**SYMPOSIUM K**

Silicon Carbide—Materials, Processing, and Devices

December 2 – 4, 2002

*Chairs*

Stephen E. Saddow, Univ. of South Florida

Nelson S. Saks, Naval Research Laboratory

David J. Larkin, NASA-Glenn Research Ctr

Adolf Schömer, ACREO AB

Marek Skowronski, Carnegie Mellon Univ

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*Invited paper*

**SESSION K1: EPITAXIAL GROWTH**

Chair: David J. Larkin and Tatsunobu Kimoto

Monday Afternoon, December 2, 2002

Room 206 (Hynes)

130 PM **K1.1**

*EPITAXIAL GROWTH AND CHARACTERIZATION OF 4H-SiC(115) AND (0001): Tatsunobu Kimoto, Shun-ichi Nakamura, Keiko Fujihira, Kouichi Hashimoto, Ken-sumi Danno, Yuuki Negoro, and Hironori Matsusami, Department of Electronic Science and Engineering, Kyoto University, Kyoto, JAPAN; Materials Science Centre, Indian Institute of Technology, Kanpur, INDIA.

2:00 PM **K1.2**

*CHANNEL EPITAXY OF 3C-SiC ON SI SUBSTRATES BY CVD. S. Nishino, Y. Okui, C. Jacob and S. Ohashima, Kyoto Institute of Technology, Department of Electronics and Information Science, Kyoto, JAPAN; Materials Science Centre, Indian Institute of Technology, Kanpur, INDIA.

2:30 PM **K1.3**


2:45 PM **K1.4**

*EXPERIMENT AND MODELING OF THE LARGE AREA ETCHING AND GROWTH RATE OF EPITAXIAL SiC. J. Meziere, M. Pongs, J. Deprade, S. Blanquet, CNRS Grenoble, FRANCE; L. Di Gioacchino, P. Ferret, T. Bilon, CEA-Grenoble, FRANCE.*

3:00 PM **BREAK**

3:30 PM **K1.5**

*RECONSTRUCTION AND EPITAXIAL ADLAYERS ON SiC SURFACES: STRUCTURAL SIGNIFICANCE FOR TECHNOLOGICAL APPLICATIONS. Ulrich Starke, Max-Planck-Institut für Festkörperkunde, Stuttgart, GERMANY.*

4:00 PM **K1.6**

*3C-SiC CRYSTALS GROWN ON UNDULANT Si(001) SUBSTRATES. Hiroshi Nagashima, Kunikuni Yagi, Takamitsu Kanakura, Naoki Harata, Hoyt Advanced Semiconduct ors Technologies Co. Ltd, Tokyo, JAPAN.*

4:30 PM **K1.7**

*GROWTH OF COLUMNAR SiC ON PATTERNED Si SUBSTRATES BY CVD. Shigehiro Nishino, Yorihi Okui, Yuhei Tai, and Choko Jacob, Kyoto Institute of Technology, Department of Electronics and Information Science, Kyoto, JAPAN; Materials Science Centre, Indian Institute of Technology, Kanpur, INDIA.*

**SESSION K2: POSTER SESSION**

Chair: David J. Larkin

Monday Evening, December 3, 2002

8:00 PM

Exhibition Hall D (Hynes)

**K2.1**

*ION DOSE DEPENDENCE ON SOLID PHASE EPITAXY OF AMORPHOUS SiC CARBIDE INDUCED BY ION IMPLANTATION. In-Tae Lee, Dept of Materials Science and Engineering, Osaka Univ, Osaka, JAPAN; Masahiko Ishimaru, Yoshikito Hirota, The Institute of Scientific and Industrial Research, Osaka Univ, Osaka, JAPAN.*

**K2.2**

*RADIAL DISTRIBUTION FUNCTIONS OF AMORPHOUS SiC CARBIDE WITH ISOTOPIC IMPURITIES. In-Tae Lee, Yoshikito Hirota, Osaka Univ, The Institute of Scientific and Industrial Research, Osaka, JAPAN.*

**K2.3**

*MEMORY SWITCHING IN IMPLANTED HYDROGENATED AMORPHOUS SiC THIN FILM DEVICES. R.G. Gates, J.M. Simmons, S.P. Silva, University of Surrey, School of Electronics, Computing and Mathematics, Guildford, Surrey, UNITED KINGDOM.*

**K2.4**

*HEAT COATING DEPOSITION OF SiC ARRAYS TO PROTECTIVE COATINGS FOR MICROFLUIDIC STRUCTURES. Ulrike Hutsch, Spyros Gallis, James Castracane, Alain Kukuzakis, and Gary Edelstein, School of NanoSciences and NanoEngineering, The University at Albany-SUNY, Albany, NY; Leo MacDonald and Susan Hayes, Starfire Systems Inc, Watervliet, NY; Costas Fountoulakis, Army Research Laboratory, Weapons Material Directorate, Aberdeen Proving Ground, MD.*

**K2.5**

*WATER BONDING TECHNIQUE APPLIED TO SiC/SiC SYSTEM. G.N. Yashin, A.V. Kvit, and Z. Sitar, North Carolina State University, Department of Material Science and Engineering, Raleigh, NC.*

**K2.6**

*STRUCTURAL AND PHOTOLETTERAL PROPERTIES OF HYDROGENATED AMORPHOUS SiC THIN FILMS PREPARED BY VHF-PECVD. Zhe Yan, Hua Xia, Xiaoqiang Zeng, Yongyu Xu, Shihui Zhang, Hongwei Diao, Guanglong Kong, Applied Physics Division, Institute of Semiconductors, Beijing, CHINA.*

**K2.7**

*FIELD EMITTING MECHANISMS AND ELECTRON FIELD EMISSION PROPERTIES OF ION BEAM SYNTHETIZED AND MODIFIED Si/SiC HETEROSTRUCTURES. W.M. Tsang, S.P. Wong, Chinese Univ of Hong Kong, Dept of Electronic Engineering and Materials Science and Technology Research Centre, Hong Kong, CHINA; J.K.N. Lindner, Univ. of Augsburg, Institut für Physik, Augsburg, GERMANY.*

**K2.8**

*TUNING THE SPECTRAL DISTRIBUTION OF p-in-a-SiC DEVICES FOR COLOUR DETECTION. Paolo Lazaro, Alessandro Fantoni, Miguel Fernandez, Reinhard Schwartz, Manuela Vieira, Electronics Telecommunications and Computer Dept, ISEL, Lisbon, PORTUGAL.*

**K2.9**

*SPATIALLY RESOLVED PHOTO-AND THERMALLY STIMULATED LUMINESCENCE IN SEMI-INSULATING SiC WAVERS. Yu.M. Solominova, S. Lulu, I. Tarasov, S. Ostropenko, S.E. Svidlov, University of South Florida, Tampa, FL; V.D. Heydenreich, M.D. Roth, O. Kordina, M.F. MacMillan, Sterlinc Semiconductor, Tampa, FL.*

**K2.10**

*EXISTENCE OF AN INTERFACE STATE AT THE STACKING FAULT IN 4H-SiC AND ITS IMPACT ON ELECTRONIC DEVICES. M. Mino, Shikot Lajspunnom, and Walter R.I. Londhe, LECS.*
K2.11 CHARACTERIZATION OF POROUS SiC SUBSTRATES AND THE EPILAYER STRUCTURES GROWN ON THEM. J. Dai, P. Gomna, M. Dudley, Department of Materials Science and Engineering, State University of New York, Stony Brook, NY, M. Mynbaeva, Ioffe Physico-Technical Institute, St. Petersburg, RUSSIA; and S. Sadow, Department of Electrical Engineering, University of South Florida, Tampa, FL.

K2.12 DEVELOPMENT OF ION ENERGY LOSS MEASUREMENTS IN 4H- AND 6H-SiC THANKS TO SiC OI WAFERS OF PERFECT CRYSTAL QUALITY. Roberta Nipoti, Caterina Summonte, CNR-IMM Sezione di Bologna, Bologna, ITALY; Faustina Lerentre, SOITEC S.A., Parc Technologique des Fontaines, FRANCE.

K2.13 Abstract withdrawn

K2.14 SPECTROSCOPIC PROPERTIES OF CUBIC SiC ON Si. Zhe Chuan Feng, Ian Ferguson, Georgia Institute of Technology, School of Electrical & Computer Engineering, Atlanta, GA.

K2.15 EFFECT OF DOING ON THE INDENTATION HARDNESS OF 4H-SiC. Ming Zhang, Case Western Reserve University, Department of Materials Science and Engineering, Cleveland, OH; H.M. Holoday, Cree, Inc., Durham, NC; Khvnn Shintri, P. Pirooz, Case Western Reserve University, Department of Materials Science and Engineering, Cleveland, OH.

K2.16 WHOLE-WAFTER OPTICAL MAPPING OF DEFECTS IN INSULATING SILICON CARBIDE WAFERS. M. Mer1, J. Bocek1, D.Hill1, B. Bertrand1, E. Ramanarivo1, M. Roth2, C. Backow2, and M. Neelon3, 1Air Force Research Laboratory, Wright-Patterson AFB OH; 2Wiley Laboratory, Dayton, OH; OriginLab Inc., Northampton MA; 3Sterling Semiconductor Inc., Sterling VA; ChemIon Inc., Pittsburgh, PA.

K2.17 Abstract withdrawn

K2.18 THERMAL STRESS AS THE MAJOR FACTOR IN SiC DEFECT GENERATION DURING PVT GROWTH. D.L. Chernychenko, R.V. Drachev, I.I. Khlebnikov and T.S. Sodarskun, Univ. of South Carolina, Dept. of Electrical Engineering, Columbia, SC.

K2.19 THERMAL PLASMA PHYSICAL VAPOR DEPOSITION OF NANOSTRUCTURED SiC COATINGS. Xinshun Wang, Keisuke Eguchi, Takanobu Yoshida, Univ of Tokyo, Dept of Materials Engineering, Tokyo, JAPAN.

K2.20 STRANSGRASTANOV GROWTH OF Ge QUANTUM DOTS ON SiC SUBSTRATES. C. Calmes, V. LeThanh, D. Bouchet, V. Yam, D. Debarrre, R. Lazal, Institut d’Electronique Fondamentale, Universite Paris-Sud, Orsay, FRANCE; S. Sadow, Center for Microelectronics Research, University of South Florida, Tampa, FL.

K2.21 FIRST-PRINCIPLES STUDY OF SiC/M (M=Mg AND Al) NANO-HETERO POLAR INTERFACES. Shinzo Tamaki (Swing), Masanori Kohyama, National Institute of Advanced Industrial Science and Technology [AIST], Special Division of Green Life Tech., Osaka, JAPAN.

K2.22 BAND GAP ENGINEERING OF SiCN FILM GROWN BY PULSED LASER DEPOSITION. Nao-Mei Park, Sung Hyoob Kim, Gun Yong Sung, Electronics and Telecommunications Research Institute, Basic Research Lab, Daejeon, KOREA.

8:30 AM *K3.1 SOME CURRENT EFFORTS AT CHARACTERIZATION OF SILICON CARBIDE. W.J. Choyke, R.P. Devoy, University of Pittsburgh, Department of Physics and Astronomy, Pittsburgh, PA; and Collaborators.

9:00 AM *K3.2 RECENT RESULTS ON DEFECT CENTERS IN SiC POLYTYPES. Gerhard Pendl, University of Erlangen-Nuremberg, Institute of Applied Physics, Erlangen, GERMANY.

9:30 AM *K3.3 ION IMPLANTATION INDUCED DEEP DEFECTS IN N-TYPE 4H-SILICON CARBIDE. A.O. Berman, University of Dayton, Physics Dept., Dayton, OH; S.R. Smith, University of Dayton Research Institute, Dayton, OH; M.A. Cigano, Purdue University, Dept. of ECE, West Lafayette, IN.


10:00 AM BREAK

10:30 AM *K3.5 PROCESS INDUCED EXTENDED DEFECTS IN SILICON CARBIDE CRYSTALS GROWN VIA SUBLIMATION. Rosana Nakayama, Linkoping University, Dept of (Physics and Measurement Technology, Linkoping, SWEDEN.

11:00 AM *K3.6 DEPENDENCE OF STACKING FAULT GROWTH DYNAMICS ON CURRENT THROUGH SiC PIN DIODES. R.E. Stibrush, M.G. Aronow, Naval Research Laboratory, Washington, DC; J.T. Fedison, J.E. Tucker, S.D. Arthur, GE Global Research Center, Niskayuna, NY.

11:15 AM *K3.7 EXTENDED DEFECTS IN 4H SiC PIN DIODES. M.E. Twigg, R.E. Stibrush, M. Faerron, Naval Research Laboratory, Electronics Science and Technology Division, Washington, DC; S.B. Authur, J.B. Fedison, J.E. Tucker, General Electric, Niskayuna, NY; S. Wang, Sterling Semiconductor, Danbury, CT.

11:30 AM *K3.8 ACCURATE LATTICE CONSTANT AND MISMATCH MEASUREMENTS OF SiC HETEROSTRUCTURES USING HARMONIC X-RAY REFLECTIONS. Michael Dudley, Xianrong Huang, SUNY at Stony Brook, Dept of Materials Science and Engineering, Stony Brook, NY; Philip G. Neudeck, J. Anthony Powell, NASA Glenn Research Center, Cleveland, OH.

11:45 AM *K3.9 INFLUENCE OF ERIUM DOPING ON THE FORMATION OF SILICON CARBIDE NANOCRYSTALS FOR OPTOELECTRONIC APPLICATIONS. Spyros Gallis, Ulrike Fuchsik, Ilkka Uh-Haen, Mengbing Huang, Ahn E. Kyeong, and Harry Edlachtins, School of NanoSciences and NanoEngineering, University of Alabama, SUNY, Albany, NY.

SESSION K4: MOS TECHNOLOGY

Chairs: Marek Skowronski and Nelson S. Saha
Tuesday, December 3, 2002
Room 206 (Hynes)


2:00 PM *K4.2 NANOSCALE CHARACTERIZATION OF THE SILICON DIOXIDE/SILICON CARBIDE INTERFACE AND THE EFFECT OF PROCESSING CONDITIONS. Kai-Chieh Chang, Carnegie Mellon University, Dept of Materials Science and Engineering, Pittsburgh, OH.
R.D. Vispute, J.A. McGee, S.R. Harman, D.J. Wagnutte, and T. Venkatesan, CSR, Department of Physics, University of Maryland, College Park, MD; K.A. Jones and M.H. Ervin, Army Research Laboratory, Adelphi, MD.

**K5.10**

The Effect of Channel Recess and Passivation on 4H-SiC MESFETs. Ho-Young Cha, Christopher I. Thomas, Gautam Koley, Lester F. Eastman, Michael G. Spencer, Cornell University, Dept. of Electrical and Computer Engineering, Ithaca, NY.

**K5.20**


**K5.21**

FABRICATION OF NOVEL OPTICAL HIGH-TEMPERATURE SENSOR USING SiC THIN FILM GROWN ON SAPPHIRE SUBSTRATE. Lin Cheng, Andrew J. Seckl, Nanoelectronics Laboratory, University of Cincinnati, Cincinnati, OH; James D. Soxfield, Air Force Research Laboratory, Wright-Patterson Air Force Base, OH.

**K5.22**

Abstract Withdrawn

**K5.23**

DUAL-METAL-PLANAR RECTIFIERS ON SiC THIN FILM USING Ti AND NiSi AS SCHOTTKY BARRIER METALS. Fabrizio Roccaroforte, Francesco La Vis, Salvatore Di Franco, Vito Raineri, CNR-IMM, sezione di Catania, Catania, ITALY.

**K5.24**


**K5.25**

IMPLICATIONS OF GROWTH INDUCED DEFECTS ON THE ELECTRICAL AND MECHANICAL PROPERTIES OF AlN THIN FILMS ON SiC. Daniel Haberast, R.D. Vispute, S.S. Hulliwad, N. Reeves, B. Nagy, V. N. Kulshresh, and T. Venkatesan, CSR, Department of Physics, University of Maryland, College Park, MD; C.J. Scoville, Matt Ervin, and A. Leka, Army Research Laboratory, Adelphi, MD.

**K5.26**

MECHANISTIC ASPECTS OF SiC OXIDATION. Fernanda Chirello Steidl, Instituto de Química, UFRGS, Porto Alegre, BRAZIL; Claudio Ruitke, Israel Jacob Rubin Basmovl, Instituto de Física, UFRGS, Porto Alegre, BRAZIL; Jose Cameros Villar, Isabel-Maria Tramilla, Jean-Jacques Gruesen, Serge Rigo, Groupe de Physique des Solides, Université Paris, FRANCE.

**K5.27**

OPTIMIZATION OF DIRECT N2O GROWN GATE OXIDE ON 4H-SiC. K.Y. Cheong, and S. Dimitrijev, School of Microelectronic Engineering, Griffith University, Nathan Campus, Queensland, AUSTRALIA.

**K5.28**

MONITORING ION IMPLANTATION OF SiC AND THE RECOVERY OF DAMAGE BY MICRO-RAMAN AND MICRO-PHOTOLUMINESCENCE SPECTROSCOPY. J.W. Seed, S. Prikert, Department of Physics, University of Bristol, Bristol, UNITED KINGDOM.

**SESSION K6: SiC PROCESSING**

Chair: Stephen E. Sadow and Lain M. Porter
Wednesday Morning, December 4, 2002
Room 206 (Hynes)

8:30 AM **K6.1**

ALUMINUM AND BORON DIFFUSION IN 4H-SiC. Margaret Linnarsson, Martin Linnarsson, Bengt Svenson, Royal Institute of Technology, Solid State Electronics, Stockholm, SWEDEN; Adolf Schöner, ACREO AB, Stockholm, SWEDEN.

9:00 AM **K6.2**

ELECTRICAL CHARACTERIZATION OF Al/Ti OHMIC CONTACTS ON P-TYPE ION IMPLANTED 4H- AND 6H-SiC. Francesco Moscatelli, Andrea Scorroni, Universita di Perugia, Dipartimento d’Ingegneria Elettronica e dell’Informazione, Perugia, ITALY; Antonella Poggi, Gian Carlo Cardinali, Roberta Napoli, CNR-IMSE, Sezione di Bologna, ITALY; Mila Lange, Dominique Plessis, Christophe Raymond, Jean-Pierre Chante, Marie-Laure Locatelli, CEGELY (UMR CNRS n°5065), INSa de Lyon, Villeurbanne C6, FRANCE.

9:15 AM **K6.3**

OHMIC CONTACT PROPERTIES OF Ni/C FILMS ON 4H-SiC. Weiji Lu, Department of Physics, Fisk University, Nashville, TN; W.C. Michel, Air Force Research Laboratory, Materials and Manufacturing Directorate, Wright-Patterson Air Force Base, OH; J.R. Landis, University of Dayton Research Institute, Dayton, OH; T.R. Crenshaw, and W. Eugene Collins, Department of Physics, Fisk University, Nashville, TN.

9:30 AM **K6.4**

CONTROL OF MESA SIDEWALL ANGLE DURING THE INDUCTIVITY COUPLED PLASMA-REACTIVE ION ETCHING OF SiC SINGLE CRYSTALS. S.C. Ahn, B.T. Lee, Photonic and Electronic Thin Film Laboratory, Department of Materials Science and Engineering, Chonnam National University, Gwangju, KOREA.

9:45 AM **BREAK**

10:15 AM **K6.5**

OPTICALLY ENHANCED INTERACTION OF HYDROGEN WITH DEFECTS IN SiC. Yaroslav Koskla, Dept of Electrical and Computer Engineering, Mississippi State University, Mississippi State, MS.

10:45 AM **K6.6**

POROUS SILICON CARBIDE: PROSPECTIVE APPLICATIONS. Marina Mysljabov, Ioffe Physico-Technical Institute, St. Petersburg, RUSSIA.

11:15 AM **K6.7**

PSEUDOMORPHICALLY STRAINED LAYERS IN 4H SiC FORMED BY GERMANIUM IMPLANTATION. M.W. Dashell, Xin Zhang, G. Xue, and J. Kolodney, Department of Electrical and Computer Engineering, University of Delaware, Newark, DE.

11:30 AM **K6.8**

BAND LINEUP OF 4H-SiC SCHOTTKY INTERFACES MEASURED WITH PHOTOLUMINESCENCE SPECTROSCOPY. M. Beerboom, J. Kohlbecher, S.E. Sadow, J.T. Wolon, University of South Florida, G. Chang, M.F. MacMillan, Sterling Semiconductor, Inc.; and R. Solb, University of South Florida.

**SESSION K7: DEVICES**

Chair: Gerhard Peisl and Roland Rupp
Wednesday Afternoon, December 4, 2002
Room 206 (Hynes)

1:30 PM **K7.1**

SYSTEM DESIGN CONSIDERATIONS FOR OPTIMIZING THE BENEFIT BY UNIPOLAR SiC POWER DEVICES. Roland Rupp, Ilan Zverev, Infineon Technologies AG, Dept. A1 PS, Erlangen, GERMANY.

2:00 PM **K7.2**


2:30 PM **K7.3**

SiC BIPOLAR JUNCTION TRANSISTORS FOR HIGH POWER SWITCHING AND RF APPLICATIONS. Anant Agrawal, Se-Hyung Ryn, John Palmore, Cree Inc., Durham, NC; Him Fleck, Howard Bartow, Jerry Stambaugh, Ken Brewer, Cree Microwave, Sunnyvale, CA.

2:45 PM **K7.4**


3:00 PM **BREAK**

3:15 PM **K7.5**

INFLUENCE OF INTERFACE STATES ON HIGH TEMPERATURE SILICON CARBIDE ELECTRONICS AND
SENORS, Ruby N. Ghosh, Peter Tobin, Z. Gy. Ejpov and Braig
Golding, Center for Sensor Materials, Michigan State University, East
Lansing, MI.

3:45 P.M. **K7.6**
TOWARDS FERROELECTRIC FIELD EFFECT TRANSISTORS IN
4H-SILICON CARBIDE. S.-M. Koo, S.I. Khartsev, C.-M. Zetterling,
A.M. Grishin and M. Ostling, Department of Microelectronics and
Information Technology, Royal Institute of Technology (KTH),
Stockholm-Kista, SWEDEN.

4:15 P.M. **K7.7**
7 kV 4H-SiC GTO THYRISTORS. Stephen van Campen, John
Zingaro, Andrés Ezis, Garrett Stormaka, Kevin Elliott, R. Chris
Chen, Northrop Grumman, Advanced Materiels and Semiconductor
Device Technology Center, Baltimore, MD; Vic Temple, Todd Hansen,
Silicon Power Corporation, Malvern, PA.

4:30 P.M. **K7.8**
FABRICATION AND CHARACTERIZATION OF 4H-SILICON
CARBIDE AVALANCHE PHOTODIODES. Kent Burr,
Peter Sandvik, Stephen Arthur, Dale Brown, Kevin Matocha, GE
Global Research Center, Niskayuna, NY.

4:45 P.M. **K7.9**
A NEW PROCESS FOR THE FABRICATION OF SCHOTTKY
DIODES AND MESHFETS ON 2 INCH 4H-SILICON CARBIDE ON
INSULATOR (SCOX) SUBSTRATES. François Templier, CEA-LETI,
Grenoble, FRANCE; Nicolas Davel, SOITEC, Bernin, FRANCE and
CEGELEY-INSA, Villeurbanne, FRANCE; Fabrice Letertre, SOITEC,
Bernin, FRANCE; Daniel Bourget, CEA-LETI, Grenoble, FRANCE;
Dominique Phanon and Jean-Pierre Chartier, CEGELY-INSA,
Villeurbanne, FRANCE; Thierry Billon, CEA-LETI, Grenoble,
FRANCE.