SiGe, Ge, and Related Compounds 4: Materials, Processing, and Devices

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J. Liu (Massachusetts Institute of Technology and Dartmouth College, USA)

8:40 – 9:40 PM
Workshop Panel Discussion

Chapter 15
Optoelectronics II: Photodetectors

Thursday AM
Session Co-Chairs: J. Liu and G. Masini

(15.1) 8:00 – 8:30 AM
(Invited) Performance and Reliability of a 25Gb/s Ge Waveguide Photodetector Integrated in a CMOS Process 741
S. Sahni, D. Song, M. Sharp, D. Kucharski, D. Guckenberger, and G. Masini
(Luxtera Inc., USA)

(15.2) 8:30 – 9:00 AM
(Invited) Integration of Germanium Avalanche Photodetectors on Silicon for On-Chip Optical Interconnects 749
S. Assefa, F. Xia, and Y. Vlasov (IBM, USA)

(15.3) 9:00 – 9:30 AM
(Invited) Ge/Si Waveguide Avalanche Photodiodes on SOI Substrates for High Speed Communication 757
Y. Kang (Intel Corporation, USA), Y. Saado (Numonyx Corporation, Israel), M. Morse, M. Paniccia (Intel Corporation, USA), J. Campbell (University of Virginia, USA), J. E. Bowers (University of California at Santa Barbara, USA), and A. Pauchard (self)

(15.4) 9:30 – 9:50 AM
Near IR Photodiodes with Tunable Absorption Edge Based on Ge_{1-y} Sn_y Alloys Integrated on Silicon 765
J. Mathews, R. Roucka, C. Weng, R. Beeler, J. Tolle, J. Menéndéz, and J. Kouvetakis (Arizona State University)

9:50 – 10:05 AM
Coffee Break

Chapter 16
Nano Membranes and MEMs

Thursday AM (Concurrent Session)
Session Chair: T. Krishnamohan

(16.1) 10:05 – 10:35 AM
(Invited) Si, SiGe, Ge, and III-V Semiconductor Nanomembranes and Nanowires Enabled by SiGe Epitaxy 777
M. Orlowski, C. Ndoye, T. Liu, and M. Hudait (Virginia Tech, USA)

(16.2) 10:35 – 10:55 AM
Diffusion and Interface Segregation of Phosphorus and Boron in Bulk Germanium, Germanium Nanomembranes, and Nanowires 791
T. Liu, C. Ndoye, and M. Orlowski (Virginia Tech, USA)

(16.3) 10:55 – 11:25 AM
(Invited) SiGe MEMS Technology: A Platform Technology Enabling Different Demonstrators 799
A. Witvrouw, R. Van Hoof, G. Bryce, B. Du Bois, A. Verbist, S. Severi, L. Haspeslagh, H. Osman, J. De Coster (imec, Belgium), L. Wen (Katholieke Universiteit Leuven, Belgium), R. Puers (imec and Katholieke Universiteit Leuven, Belgium), R. Beernaert, H. De Smet, S. Rudra, and D. Van Thourhout (Universiteit Ghent, Belgium)

(16.4) 11:25 – 11:45 AM
Elastically Strain-Sharing Si(110) Nanomembranes 813
D. M. Paskiewicz, S. A. Scott, D. E. Savage, and M. G. Lagally (University of Wisconsin-Madison, USA)

(16.5) 11:45 AM – 12:05 PM
Functionalized Back-End Devices for (Bi)CMOS Circuits 823
C. Wenger, C. Walczyk, D. Walczyk, M. Lukosius, M. Fraschke, D. Wolansky (IHP, Germany), and P. Santos (PDI, Germany)

12:05 – 1:20 PM
Lunch Break

Chapter 17
Epitaxy II: Epitaxy of Alternative Semiconductors on Si Substrates

Thursday AM (Concurrent Session)
Session Chair: M. Caymax

(17.1) 10:05 – 10:35 AM
(Invited) Epitaxial Growth of III-Nitrides on Silicon Substrates 833
S. Degroote (EpiGaN bvba, Belgium), M. Leys, K. Cheng, B. Sijmus, J. Derluyn, G. Borghs, and M. Germain (imec, Belgium)

(17.2) 10:35 – 10:55 AM
High Quality Epitaxial Growth of $GaAs_yP_{1-y}$ Alloys on $Si_{1-x}Ge_x$ Virtual Substrates 843
P. Sharma, M. T. Bulsara, and E. A. Fitzgerald (Massachusetts Institute of Technology, USA)

(17.3) 10:55 – 11:25 AM
(Invited) Direct Heterointegration of III-V Materials on Group IV Substrates 849
D. A. Ahmari, B. McDermott (EpiWorks, Inc., USA), S. Thomas (ASM America, USA), B. Roof, Q. Hartmann (EpiWorks, Inc., USA), and X. Li (University of Illinois, USA)

(17.4) 11:25 – 11:55 AM
(Invited) Epitaxial Formation of Graphene on Si Substrates: From Heteroepitaxy of 3C-SiC to Si Sublimation 859
M. Suemitsu (CREST/Japan Science and Technology Agency and Tohoku University, Japan), H. Handa, E. Saito, and H. Fukidome (Tohoku University, Japan)

11:55 AM – 1:20 PM
Lunch Break

Chapter 18
Surfaces and Interfaces II: Interface Physics, Characterization, and Device Application

Thursday PM (Concurrent Session)
Session Co-Chairs: S. Miyazaki and S. Zaima

(18.1) 1:20 – 1:40 PM
Novel SiGe Source/Drain for Reduced Parasitic Resistance in Ge NMOS 871
S. Raghunathan (Stanford University, USA), T. Krishnamohan (Intel, USA), and K. C. Saraswat (Stanford University, USA)

(18.2) 1:40 – 2:00 PM
Non-Contact and Non-Destructive Measurement of Ge and B Content in $Si_{1-x}Ge_x/Si$ Using Very High Resolution Multiwavelength Raman Spectroscopy 877
W. Yoo, T. Ueda, T. Ishigaki, and K. Kang (WaferMasters, Inc., USA)

(18.3) 2:00 – 2:20 PM
X-ray Microdiffraction Study on Crystallinity of Micron-Sized Ge Films Selectively Grown on Si(001) Substrates 887
K. Ebihara, S. Harada, J. Kikkawa, Y. Nakamura, A. Sakai (Osaka University, Japan), G. Wang, M. Caymax (imec, Belgium), Y. Imai, S. Kimura, and O. Sakata (JASRI/SPring-8, Japan)

(18.4) 2:20 – 2:40 PM
Interface Reaction and Rate Enhancement of SiGe Thermal Oxidation 893
T. Shimura, Y. Okamoto, D. Shimokawa, T. Inoue, T. Hosoi, and H. Watanabe (Osaka University, Japan)

(18.5) 2:40 – 3:00 PM
Misfit Stress Relaxation Mechanism in GeO_2/Ge Systems: A Classical Molecular Simulation Study 901
T. Watanabe, T. Onda, and I. Ohdomari (Waseda University, Japan)

(18.6) 3:00 – 3:20 PM
Chemical Trend of Schottky-Barrier Change by Segregation Layers at Metal/Si Interfaces: First-Principles Study 913
T. Nakayama, Y. Maruta, and K. Kobinata (Chiba University, Japan)

3:20 – 3:35 PM
Coffee Break

Chapter 19
Related Compounds I

Thursday PM (Concurrent Session)
Session Chair: A. Reznicek

(19.1) 1:20 – 1:50 PM
(Invited) III-V Photovoltaics: Recent Developments and Prospects 923
N. Sosa, T. Van Kessel, Y. Martin, and H. Hovel (IBM, USA)

(19.2) 1:50 – 2:20 PM
(Invited) Ge/III-V Heterostructures and Their Applications in Fabricating Engineered Substrates 927
Y. Bai and E. A. Fitzgerald (Massachusetts Institute of Technology, USA)

(19.3) 2:20 – 2:50 PM
(Invited) Selective Epitaxial Growth of III-V Semiconductor Heterostructures on Si Substrates for Logic Applications 933
N. Nguyen (imec and Université de Liège, Belgium), G. Wang, G. Brammertz, M. Leys, N. Waldron, G. Winderickx, K. Lismont, J. Dekoster, R. Loo, M. Meuris (imec, Belgium), S. Degroote (EpiGaN bvba, Belgium), F. Buttitta, B. O'Neil, O. Féron, J. Lindner, F. Schulte, B. Schineller, M. Heuken (AIXTRON AG, Germany), and M. Caymax (imec, Belgium)

(19.4) 2:50 – 3:10 PM
Growth and Optical Properties of InGaAs via Ge-Based Virtual Substrates: A New Chemistry Based Strategy 941
R. Beeler, C. Weng, J. Tolle, R. Roucka, J. Mathews (Arizona State University, USA), D. A. Ahmari (EpiWorks, Inc., USA), J. Menéndéz, and J. Kouvetakis (Arizona State University, USA)

3:10 – 3:35 PM
Coffee Break

Chapter 20
Processing II: Advances in Structures, Doping, and Annealing

Thursday PM (Concurrent Session)
Session Co-Chairs: J.-M. Hartmann and T. Sadoh

(20.1) 3:35 – 4:05 PM
(Invited) Graphene FETs: Promises and Challenges 953
C. Miao, Y. Park, W. Liu, Y. Wang, J. Zhu, B. Huang, J. Woo, and Y. Xie (University of California at Los Angeles, USA)

(20.2) 4:05 – 4:35 PM
(Invited) Aspect Ratio Trapping: A Unique Technology for Integrating Ge and III-Vs with Silicon CMOS 963
J. G. Fiorenza, J. Park, J. Hydrick, J. Li (AmberWave Systems Corporation, USA), J. Li, M. Curtin, M. Carroll, and A. Lochtefeld (AmberWave Inc., USA)

(20.3) 4:35 – 4:55 PM
Epitaxial Growth on High Aspect Ratio Structures 977
S. Chopra, V. Tran, B. Wood, Y. Kim, and S. Kuppurao (Applied Materials, USA)

(20.4) 4:55 – 5:15 PM
HCl Selective Etching of SiGe versus Si in Stacks Grown on (110) 985
J. Hartmann, V. Destefanis (CEA-LETI, Minatec, France), G. Rabillé, and S. Monfray (STMicroelectronics, France)

(20.5) 5:15 – 5:35 PM
Phosphorus Atomic Layer Doping in Si Using PH_3 995
Y. Yamamoto (IHP, Germany), J. Murota (Tohoku University, Japan), and B. Tillack (IHP and TU Berlin, Germany)

(20.6) 5:35 – 5:55 PM
Non-Contact and Non-Destructive Characterization of Laser Spike Annealed $Si_{1-x}Ge_x$/Si Using Very High Resolution Multiwavelength Raman Spectroscopy 1003
W. Yoo, T. Ueda, T. Ishigaki, and K. Kang (WaferMasters, Inc., USA)

Chapter 21
Related Compounds II

Thursday PM (Concurrent Session)
Session Chair: A. Reznicek

(21.1) 4:35 – 4:55 PM
Defect-Induced Surface Morphological Evolution in Epitaxial Germanium Growth on Silicon 1015
Y. Huang, X. Tao, M. Jin, C. Wang, and E. Sanchez (Applied Materials, Inc., USA)

(21.2) 4:55 – 5:15 PM
Observation of CMOS Device Channel Strain Using In-line HRXRD n/a
J. R. Holt, A. Madan, C. Murray (IBM, USA), M. V. Holt (Argonne National Lab, USA), S. Bedell, E. C. Harley, T. N. Adam, T. Pinto, D. Schepis (IBM, USA)

(21.3) 5:15 – 5:35 PM
Self-Aligned NiGeSi Contacts on Gallium Arsenide for III-V MOSFETs 1021
X. Zhang, H. Guo, H. Chin, X. Gong, P. Lim, and Y. Yeo
(National University of Singapore, Singapore)

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