicity and performance of rule-based tools
Contact: Sylvie Hurat, US Area Manager, sylvie@xyalis.com

General Sponsor

Zeeko Ltd.

#206

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LE67 3FW United Kingdom
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info@zeeko.co.uk; www.zeeko.co.uk

PRODUCT CATEGORIES

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REGISTRATION

Onsite Registration and Badge Pick-Up Hours

Location: Portola Lobby

Monday 15 September 12:00 pm to 5:00 pm

Tuesday 16 September 7:15 am to 4:00 pm

Wednesday 17 September 7:30 am to 4:00 pm

Thursday 18 September 8:00 am to 10:30 am

CONFERENCE REGISTRATION

Includes admission to all conference sessions, Keynote, Panel Discussion, Poster Reception, Photomask Reception, admission to the Exhibition, buffet-style lunches on Tuesday, Wednesday, Thursday, morning breakfast breads, coffee breaks, afternoon dessert snacks, and a choice of proceedings. Student pricing does not include proceedings, lunches, or Photomask Reception.

EXHIBITION REGISTRATION

Exhibition-Only visitor registration is complimentary.

SPIE MEMBER, SPIE STUDENT MEMBER, AND STUDENT PRICING

- SPIE Members receive conference and course registration discounts. Discounts are applied at the time of registration.
- SPIE Student Members receive a 50% discount on all courses.
- Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

PRESS REGISTRATION

For credentialed press and media representatives only. Please email contact information, title, and organization to media@spie.org.

SPIE Cashier

Location: Registration Area

Open during registration hours

REGISTRATION PAYMENTS

If you are paying by cash or check as part of your onsite registration, wish to add a special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier.

RECEIPTS AND CERTIFICATE OF ATTENDANCE

Preregistered attendees who did not receive a receipt or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

BADGE CORRECTIONS

Badge corrections can be made by the SPIE Cashier. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

REFUND INFORMATION

There is a \$50 USD service charge for processing refunds. Requests for refunds must be received by 29 August 2014; all registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions or Special Events purchased are not refundable.

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AUTHOR / PRESENTER INFORMATION _____

Speaker Check-In and Preview Station

Location: Steinbeck Lobby

Open during Registration Hours

The computers at the Internet Stations are available to preview speakers' presentations. They are identical to the computer in the conference room. Speakers may use their own computer to present and may test their presentations in the conference room before, after or during breaks in the conference schedule. If experiencing any difficulties with a presentation please visit the SPIE Registration Desk.

Exhibition/Poster Reception

Location: Serra Grand Ballroom

Tuesday 16 September 6:00 to 7:30 pm

Symposium attendees are invited to attend the Exhibition/Poster Reception on Tuesday evening in the Serra Grand Ballroom. The reception provides an opportunity for attendees to meet with colleagues, network, view poster papers and interact with the authors, and visit the exhibition booths. Refreshments will be served. Attendees are requested to wear their conference registration badges.

Poster Viewing

Location: Serra Grand Ballroom

Tuesday 16 September 10:00 am to 4:00 pm, and
6:00 to 7:30 pm

Wednesday 17 September 10:00 am to 3:00 pm

Poster authors may set up their poster papers between 10:00 am and 4:00 pm on Tuesday and will leave them up until Wednesday afternoon. Authors will be present during the Poster Reception 6:00 to 7:30 pm Tuesday to answer questions and provide in-depth discussion regarding their papers. Posters will remain up until 3:00 pm Wednesday.

OFFSITE SERVICES

FedEx Kinkos is located at 799 Lighthouse Ave., Suite A, Monterey, Calif., 93940, Phone 831.373.2298. It is located 1.3 miles from the Monterey Marriott. Go north on Calle Principal, left onto Del Monte Avenue, right onto Pacific St., right onto ramp to merge onto Lighthouse Avenue.

Child Care Services

The Monterey Marriott suggests the following childcare service companies:

Parents Time Out, Phone: 831.375.9269 VIP

Babysitting Solutions Inc., (in-room hotel babysitting services).
Phone: 800.838.2787

SPIE does not imply endorsement or recommendation for these services. Information provided as “information only” for your further analysis and decision. Other services may be available.

SPIE GREEN INITIATIVE

As host to events that bring together scientists and engineers from around the globe, SPIE is committed to making our symposia as environmentally friendly as possible.

Ongoing efforts of SPIE include using non-disposable materials such as glass plates and metal flatware as often as possible, and encouraging facilities to donate surplus meals to soup kitchens. Many partnering facilities have robust recycling programs for paper, plastic, and aluminum products. SPIE continues to collaborate with venues, hotels, suppliers and the local Chambers of Commerce to assess and ease the conference’s environmental impact. SPIE is currently working to implement solutions from the Green Meetings Industry Council guidelines with a goal to take our environmental efficiency to a whole new level.

When at this event, SPIE encourages you to take advantage of recycling bins, to reuse towels at your hotel, and to carpool whenever transportation is required during your stay in Monterey.

ONSITE SERVICES

Internet Access

Location: Steinbeck Lobby – Internet Stations

SPONSORED BY: 

Complimentary wired internet access is available; attendees can hook up their laptops or use provided workstations.

WiFi

Location: Monterey Conference Center –
WiFi available in the entire center

SPONSORED BY: 

Complimentary wireless access is available; instructions will be posted onsite.

Business Center

Location: Monterey Marriott

Attendees may use their hotel room key at the Monterey Marriott to access the onsite Business Center which offers use of the free online computers. Copy and fax machines are available at the front desk. Copies are free for the first 20 copies, 10 cents per page after. The fax machine is \$1 per page for domestic usage and \$3 per page for international usage.

Urgent Message Line

An urgent message line is available during registration hours:
831.646.5312

Lost and Found

SPIE Cashier

Registration Hours

Found items will be kept at SPIE Cashier until the close of Registration each day and then turned over to Inact Protective Services, 831.763.2594. At the end of the meeting, all found items will be turned over to Monterey Conference Center, 831.646.3770.

CAR RENTAL

The Hertz logo, consisting of the word "Hertz" in a bold, italicized, black sans-serif font, set against a bright yellow rectangular background.

Hertz Car Rental has been selected as the official car rental agency for SPIE Photomask Technology. To reserve a car, identify yourself as a conference attendee using the Hertz Meeting Code **CV#029B0019**. When booking from international Hertz locations, the CV# must be entered with the letter CV before the number, i.e. CV029B0019.

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FOOD AND BEVERAGE SERVICES

Breakfast Breads

Location: Steinbeck Lobby

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Complimentary coffee and breakfast breads will be served Tuesday through Thursday 7:30 to 8:30 am.

Coffee Breaks

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NUFLARE



Complimentary coffee will be served Tuesday through Thursday in the following locations.

Tuesday 16 September 10:15 am and 3:35 pm
Location: Serra Grand Ballroom – Exhibition Hall

Wednesday 17 September 10:00 am and 3:20 pm
Location: Serra Grand Ballroom – Exhibition Hall

Thursday 18 September 10:00 am and 3:00 pm
Location: Steinbeck Lobby

SPIE-Hosted Lunches

Location: San Carlos Ballroom – Marriott

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Hosted lunches will be served at the lunch break Tuesday – Thursday in the San Carlos Ballroom at the Monterey Marriott.

Complimentary lunch tickets will be included for full conference registrants attending the Photomask Meeting. **NOTE:** Scanning attendees, Exhibitors and students may purchase tickets in the SPIE Registration area in the Portola Lobby.

Desserts

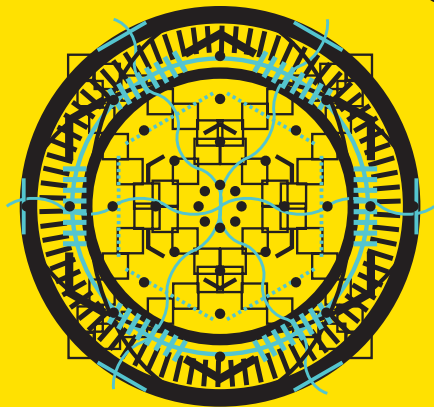
Complimentary tickets for dessert snacks are included in conference attendee and exhibitor registration packets.

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