23rd IEEE SISC

December 9-12, 1992
San Diego, California

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23rd IEEE SISC 92

San Diego, California

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23rd IEEE SISC 92
Technical Program

San Diego, California — December 9-12, 1992

SESSION 1
PLENARY
Thursday 12/10/92 8:15 am -12:30 pm

ANALYTICAL AND ELECTRICAL CHARACTERIZATION OF INTERFACES:

Session Chairpersons: A. H. Edwards, *UNC - Charlotte, USA*
M. Schulz, *University of Erlangen, Germany*

1.1 **Comparison of Electrical Techniques for Characterization of Si/SiO_2 Interface, D. K. Schroder,** *Arizona University, USA* **(Invited)**

1.2 **Fundamental Considerations of Tunneling in MOS Structures, J. Maserjian,** *Jet Propulsion Laboratory, USA* **(Invited)**

1.3 **Spatially Resolved Characterization of SiO_2 with AFM/STM, M. P. Murrell,** *Cambridge University, UK* **(Invited)**

1.4 **Understanding the Nature of Si/SiO_2 Interface Using XPS, P. J. Grunthaner,** *Jet Propulsion Laboratory, USA* **(Invited)**

ORAL SUMMARY OF POSTER PAPERS. P.1.1 - P.2.4.

Session Chairpersons: W. Warren, *Sandia National Laboratories, USA*
R. Stahlbush, *Naval Research Laboratories, USA*

SESSION 2
Thursday 12/10/92 2 pm - 6:15 pm

THEORY AND CHARACTERIZATION OF INTERFACES:

Session Chairpersons: S. A. Lyon, *Princeton University, USA*
G. Groeseneken, *IMEC, Belgium*

2.1 **Theory of the Capture Cross-sections of the Pb centers, M. Lannoo,** *ISEN, France* **(Invited)**

2.2 Theoretical Study of Halogen Impurities near the Silicon - Silicon Dioxide Interface, K. C. Snyder and W. Beall Fowler, ***Lehigh University, USA***

2.3 Nature of P_b Defect at the (111)Si/SiO_2 Interface as a Function of Oxidation Temperature, A. Stesmans, ***Universiteit Leuven, Belgium***

2.4 Can Interface-Trap Capture Cross Sections as Determined by Charge Pumping Be Used to Predict Surface Recombination/Generation Currents?, W. Chen and T.-P. Ma, ***Yale University, USA***

2.5 A New Quantum Mechanical Charge Pumping Model for Near-Interface Oxide Traps in Silicon MOSFET's, R. E. Paulsen and M. H. White, *Lehigh University, USA*

2.6 Energy and Location of Single, Individual Interface Traps in Sub-μm MOSFETs, J. Vennemann and M. Schulz, *University of Erlangen, Germany*

2.7 Laplace Transform Method of Measuring the Distribution of Si/SiO_2 Barrier Heights, D. Babic, E. H. Nicollian, and J. C. Lofgren, *University of North Carolina, USA*

ORAL SUMMARY OF POSTER PAPERS: P3.1 - P6.5

Session Chairpersons: L. Trombetta, *University of Houston, USA*
D. A. Buchanan, *IBM, USA*

SESSION P
POSTER PRESENTATIONS

Thursday 12/10/92 7:15 pm - 9 pm

P1.1 Selective Annealing Behavior of Two Distinct Defect Centers at Irradiated <100>Si/SiO_2 Interface, L. Vishnubhotla and T. P. Ma, *Yale University, USA*

P1.2 Reduction of Interface-trap Density in MOS Devices by Irradiation, A. Balasinski and T. P. Ma, *Yale University, USA*

P1.3 Characterization of Si/SiO_2 Interface States in Ultra - Thin Oxide, Y. Hu, A. Chatterjee and M. White, *Lehigh University, USA*

P1.4 A Low-Temperature, Plasma-Assisted Process for the Formation of Device-Quality Si/SiO_2 Interfaces on Si<111> Substrates: The Effects of Surface Roughness, and Surface Steps on Interfacial Defects, D_{it}, and Second Harmonic Generation, SHG, G. Lucovsky, C. H. Bjorkman, T. Yasuda, C. E. Shearon, Jr., Y. Ma, U. Emmerichs, C. Meyer, K. Leo, and H, Kurz, *North Carolina State University, USA*

P1.5 Effect of Oxide Thickness on Interface-Trap Buildup Rates, M. R. Shaneyfelt, J. R. Schwank, D. M. Fleetwood, and P. S. Winokur, *Sandia National Laboratories, USA*

P1.6 Energy Distribution of Trapped Holes in Irradiated SiO_2, D. M. Fleetwood and S. L. Miller, *Sandia National Laboratories, USA*

P2.1 Evidence of a Long-Range Density Gradient in SiO_2 Films on Si from H_2 Permeability Measurements, B. J. Mrstik, *Naval Research Laboratory and P. J. McMarr, SFA Inc. USA*

P2.2 ESR and Room Temperature Hydrogen Interaction with Radiation Induced E' Centers, John F. Conley, Jr. and P. M. Lenahan, *The Pennsylvania State University, USA*

P2.3 Evidence for Neutral Hydrogen-Related Defects in SiO_2 Films, M. E. Zvanut, R. E. Stahlbush, W. E. Carlos, and E. S. Steigerwalt, ***Naval Research Laboratory, USA***

P2.4 On the Post-Stress Interface Trap Generation Process in n-Channel MOSFET's and its Relation with Hydrogen, E. de Schrijver, R. Bellens, G. Groeseneken, and H. E. Maes, ***IMEC, Belgium***

P3.1 1/f Noise in Hot-Carrier Damaged MOSFET's: Effects of Oxide Charge and Interface Traps, M.-H. Tsai and T.-P. Ma, ***Yale University, USA***

P3.2 Interface Trap Generation during and after Low-Temperature Electron Injection in MOSFETS, G. Van den bosch, G. Groeseneken, H. E. Maes, ***IMEC, Belgium***

P3.3 P-well Bias Dependence of Electron Trapping in the Gate Oxide of nMOSFETs during Substrate Hot Electron (SHE) Injection, S. P. Zhao, S. Taylor and W. Eccleston and K. J. Barlow, ***Liverpool University and GEC, UK***

P3.4 Direct Measurement of Energy Dependent Hot Electron Dynamics in Silicon Nitride, E. A. Eklund, E. Cartier and F. R. McFeely, ***IBM, USA***

P3.5 Dielectric Breakdown of $SiO_2/Si_3N_4/SiO_2$ Capacitors Due to Hole Accumulation, M. Sawachi, A. Nishimura, Y. Fukuda, and M. Obara, ***Texas Instruments Japan***, Y. Nishioka, ***Tsukuba R&D Center, Japan***

P4.1 High-Field Breakdown in Thin N_2O-Grown Oxides, A. B. Joshi, G. Q. Lo, G. W. Yoon, J. Kim, J. Ahn and D. L. Kwong, ***University of Austin Texas, USA***

P4.2 Mechanisms of Interface-State Generation in Reoxidized Nitrided Oxide Gate Dielectrics, K. S. Krisch and C. G. Sodini, ***Massachusetts Institute of Technology, USA***

P5.1 How Do Electron Trapping in Buried Oxide and Back-Interface Traps Affect the Front-Channel Characteristics of Thin-Film SOI/NMOSFET's?, B. Zhang and T. P. Ma, ***Yale University, USA***

P5.2 Reduction of Charge Trapping in SIMOX by Supplemental Oxygen Implantation, R. E. Stahlbush and H. L. Hughes, ***Naval Research Laboratory, USA***

P6.1 Study of the Properties of Ge-implanted SiO_2, J. M. M. de Nijs, P. F. A. Alkemade and P. Balk, ***Delft University, the Netherlands***

P6.2 New Insight in Gate Oxide Yield Improvement through Chlorine-Addition, P. W. Mertens, S. Verhaverbeke, M. Meuris, M. Heyns, and G. Declerck, ***IMEC, Belgium, Wacker, Germany and DEC,USA***

P6.3 Influence of RF Plasma Anneal on Dry and Pyrogenic Oxides Under Radiation, A. N. Chandorkar, ***Indian Institute of Technology, Bombay, India***

P6.4 Oxygen-Doped Semi-Insulating Epitaxial Silicon Grown by Low-Temperature Rapid Thermal Chemical Vapor Deposition, P. V. Schwartz, J. C. Sturm and C. W. Liu, ***Princeton University, USA***

P6.5 Charge Trapping Centers in Ferroelectric Ceramics, W. L. Warren, C. H. Seager, B. A. Tuttle, R. D. Nasby, and D. Dimos, ***Sandia National Laboratories*** and E. H. Poindexter, ***US Army Research, Fort Monmouth, N J, USA***

SESSION 3
Friday 12/11/92 8:30 am - 10:25 am

HOT-CARRIER, RADIATION AND H_2 EFFECTS ON THE Si/SiO_2 INTERFACE:

Session Chairperson: D. J. DiMaria, *IBM, USA*

3.1 Trap Creation Studies by EPR, J. Stathis, *IBM, USA* (Invited)

3.2 Effect of Hydrogen on Channel Hot Carrier Degradation, N. S. Saks and R. B. Klein, *Naval Research Laboratory, USA*

3.3 Hydrogen Cracking Sites in SiO_2 Produced by Fowler-Nordheim Injection, D. A. Buchanan and A. D. Marwick, *IBM, USA*

3.4 Polarity Dependence of Tunnel Injection-Induced Positive Charge Generation in MOS Capacitors, Y. Roh and L. Trombetta, *University of Houston, USA and* J. Stathis, *IBM, USA*

SESSION 4
Friday 12/11/92 10:45 am - 12:50 pm

HIGH FIELD EFFECTS ON MOS DEVICES AND INTERFACES:

Session Chairpersons: W. T. Lynch, *SRC, USA*
K. Taniguchi, *Osaka University, Japan*

4.1 Degradation and Breakdown of Silicon Dioxide Films on Silicon, D. J. DiMaria, E. Cartier, and D. Arnold, *IBM, USA*

4.2 Theoretical Calculation of Impact Ionization Rate in SiO_2 Based on the Full Band Structure, H. Mizuno, M. Morifuji, K. Taniguchi and C. Hamaguchi, *Osaka University, Japan*

4.3 Impact Ionization in Silicon, M. V. Fischetti, E. Cartier, E. A. Eklund, and F. R. McFeely, *IBM, USA*

4.4 A Self-consistent Method for the Determination of the Impact Ionization Energy and the Effective Si/SiO_2 Interface Barrier for Hot-electron Injection in MOS Structure, J. Van Houdt, G. Groeseneken, H. E. Maes, *IMEC, Belgium*

4.5 Effects of Low- Temperature Homogeneous Hole Injection in MOSFETs, G. Van den bosch, G. Groeseneken, H. E. Maes, *IMEC, Belgium* R. B. Klein, S. F. *Associates, USA* and N. S. Saks, *Naval Research Laboratory, USA*

SESSION 5

Friday 12/11/92 2:30 pm - 3:45 pm

FUNDAMENTAL PROPERTIES OF OXINITRIDES:

Session Chairperson: R. C. Barker, *Yale University, USA*

5.1 Gate Structures with Oxide/Nitride/Oxide Dielectrics, G. Lucovsky, Y. Ma, T. Yasuda, S. S. He, D. R. Lee and D. J. Stephens, *North Carolina State University, USA*

5.2 Role of Interfacial Nitrogen in Improving Thin Silicon Oxides Grown in N_2O, E. C. Carr, R. J. Soave, and R. A. Buhrman, *Cornell University, USA*

5.3 Paramagnetic Point Defects in Nitrided and Reoxidized Nitrided Silicon Dioxide Films, J. T. Yount and P. M. Lenahan, *Pennsylvania State University, USA*, G. J. Dunn, *U.S. Department of State, USA*

SESSION 6

Friday 12/11/92 4 pm - 6 pm

PANEL DISCUSSION "WILL ANY OTHER DIELECTRIC REPLACE SiO_2" ?

Session Moderator: P. Balk, *DIMES, Delft University, the Netherlands*

6.1 The Physics of Dielectrics for Charge Storage Capacitors and Non-volatile Memory, P. Balk, *DIMES, Delft University, the Netherlands* **(Invited)**

6.2 High-Dielectric Constant Films as SiO_2 Replacements in ULSI Devices, J. Scott, *University of Colorado, USA* **(Invited)**

6.3 Effects of Oxinitridation on Dielectric Properties of Scaled MOSFETS and EEPROMs, H. Fukuda, *OKI, Electric Industry, Japan* **(Invited)**

DISCUSSION.....

SESSION 7

Saturday 12/12/92 8:15 am - 1:05 pm

NOVEL DEVICES/DIELECTRICS/PROCESSING/INTERFACES:

Session Chairpersons: A. Ourmazd, *ATT Bell Laboratories, USA*
Y. Nishioka, *TI, Japan*

7.1 **ULSI Technology and Interfaces : Future Directions,**
R.E. Howard, ***ATT Bell Laboratories, USA*** **(Invited)**

7.2 **Iron Disilicide on Silicon,**
H. Lueth, ***ISI, Germany*** **(Invited)**

7.3 Octadecyltrichlorosilane Monolayer as Ultra-thin Insulating Film for Silicon MIS Devices, P. Fontaine, D. Deresmes, D. Vuillaume, *IEMN, France*

7.4 **Wet Cleaning Strategy for Improved Gate Oxide Integrity,**
M. Heyns, ***IMEC, Belgium*** **(Invited)**

7.5 **Chemical Cleaning of Silicon Surfaces for ULSI,**
M. Hirose, ***Hiroshima University, Japan*** **(Invited)**

7.6 **Formation of Near Ideal Si/SiO_2 Interface,**
T. Hattori, ***Musashi Institute of Technology, Japan*** **(Invited)**

7.7 Conversion of <111>Si/SiO_2 Interface into <100>-Like Interface by Introducing Fluorine, X. W. Wang, Wenliang Chen, and T-P. Ma, *Yale University, Japan*

7.8 Hole Trapping, Detrapping and Interface- Trap Generation in Flourinated SiO_2 MOS Capacitors, L. Vishnubhotla and T-P. Ma, *Yale University, USA* and H. H. Tseng and P. J. Tobin, *Adv. Products, R/D Laboratory, Motorola, USA*

Adjournment of SISC 92