Elizabeth Buitrago, PhD

R&D Project leader BiMOS Chips

PERSONAL INFO

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SKILLS, HONORS & ACTIVITIES

- Bilingual (Spanish, English), basic French and German
- Organization Staff for the International Conference on Micro and Nano Engineering (MNE) 2014, Lausanne-CH.
- Donald F. Othmer Sophomore Academic Excellence Award (AICHE)
- IEEE EPFL student branch member (2010 - present)
- Triton Engineering Council Representative for AICHE (2003 – 2005)

EDUCATION

JUN 2014 — PhD Microsystems and Microelectronics
École Polytechnique Fédérale de Lausanne (EPFL)
Switzerland

SEPT 2010 — MSc Process Engineering
Eidgenössische Technische Hochschule Zürich (ETHZ)
Switzerland

JUN 2005 — BSc Chemical Engineering
University of California San Diego (UCSD)
USA

EXPERIENCE

NOV 2016 - PRESENT: R&D Project leader BiMOS Chips

ABB Switzerland – Lenzburg (Switzerland)

- Development and benchmarking of novel buffer technologies compatible with ultra-thin > 200 mm wafers.
- Process flow assessment and tool set evaluation (laser anneal) for thin wafer backside processing of IGBTs.
- Process integration enabling $T_{vj(op)}$ = 150 °C capability of 6.5kV, 900A IGBT HiPak Module.
- Project management, process integration of next generation low voltage Trench IGBTs in house and foundry.
- Process and device TCAD simulations, device design, electrical characterization and testing of IGBTs.

JUL 2014 - OCT 2016: Postdoctoral Research Scientist & Nanofabrication Lead

Paul Scherrer Institute (PSI) & ASML, X-Ray Interference Lithography Group (XIL-II) – Villigen (Switzerland)

- Process optimization and characterization of state-state-of the-art chemically amplified (CAR) and inorganic resist and materials for extreme ultraviolet (EUV) lithography at the Swiss Light Synchrotron Source (SLS).
- 10 nm half-pitch resolution achieved with CAR via ASML industrial collaboration.
- Nanofabrication lead in the development of highly efficient diffraction gratings (masks) with novel materials for interference lithography (IL) at the Lab of Micro and Nanotechnology (LMN) in PSI.

OCT 2010 - JUN 2014: Research Engineer (PhD Thesis)

EPFL, Nanoelectronic Devices Laboratory (Nanolab) – Lausanne (Switzerland): Prof. A. M. IonescuLithography Group (XIL-II) – Villigen (Switzerland)

- 3D vertically stacked silicon nanowire (SiNW) field effect transistor (FET) was realized as a proof-of-concept device for its future implementation into low cost biosensors.
- Led a multi-institution collaboration within two European projects (E-BRAINS and SiNAPS) that resulted in the successful microfluidic platform development, electrical characterization and surface functionalization for ultra-low concentration protein sensing.
- Research on high performance SiNW/Fin based FETs for biosensing (junctionless and enhancement mode).
- Careful design and fabrication of CMOS compatible process flow for robust 3D heterogeneous systems integration. 3D TCAD-Sentaurus process and device simulations.
- Teaching and supervision of master students.

SEPT 2007 - OCT 2008: Process Engineer (Wet Etch Process-Cleans)

Micron Technology (300 mm Wafer Fab) – Manassas, VA (USA)

- Direct and sustain process improvements using statistical process control (SPC).
- Strategically identify and analyze process failures.
- Audit process recipes, configure hardware and use procedural methods to perform process enhancements.
- Identifying, understanding, and resolving defect issues, assisting area technicians troubleshooting problems, improving preventative maintenance procedures, and optimizing overall tool performance.
- Proficiency across all wet process modules and toolsets necessary in order to be able to disposition lots efficiently, prevent scrap and continuously improve wet process capabilities.
- Process modules and tool sets: Wet Benches (Tel and DNS Electronics FC-3000, FC-3100), Ash and Descum (Axcelis -Rapid Strip), Single wafer processing, Nanospray and Scrub (SCREEN - DNS, SU-3000, SS-3000), Cu Plating (Semitool - Raider), Dry Bevel Etch (Sosul).
- 50 Series NAND Redundancy Project. Create redundancy for clean process steps across all wet process toolsets in anticipation for wafer processing ramp.

JAN 2006 - JAN 2007: Primary Process Engineer (Metal Deposition)

AMI Semiconductor (ON Semiconductor) – Pocatello, ID (USA)

- Worked directly with production and engineering teams to review existing procedures and identify and implement cost, quality and productivity improvements.
- Statistical analysis, design of experiments (DOE), SPC and process capability studies.
- Responsibilities included sustaining, data analysis, continuous improvement of current procedures, cost savings, new process introduction.
- Tool sets: MRC, Heat Pulse 8108 Rapid Thermal Processor.

MAR 2010 - AUG 2010: Research Assistant (Master Thesis)

ETHZ, Transport Processes and Reactions Laboratory – Zurich (Switzerland): Prof. R. Von Rohr, Dr. C. Roth

- Temperature sensitive substrate powders treated in a plasma enhanced chemical vapor deposition (PECVD) downstream reactor to simultaneously disperse and mix with silica nanoparticles generated in plasma process.
- Different organosilicon precursors were investigated for the optimization of flowability and wettability process parameters important for transportation, encapsulation, and dosing of particles among other applications.
- Analytical methods: ATR-FTIR, X-ray Diffraction XRD, SEM, flowability measurements (ring shear tester), particle size distribution determination by laser diffraction, tensiometer (contact angle determination).

FEB 2009 - JUN 2009: Research Assistant (Semester Work)

ETHZ, Particle Technology Laboratory (PTL) - Zurich (Switzerland): Prof. S. Pratsinis, Dr. H. Keskinen

- Research and development of SnO_2 sensors with Ag Nanoelectrodes for sensing ultra-low concentrations of acetone as applicable for diabetes diagnostics.
- SnO_2 nanostructured films synthesized by flame spray pyrolysis (FSP).
- Analytical methods: XRD, SEM, specific surface area calculated by BET nitrogen adsorption.

SUMMER 2003 & 2004: REU Intern (Research Experience for Undergrads)

University of Arizona, Engineering Research Center for Environmentally Benign Semiconductor Manufacturing – Tucson, AZ (USA): Prof. F. Shadman

- Developed photocatalytic stainless screen meshes for degradation of extremely low concentrations of organics in ultra-pure water (UPW) using Sol-Gel methods and chemical vapor deposition of TiO_2.

JAN 2003 - APR 2003: Lab Intern (Laboratory Technical Training Program)

Lab Intern (Laboratory Technical Training Program): UCSD – La Jolla, CA (USA): Prof. P. Russell and Dr. A. Williams.

- Received training in laboratory techniques, centrifuge, UV/VIS spectrometry, enzyme assays, protein purification, statistical analysis while doing research on the inhibition of rabbit muscle isozymes by Vitamin C.

PUBLICATIONS

1. E. Buitrago, S. Nagahara, O. Yildirim, et al., Sensitivity enhancement of chemically amplified resists and performance study using extreme ultraviolet interference lithography. Journal of Micro/Nanolithography, MEMS, and MOEMS 15 (2016), 033502.
2. T. Nagai, H. Nakagawa, E. Buitrago, et al., Novel high sensitivity EUV photoresist for sub-7 nm node. Journal of Photopolymer Science and Technology 29 (2016), 475-478.
3. R. Fallica, E. Buitrago, Y. Ekinci. Comparative study of line roughness metrics of chemically amplified and inorganic resists for extreme ultraviolet. Journal of Micro/Nanolithography, MEMS, and MOEMS 15 (2016), 034003.
4. E. Buitrago, T.K. Kulmala, R. Fallica, et al., EUV lithography process challenges, Materials and Processes for Next Generation Lithography, Edited by A. Robinson, Elsevier, 2016.
5. E. Buitrago, R. Fallica, D. Fan et al., SnO x high-efficiency EUV interference lithography gratings towards the ultimate resolution in photolithography, Microelectronic Engineering, 155(2016) 44.
6. D. Fan, E. Buitrago, S. Yang et al., Patterning of nanodot-arrays using EUV achromatic Talbot lithography at the Swiss Light Source and Shanghai Synchrotron Radiation Facility, Microelectronic Engineering, 155(2016) 55.
7. T.S. Kulmala, E. Buitrago, M. Vockenhuber et al., Pattern collapse mitigation in inorganic resists via a polymer freeze technique, Microelectronic Engineering, 155(2016) 39.
8. R. Del Re, J. Passareli, E. Buitrago et al., Low-line edge roughness extreme ultraviolet photoresists of organotin carboxylates, The Journal of Micro/Nanolithography, MEMS, and MOEMS (JM3), 14 (2015) 4.
9. S. Rigante, P. Scarbolo, E. Buitrago et al., Sensing with Advanced Computing Technology: Fin Field Effect Transistors with High-K Gate Stack on Bulk Silicon. ACS nano, 9(2015) 4872.
10. T. S. Kulmala, M. Vockenhuber, E. Buitrago et al., Towards 10nm half-pitch in EUV lithography: results on resist screening and pattern collapse mitigation techniques. The Journal of Micro/Nanolithography, MEMS, and MOEMS (JM3), 14(2015) 3.
11. H. Guerin, H. Le Poche, E. Buitrago et al., Carbon nanotube gas sensor array for multiplex analyte discrimination. Sensors and Actuators B: Chemical 207,(2015) 833.
12. E. Buitrago, M. Fernández-Bolaños, Y.M. Georgiev, R. Yu, O. Lotty, J.D. Holmes, et al., Electrical Characterization of High Performance, Liquid Gated Vertically Stacked SiNW-Based 3D FET for Biosensing Applications, Sensors and Actuators B: Chemical, 199, (2014) 291.
13. E. Buitrago, M. Fernández-Bolaños, S. Rigante, C.F. Zilch, N. Schröter, A.M. Nightingale, et al., The Top-Down Fabrication of a 3D-Integrated, Fully CMOS-Compatible FET Biosensor Based on Vertically Stacked SiNWs and FinFETs, Sensors and Actuators B: Chemical, 193(2014) 400.
14. H. Guerin, H. Le Poche, E. Buitrago et al., High-yield, in-situ fabrication and integration of horizontal carbon nanotube arrays at the wafer scale for robust ammonia sensors. Carbon 78, (2014) 326.
15. G. Fagas, M. Nolan, E. Buitrago., Component design and testing for a miniaturized autonomous sensor based on a nanowire materials platform. Microsystem technologies 20,(2014) 971.
16. E. Buitrago, G. Fagas, M. Fernández-Bolaños, Y.M. Georgiev, et al., Junctionless Silicon Nanowire Transistors for the Tunable Operation of a Highly Sensitive, Low Power Sensor, Sensors and Actuators B: Chemical, 183(2013).
17. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, Vertically Stacked Si Nanostructures for Biosensing Applications, Microelectronic Engineering, 97(2012) 345.
18. M. Fernández-Bolaños, E. Buitrago, A.M. Ionescu, RF MEMS Shunt Capacitive Switches Using AlN Compared to Si_3N_4 Dielectric, Journal of Microelectromechanical Systems, 21(2012) 1229.
19. C. Roth, G. Oberbossel, E. Buitrago, R. Heuberger, P.R. von Rohr, Nanoparticle Synthesis and Growth in a Continuous Plasma Reactor from Organosilicon Precursors, Plasma Processes and Polymers, 9(2012) 119.

CONFERENCES & INVITED TALKS

1. E. Buitrago, A. Mesemanolis, C. Papadopoulos, et al., An advanced soft punch through buffer design for thin wafer IGBTs targeting lower losses and higher operating temperatures up to 200° C. ISPSD, Chicago, 2018.
2. S. Nagahara, M. Carcasi, E.Buitrago et al,. Photosensitized Chemically Amplified Resist (PSCAR) 2.0 for high-throughput and high-resolution EUV lithography: dual photosensitization of acid generation and quencher SPIE Advanced Lithography, San Jose, CA (2017)10146, 101460G.
3. E. Buitrago, M. Meeuwissen, O. Yildirim, et al., State-of-the-art EUV materials and processes for the 7nm node and beyond. SPIE Advanced Lithography, San Jose, CA (2017)10143, 101430T.
4. O. Yildirim, E. .Buitrago, R Hoefnagels, et al., Improvements in resist performance towards EUV HVM. SPIE Advanced Lithography, San Jose, CA (2017)10143 101430Q.
5. R. Fallica, E. Buitrago, Y. Ekinci. Comparative study of line roughness metrics of chemically amplified and inorganic resists for EUV. SPIE Advanced Lithography, San Jose, CA (2016), pp. 97790K.
6. E. Buitrago, R. Fallica, D. Fan, et al., From powerful industrial platform for EUV photoresist development to world record resolution by photon based lithography: EUV interference lithography at the Paul Scherrer Institute. International Materials Research Congress, Invited Talk, Cancun, Mexico (August, 2016).
7. T. Nagai, O. Nakagawa, E. Buitrago et al., Novel High Sensitivity EUV Photoresist for Sub-7 nm Node. ICPST-33, Invited Talk, Chiba, Japan (June 2016).
8. E. Buitrago, R. Fallica, D. Fan, et al., From powerful industrial platform for EUV photoresist development to world record resolution by photon based lithography: EUV interference lithography at the Paul Scherrer Institute. SPIE Optics and Photonics, Invited Talk, San Diego, CA (August, 2016).
9. E. Buitrago, S. Nagahara, O. Yildirim, et al., Sensitivity enhancement of chemically amplified resists and performance study using EUV interference lithography. SPIE Advanced Lithography, San Jose, CA (2016), pp. 97760Z.
10. S. Nagahara, M. Carcasi, E. Buitrago, et al., Challenge toward breakage of RLS trade-off for EUV lithography by Photosensitized Chemically Amplified Resist (PSCAR) with flood exposure. SPIE Advanced Lithography, San Jose, CA (2016), pp. 977606.
11. T. Nagai, H. Nakagawa, E. Buitrago, et al., Novel high-sensitivity EUV photoresist for sub-7nm node, San Jose, CA (2016), pp. 977908.
12. R. Fallica, E. Buitrago, Y. Ekinci et al., Comparative study of line roughness metrics of chemically amplified and inorganic resists for EUV. SPIE Advanced Lithography, San Jose, CA (2016), pp. 97790K.
13. E. Buitrago, D. Fan, W. Karim et al., EUV Lithography at PSI. Shanghai Synchrotron Radiation Facility (SSRF), Invited Talk (2015).
14. E. Buitrago, R. Fallica, Y. Ekinci et al., The road towards single digit nanometer resolution patterning in mass production: State-of-the-art EUV resists platforms compared. International Symposium on Extreme Ultraviolet Lithography, Maastricht, Netherlands (2015).
15. E. Buitrago, R. Fallica, D. Fan et al., SnO x high-efficiency EUV interference lithography gratings towards the ultimate resolution in photolithography, International Conference on Micro and Nano Engineering (MNE), The Hague (2015).
16. E. Buitrago, D. Fan, S. Yang et al., Patterning of nanodot-arrays using EUV achromatic Talbot lithography at the Swiss Light Source and Shanghai Synchrotron Radiation Facility, International Conference on Micro and Nano Engineering (MNE), The Hague (2015).
17. T.S. Kulmala, E. Buitrago, M. Vockenhuber et al., Pattern collapse mitigation in inorganic resists via a polymer freeze technique, International Conference on Micro and Nano Engineering (MNE), The Hague (2015).
18. E. Buitrago, O. Yildirim, C. Verspaget et al., Evaluation of EUV resist performance using interference lithography. SPIE Advanced Lithography, San Jose, CA (2015), pp. 94221S.
19. T.S. Kulmala, E. Buitrago, M. Vockenhuber et al., Toward 10nm half-pitch in EUV lithography: results on resist screening and pattern collapse mitigation techniques, San Jose, CA (2015), pp. 942204.
20. E. Buitrago, M. Fernández-Bolaños, Y.M. Georgiev, et al., Attomolar Streptavidin and pH Low Power Sensor Based on 3D Vertically Stacked SiNW FETs, International Symposium on VLSI Technology, Systems and Applications (VLSI-TSA), Hsinchu, Taiwan (2014).
21. E. Buitrago, M. Fernández-Bolaños, Y.M. Georgiev, et al., Functionalized 3D 7x20-array of Vertically Stacked SiNW FET for Streptavidin Sensing, 71th Annual Device Research Conference (DRC), Notre Dame, IN (2013).
22. E. Buitrago, G. Fagas, M. Fernández-Bolaños, Y.M. Georgiev, M. Berthomé, A.M. Ionescu, Junctionless Silicon Nanowire Transistors for the Tunable Operation of a Highly Sensitive, Low Power Sensor, International Conference on Biosensing Technology, Sitges, Spain (2013).
23. N. Schröter, E. Buitrago, M. Fernandez-Bolaños, et al., Immobilization of DNA to Planar and Nanostructured Chip-Surfaces for the Detection of Pathogen-Specific Biomolecules on a Magnetic Bead Based Diagnostic Platform, International Conference on Biosensing Technology, Sitges, Spain (2013).
24. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, Vertically Stacked Silicon Nanowire for Biosensing Applications, Micro Nano Fabrication Annual Review Meeting, Lausanne, Switzerland (2013).
25. T. Bieniek, G. Janczyk, E. Buitrago et al., Reliability and Robustness Investigation of 3D Vertically Stacked Silicon Nanowire Structures Using AFM Based Techniques, Nanotech Conference and Expo, Washington, DC, USA (2013).
26. E. Buitrago, M. Fernández-Bolaños, Y.M. Georgiev, et al., Functionalized 3D 7x20-array of Vertically Stacked SiNW FET for Streptavidin Sensing, Swiss-Japanese Symposium on Nanomedicine and Imaging Frontiers EPFL, Lausanne, EPFL (2013).
27. T. Bieniek, G. Janczyk, P. Janus, E. Buitrago, et al., Silicon Nanowires Reliability and Robustness Investigation Using AFM-based Techniques, Electron Technology Conference, Ryn, Poland (2013), p. 89022L.
28. E. Buitrago, G. Fagas, M. Fernández-Bolaños, et al., Silicon Nanowires for Biosensing Applications, Zero Power Workshop, Barcelona, Spain (2012).
29. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, Vertically Stacked Silicon Nanowire for Biosensing Applications, Micro Nano Fabrication Annual Review Meeting, Lausanne, Switzerland (2012).
30. T. Bieniek, G. Janczyk, E. Buitrago et al., Reliability Investigation by Examination of dedicated MEMS/ASIC and NW's Test Structures related to novel 3D SiP and Nano-Sensors Systems, IEEE International Workshop on Three-Dimensional Stacked Integrated Circuits (3D-Test), Anaheim, CA, USA (2012).
31. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, 3D Vertically Stacked SiNWs for Biosensing Applications, LEA Micro-Engineering Workshop, Saline Royale d'Arc et Senans, France (2012).
32. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, 3D Vertically Stacked Nanostructures for Biosensing Applications, International Conference on Micro and Nano Engineering (MNE), Berlin (2011).
33. E. Buitrago, M. Fernández-Bolaños, A.M. Ionescu, Vertically Stacked Silicon Nanowire for Biosensing Applications, Micro Nano Fabrication Annual Review Meeting, Lausanne, Switzerland (2011).
34. E. Buitrago, F. Shadman, Photocatalytic Degradation of Organics for Ultra-Pure Water (UPW) Applications used in the Semiconductor Industry, AICHE Annual Meeting, San Francisco, CA (2004).