PROGRAM

The Forum on the Science and Technology of Silicon Materials 2007

Nov. 12 (Mon.) - 14 (Wed.), 2007, Toki Messe, Niigata, Japan

Registration Desk Opening : Nov. 12, 10 a.m.

Nov. 12, Mon.

Opening remarks [13:00-13:10]

Hiroshi Yamada-Kaneta

(Center for Quantum Materials Science, Niigata University) 13:00-13:10

Plenary [13:10-15:05]

1. Silicon crystal technologies for ultra large scale integration

Hideki Tsuya

(Aoba-ku, Yokohama) 13:10-13:55

2. Recent progress and future trends of silicon crystal technology as viewed from roadmap

Toshiya Sato

(Aizuwakamatsu Plant, Fujitsu Limited) 13:55-14:30

3. Development and technology of silicon single crystal wafer in a next generation semiconductor devices

Koji Izunome

(Silicon Business Group, Covalent Materials Corporation) 14:30-15:05

Coffee Break 15:05-15:20

Point defects and related phenomena [15:20-18:00]

4. Observation of vacancy in silicon using low-temperature ultrasonic measurements

Terutaka Goto[1,2], Hiroshi Yamada-Kaneta[2], Masatoshi Hikin[1], Hajime Watanabe[1], Koji Sato[1], Yuichi Nemoto[1,2], Tatsuya Yanagisawa[2],and Shintaro Nakamura[3]

([1]Graduate School of Science and Technology, Niigata University),

([2]Center for Quantum Materials Science, Niigata University),

([3]Institute for Materials Research, Tohoku University) 15:20-15:50

5. Large-scale *ab-initio*/molecular-dynamics study on Si vacancy

K. Tsuruta, T. Ogawa, H. Iyetomi, T. Goto*, H. Yamada-Kaneta*, C. Totsuji*, and H. Totsuji

(Department of Electrical and Electronic Engineering, Okayama University),

*(*Graduate School of Science and Technology, Niigata University)* 15:50-16:20

6. Modeling of oxide precipitate nucleation in silicon using ab-initio calculations and classical nucleation theory

G. Kissinger[1,2], J. Dabrowski[1], A. Sattler[3], T. Müller[3] and W. von Ammon[3]

([1]IHP, Germany),
([2]BTU/IHP Joint Lab, Germany),
([3]Siltronic AG, Germany) 16:20-16:55

7. Control of point defects in silicon crystal during CZ growth process
Kozo Nakamura and Junsuke Tomioka
(Technical Division, SUMCO TECHXIV Co.) 16:55-17:25

8. Intrinsic (point) defects in silicon and germanium, similar but so different
J. Vanhellemont[1], P. Spiewak[2,3], K. Sueoka[4] and I. Romandic[5]
([1]Department of Solid State Sciences, Ghent University, Belgium),
([2]Warsaw University of Technology, Poland),
([3]Umicore, Poland),
([4]Okayama Prefectural University, Japan),
([5]Umicore EOM, Belgium) 17:25-18:00

Break 18:00-18:30
Welcome party 18:30-20:30
Second party (Optional) 21:00-

Nov. 13, Tue.

Metal impurities [8:30- 9:30]

9. A microscopic study of diffusive 3d transition metals behavior in silicon
Kazuhito Matsukawa[1], Masanori Fujinami[2], Koichi Oguma[2], Takashi Akahane[3], Ryoichi Suzuki[4], and Toshiyuki Ohdaira[4],
([1]Renesas Technology Corporation),
([2]Chiba University, Dept. of Applied Chemistry & Biotechnology),
([3]Advanced Materials Laboratory, National Institute for Materials Science),
([4]National Institute of Advanced Industrial Science and Technology) 8:30- 9:00

10. Fe impurities in Si observed by Mössbauer spectroscopy
Y. Yoshida
(Shizuoka Institute of Science and Technology) 9:00- 9:30

Coffee Break 9:30- 9:45

Light-mass element impurities and complexes [9:45-11:20]

11. Atomistic modelling of nitrogen related defects in Cz-silicon
N. Fujita and R. Jones
(School of Physics, University of Exeter, UK) 9:45-10:20

12. Effects of hydrogen on resistivity depth profile of SiGe/p-Si detected by spreading resistance method
Yoshifumi Yamashita, Yoshifumi Sakamoto, Takeshi Ishiyama, and Yoichi Kamiura
(The Graduate School of Natural Science and Technology, Okayama University)
10:20-10:50

13. Infrared absorption study on light impurities and complexes in silicon crystals
N. Inoue[1], S. Shirafuji[1], H. Ohyama[2], Y. Goto[3], T. Sugiyama[4] and H. Ono[5]
([1]RIAST, Osaka Prefecture University),
([2]KNCT, Kumamoto National College of Technology),
([3]Vehicle Eng. G., Toyota Motor Co.),
([4]Power Device Div., Toyota Central R&D Labs., Inc.),
([5]Kanagawa Industrial Technology Center) 10:50-11:20

Get-Together Photo 11:20-11:45

Lunch 11:45-13:00

Poster session [13:00-16:00]

Short presentation (3-min talk) 24 contributed papers 13:00-14:15

Poster Session 14:15-16:00

Coffee Break 16:00-16:15

Topics 16:15-18:00

14. Optical centres in irradiated silicon: towards understanding 'heavy' damage
Gordon Davies, K. Kohli, and L. Murin*
(Department of Physics, King's College London, UK),
(National Academy of Science of Belarus, Belarus)* 16:15-16:50

15. Redefinition of the kilogram by the Avogadro constant determination from 28Si enrichment
Kenichi Fujii, Atsushi Waseda and Naoki Kuramoto
(National Metrology Institute of Japan (NMIJ), AIST) 16:50-17:25

16. Impurity doping in silicon nanowires
N. Fukata[1,2,3], S. Matsushita[4], J. Chen[3], T. Sekiguchi[3], and K. Murakami[4]
([1] National Institute for Materials Science),
([2]PRESTO, Japan Science and Technology Agency),
([3]Advanced Electronic Materials Center, National Institute for Materials Science),
([4]Institute of Applied Physics, University of Tsukuba) 17:25-18:00

Break 18:00-18:30

Banquet 18:30-21:00

Second party (Optional) 21:00-

Nov. 14, Wed.

Solar cells and photovoltaic materials [8:30-10:30]

17. Development of polysilicon manufacturing process for solar cell
Junya Sakai
(Department of Strategic Planning, Tokuyama Corporation) 8:30- 9:00

18. Recent topics of crystalline silicon solar cells
T. Saitoh
(Tokyo University of Agriculture and Technology) 9:00- 9:30

19. Growth and characterization of polycrystalline silicon ingot for solar cells
Koji Arafune, Yoshio Ohshita, and Masafumi Yamaguchi
(Toyota Technological Institute) 9:30-10:00

20. Precise determination of metallic impurities in mono and multi-crystalline silicon by ICP-MS and SIMS and their response to phosphorus gettering
Mohammad B. Shabani, T. Yamashita and E. Morita
(SUMCO Corporation) 10:00-10:30

Coffee Break 10:30-10:45

Contributed papers [10:45-11:45]

21(G47). Analysis of oxygen incorporation process in unidirectionally solidified multicrystalline silicon for solar cells
Hitoshi Matsuo[1], R. Bairava Ganesh[2], Satoshi Nakano[2], Lijun Liu[2], Yuriko Matsuo[2], Yoshihiro Kangawa[1, 2], Koji Arafune[3], Yoshio Ohshita[3], Masafumi Yamaguchi[3], and Koichi Kakimoto[1, 2]
([1]Graduate School of Engineering, Kyushu University),
([2]Research Institute for Applied Mechanics, Kyushu University),
([3]Toyota Technological Institute) 10:45-11:05

22(F39). Heteroepitaxy of compound semiconductor on Si substrates and possibility of electron devices using it
Jun Komiyama, Yoshihisa Abe, Shun-ichi Suzuki, and Hideo Nakanishi
(Core Technology Center, Covalent Materials Corp) 11:05-11:25

23(F40). Crystallinity investigation of compositionally graded SiGe layers by synchrotron X-ray cross-sectional diffraction
Takeshi Senda[1, 2], Koji Izunome[1], Yoshiyuki Tsusaka[2], Kazunori Fukuda[2], Kazuki Hayashi[2], Maiko Abe[2], Sayuri Takahata[2], Hidekazu Takano[2], Yasushi Kagoshima[2] and Junji Matsui[2]
([1]Covalent Materials Corporation),
([2]Graduate School of Material Science, University of Hyogo) 11:25-11:45

Lunch 11:45-13:00

SiC for high-efficiency and high-power devices [13:00-14:30]

24. Characterization of defects in SiC wafers by room-temperature photoluminescence mapping
Michio Tajima, Norihiro Hoshino, Hideaki Isono and Eikou Higashi
(Institute of Space and Astronautical Science / JAXA) 13:00-13:30

25. Numerical simulation of SiC-CVD in a horizontal hot-wall reactor
Shin-ichi Nishizawa
(National Institute of Advanced Industrial Science and Technology) 13:30-14:00

26. Recent progress in SiC crystal growth and device technologies
Noboru Ohtani, Masashi Nakabayashi, Masakazu Katsuno, Tatsuo Fujimoto, Hiroshi Tsuge, Takashi Aigo, Hirokatsu Yashiro, Hosei Hirano, and Taizo Hoshino
(Nippon Steel Corporation, Advanced Technology Research Laboratories)
14:00-14:30

Closing Remarks [14:30-14:45]

Hiroshi Yamada-Kaneta
(Center for Quantum Materials Science, Niigata University) 14:30-14:45

Short Presentation and Poster Session 13th November (Tuesday)

B. Quality control of wafers 13:00～13:15

B4. Planarization of Si wafers by gas cluster ion beams irradiation
Hiromichi Isogai[1], Eiji Toyoda[1], Takeshi Senda[1], Koji Izunome[1], Kazuhiko Kashima[2], Noriaki Toyoda[3] and Isao Yamada[3]
([1]Silicon Business Group, Covalent Materials Corporation),
([2]New Business Creation, Covalent Materials Corporation),
([3]Graduate School of Engineering, University of Hyogo)

B5. Study of the mechanical properties and the chemical reactions at the directly bonded Si-Si interface
E. Toyoda[1,2], A. Sakai[3], H. Isogai[1], T. Senda[1], K. Izunome[1], O. Nakatsuka[2], M. Ogawa[4], and S. Zaima[2]
([1]Covalent Materials Co., Ltd.),
([2]Graduate School of Eng., Nagoya University),
([3]Graduate School of Eng. Sci., Osaka University),
([4]ESI, Nagoya University)

B6. Characterization of bonding structures of directly bonded hybrid crystal orientation substrates
Tatsuhiko Aoki[1,2], Hiroaki Kariyazaki[2], Eiji Toyoda[1], Koji Izunome[1] ,and Koji Sueoka[2]
([1]Covalent Materials Co.,Ltd.),
([2]Department of System Engineering, Okayama Prefectural University)

B7. TEM observation of the dislocations nucleated from cracks inside lightly or heavily doped Czochralski silicon wafers
Koji Sueoka, Tomoyuki Kabasawa and Seiji Shiba
(Department of System Engineering, Okayama Prefectural University)

B8. Bulk micro defect measurement by laser scattering method
Kazuo Moriya
(Raytex Corporation)

C. Point defects and related phenomena 13:15～13:33

C14. Theory of softening of non-doped Si and B-doped Si
Hiroyasu Matsuura and Kazumasa Miyake
(Graduate School of Engineering Science, Osaka University)

C15. Effect of monovacancy on the elastic constant of crystalline silicon
J. Ishisada, K. Shirai, H. Dekura and H. Katayama-Yoshida
(ISIR, Osaka University)

C16. Vacancy distribution in growth-rate-varied CZ silicon crystal observed by low-temperature ultrasonic measurements
Hiroshi Yamada-Kaneta[1], Masatoshi Hikin[2], Terutaka Goto[2], Yuichi Nemoto[2], Koji Sato[2], Yasuhiro Saito[2], Shintaro Nakamura[3]
([1]Center for Quantum Materials Science, Niigata University),
([2]Graduate School of Science and Technology, Niigata University),
([3]Institute for Materials Research, Tohoku University)

C17. Piezoelectric ZnO sputtering on crystalline silicon for low-temperature ultrasonic measurements
Hajime Watanabe[1], Terutaka Goto[1], Hiroshi Yamada-Kaneta[2], Yuichi Nemoto[1], Masatoshi Hikin[1], Tatsuya Yanagisawa[2], Shintaro Nakamura[3]
([1]Graduate School of Science and Technology, Niigata University),
([2]Center for Quantum Materials Science, Niigata University),
([3]Institute for Materials Research, Tohoku University)

C18. Effects of electron correlation and electron-phonon coupling on the quantum state of a silicon vacancy
Youichi Yamakawa[1] , Keisuke Mitsumoto[1] and Yoshiaki Ōno[1,2]
([1]Department of Physics, Niigata University),
([2]Center for Transdisciplinary Research, Niigata University)

C19. Electronic state of a single vacancy in silicon crystal
Takemi Yamada[1], Youichi Yamakawa[1] and Yoshiaki Ōno[1,2]
([1]Department of Physics, Niigata University),
([2]Center for Transdisciplinary Research, Niigata University)

D. Metal impurities 13:33～13:51

D22. Formation and annealing behaviors of the Cu center studied by photoluminescence and deep level transient spectroscopy
Minoru Nakamura, Susumu Murakami, Naoyuki J. Kawai*, Kazuhito Matsukawa*, Shigeaki Saito* and Hiroyuki Arie*
(Hitachi, Ltd., Hitachi Res. Lab.),
*(*Renesas Technology Corp., Wafer Process Engineering Develop. Div.)*

D23. The stable site and electronic states of Cu in Si
H. Yamaguchi, K. Shirai, and H. Katayama-Yoshida
(Nanoscience and Nanotechnology center, ISIR, Osaka University)

D24. Improvement of the gettering efficiency of Cu by BO complexes
K. Shirai, K. Matsukawa *, N. Yamaguchi, H. Katayama-Yoshida
(Nanotechnology Center, ISIR, Osaka University),
(Renesas Technology Corp.)*

D25. First principles calculation on the gettering mechanism of the transition metals in Si crystal
Ken Kamimura, Seiji Shiba and Koji Sueoka
(Department of System Engineering, Okayama Prefectural University)

D26. Search for a stress induced diffusion of iron impurities in silicon
K. Suzuki[1], Y. Morikawa[2], Y. Yoshida[2], K. Asahi[1]
([1]Tokyo Institute of Technology),
([2]Shizuoka Institute of Science and Technology)

D27. Iron impurities in a p-n junction of Si wafer under external voltage
K.Sakata, K.Suzuki, and Y.Yoshida
(Shizuoka Institute of Science and Technology)

E. Light-mass element impurities and complexes 13:51～14:06

E31. Quantitative photoluminescence analysis of ultra-low concentration of impurities in silicon wafers
Satoko Nakagawa[1,2], Kazuyuki Hirose[1,2], and Michio Tajima[1]
([1]Institute of Space and Astronautical Science / Japan Aerospace Exploration Agency),
([2]The Graduate University for Advanced Studies)

E32. Quantitative photoluminescence analysis of impurities in Si: extension to higher concentration range
Takashi Ogihara[1,2], Satoko Nakagawa[1,3], Michio Tajima[1,2]
([1]Institute of Space and Astronautical Science / Japan Aerospace Exploration Agency),
([2] The University of Tokyo),
([3] The Graduate University for Advanced Studies)

E33. Nitrogen-oxygen complexes associated with shallow thermal donors in silicon
Haruhiko Ono
(Kanagawa Industrial Technology Center)

E34. The first-principles calculation on oxygen clusters in silicon crystal
Fumitaka Oohashi, Seiji Shiba and Koji Sueoka
(Department of System Engineering, Okayama Prefectural University)

E35. The electronic states of platinum-hydrogen defects and hydrogen motion in Si observed by DLTS and IR techniques under uniaxial stress
K. Sato, Y. Kamiura, T. Ishiyama, and Y. Yamashita
(The Graduate School of Natural Science and Technology Okayama University)

F. Topics 14:06～14:12

F41. Surface electrical conduction measurement of Si(100) film of silicon-on-insulator wafers
Eiji Kamiyama and Kouji Sueoka
(Okayama Prefectural University)

F42. Electronic structure of Silicon (111) surface functionalized with alkane molecules
Abhijit Chatterjee
(Accelrys, Material Science, Japan)