

## TECHNICAL PROGRAM

### 1990 IEEE SEMICONDUCTOR INTERFACE SPECIALISTS CONFERENCE

December 6-8, 1990

San Diego, California

#### **Program Committee**

General Chairman	Zeev A Weinberg IBM T. J. Watson Research Center, USA
Technical Chairman	Stephen A. Lyon Princeton University, USA
Arrangements Chairman	Arthur Edwards University of North Carolina at Charlotte, USA
Ex-Officio	Paula J. Grunthaner Jet Propulsion Laboratory, USA

P. Balk, DIMES, The Netherlands  
R. C. Barker, Yale University, USA  
G. A. Brown, Texas Instruments, USA  
P. V. Dressendorfer, Sandia National Labs, USA  
M. Heyns, IMEC, Belgium  
P. M. Lenahan, Penn State University, USA  
L. Manchanda, AT&T Bell Labs, USA  
R. D. McGrath, Polaroid, USA  
Y. Nishioka, Hitachi, Japan  
T. R. Oldham, Harry Diamond Lab, USA  
M. J. Schulz, University of Erlangen-Nurnberg, Germany  
R. Stahlbush, Naval Research Lab, USA  
B. Triplett, Intel, USA  
L. Trombetta, University of Houston, USA

#### **IMPORTANT NOTICE**

**The conference abstracts reproduced here are for the use of the attendees at the conference. They may NOT be reproduced or referenced.**

Thursday Morning, December 6, 1990 (8:30 – 12:15)

**Session I: Advanced Technologies**

Chairs: L. Manchanda (AT&T Bell Labs) and R. D. McGrath (Polaroid)

I.1 Invited Paper: Technology trends in dynamic RAMs: 64 Mb and beyond – H. Sunami (Hitachi Ltd.)

I.2: Trapping and trap creation studies on nitride and reoxidized-nitrided silicon dioxide films on silicon – D. J. DiMaria and J. H. Stathis (IBM)

I.3: Characterization of slow donor states in reoxidized nitride oxide gate dielectrics – K. S. Krisch, B. J. Gross, and C. G. Sodini (MIT)

Coffee Break

I.4: Voltage dependence of interface trap generation in MOSFETs – C. C-H. Hsu, D. S. Wen, and T. H. Ning (IBM)

I.5: Electron induced positive charging in  $\sim 25 \text{ \AA}$  tunnel oxides – K. R. Farmer, M. O. Andersson, and O. Engström (Chalmers University of Technology)

I.6: High drain current induced oxide breakdown and hot-electron induced parasitic effects in n-channel MOSFETs – Y. Nishioka (Hitachi) and T. P. Ma (Yale University)

**Oral Poster Presentations, P1** (Chair: L. Trombetta, University of Houston)

P1.1: Individual, attractive defect centers in the SiO<sub>2</sub> interface of sub- $\mu\text{m}$  MOSFETs – M. Schulz and A. Karmann (Universität Erlangen – Nürnberg)

P1.2: Effect of dipoles and interface charges on Si-SiO<sub>2</sub> interfacial barrier – V. K. Adamchuk and V. V. Afanas'ev (Leningrad State University)

P1.3: Quantum effects in the accumulation layers of MOS structures at room temperature – J. Suñé, P. Olivo, and B. Riccò (Università di Bologna)

P1.4: Impurity band transport at the Si-SiO<sub>2</sub> interface after hot carrier stress – Q. Y. Ye (UNC Charlotte) and F. Koch (TU München)

P1.5: Electrical characterization of SiGe MOS capacitors – M. Ancona, C. Scott, F. Kub, D. Godbey, and D. McCarthy (Naval Research Lab)

P1.6: Contactless optical characterization of processing effects on carrier lifetime in silicon – P. F. Baude, T. Tamagawa, and D. L. Polla (University of Minnesota)

Thursday Afternoon, December 6, 1990 (2:00 – 5:20)

**Session II: Interface Formation and Modification**

Chairs: P. Balk (DIMES) and M. J. Schulz (University of Erlangen-Nurnberg)

II.1: Invited Paper: STM of the oxygenation of silicon at room temperature and 650 °C – Mark Welland (Cambridge University)

II.2: Support for the strain dependent diffusion model for dry thermal oxidation of crystalline Si – C. H. Bjorkman, D. R. Lee, and G. Lucovsky (North Carolina State University)

**Oral Poster Presentations, P2** (Chair: R. Stahlbush, Naval Research Lab)

P2.1: A capacitor silicon nitride film prepared by rapid thermal nitridation and subsequent LPCVD – K. Ando, A. Ishitani, and K. Hamano (NEC Corp.)

P2.2: A magnetic resonance investigation of silicon and nitrogen dangling bonds in silicon nitride – W. L. Warren (Ft. Monmouth and Sandia National Labs), P. M. Lenahan (Penn State University), and J. Kanicki (IBM)

P2.3: Oxide field dependence of bulk and interface trap generation in SiO<sub>2</sub> due to electron injection – A.v. Schwerin and M. M. Heyns (IMEC)

P2.4: Electron capture and emission in SiO<sub>2</sub> from 77-298 K – Scott Thompson and T. Nishida (University of Florida)

P2.5: Effects of pre-oxidation F implantation on MOS interface properties – X. W. Wang, A. Balasinski, T. P. Ma (Yale University), and Y. Nishioka (Hitachi)

P2.6: The effect of electron current induced by Si avalanche injection on fluorinated SiO<sub>2</sub> – D. R. Young and D. Xie (Lehigh University)

P2.7: A unique hot electron injection structure with very low electric fields in gate insulators – S. Yoon, R. Siergiej, and M. White (Lehigh University)

**Coffee Break**

II.3: Effect of helium dilution during low-temperature plasma deposition on the properties of SiO<sub>2</sub> thin films – Y. C. Park, S. B. Hagstrom (Stanford University), N. M. Johnson, W. B. Jackson, K. S. Stevens, and D. L. Smith (Xerox PARC)

II.4: Current gain enhancement in bipolar transistors by low energy ion beam modification of polysilicon/Si interface – B. Jalali, C. A. King, G. Higashi, J. C. Bean, and R. Hull (AT&T Bell Labs)

**Oral Poster Presentations, P3** (Chair: R. C. Barker, Yale University)

P3.1: Unstable SiO<sub>2</sub>/Si interface and oxide defects – R. E. Stahlbush (Naval Research Lab)

P3.2: Time evolution of capture cross-sections of radiation-induced Si/SiO<sub>2</sub> interface traps – W. Chen and T. P. Ma (Yale University)

P3.3: A study of fast and slow states generated by negative bias stress – M. J. Uren and M. J. Kirton (RSRE)

P3.4: Correlation between preirradiation channel resistance and postirradiation interface-trap charge in MOS transistors – D. M. Fleetwood (Sandia National Labs) and J. H. Scofield (Oberlin College)

P3.5: Cooling rate dependent degradation of thin SiO<sub>2</sub> layers – K. Heyers (TU Aachen) and P. Balk (DIMES)

P3.6: Effect of oxide and interface-trap charge on 1/f noise in MOS devices – T. L. Meisenheimer and D. M. Fleetwood (Sandia National Labs)

P3.7: Noise characteristics of n- and p-channel MOS transistors – J. Chang and C. R. Viswanathan (UCLA)

**Reception and Poster Viewing (6:30 pm)**

**Friday Morning, December 7, 1990 (8:30 – 11:50)**

**Session III: Interface Structure and Defects**

Chairs: P. M. Lenahan (Penn State University) and B. Triplett (Intel)

III.1: Invited Paper: The theory of oxide defects near the Si-SiO<sub>2</sub> interface – W. Beall Fowler (Lehigh University)

III.2: A study of electrically-active point defects in MOSFETs using the spin dependent recombination technique – M. A. Jupina (Villanova University) and P. M. Lenahan (Penn State University)

III.3: Electron spin resonance observation of dipolar interactions between [111] P<sub>b</sub> centers at the (111) Si/SiO<sub>2</sub> interface – A. Stesmans (Universiteit Leuven)

**Coffee Break**

III.4: Fundamental chemical differences in P<sub>b</sub>-like defects on (111) and (100) silicon – J. H. Stathis and L. Dori (IBM)

III.5: Questions about tridymite model of SiO<sub>2</sub>/(001) interface – H. Akatsu (IBM, Tokyo), Y. Sumi (Tokyo University), and I. Ohdomari (Waseda University)

III.6: Electrically detected magnetic resonance in p-n junction diodes – F. Rong, W. R. Buchwald, E. H. Poindexter, and M. Harmatz (Ft. Monmouth)

**Friday Evening, December 7, 1990 (4:00 – 7:20 pm)**

**Plenary Address: The role of interfaces in VLSI  
(Y. Nishi and M. Scott, Hewlett Packard)**

**Session IV: Silicon-Germanium Technology and Devices**

Chairs: P. Grunthaner (Jet Propulsion Lab) and G. A. Brown (Texas Instruments)

IV.1: Invited Paper: Silicon and Si-Ge structures and devices by UHV chemical vapor deposition – B. Meyerson (IBM T. J. Watson Research Center)

IV.2: Modifications of SiGe heterostructure with carbon ion implantation – A. Fukami, K-I. Shoji, T. Nagano (Hitachi) and C. Y. Yang (Santa Clara University)

IV.3: Anomalous oxidation of strained Si<sub>1-x</sub>Ge<sub>x</sub> epitaxial layer – H. K. Liou, U. Gennser, P. Mei, and E. S. Yang (Columbia University)

IV.4: Oxidation of Si-Ge alloys – J. Eugene, F. K. LeGoues, V. P. Kesan, F. M. d'Heurle, and S. S. Iyer (IBM)

**Conference Banquet (7:45 pm)**

**Saturday Morning, December 8, 1990 (8:30 – 11:50)**

**Session V: Radiation Effects**

Chairs: T. R. Oldham (Harry Diamond Lab) and P. V. Dressendorfer (Sandia National Labs)

V.1: Invited Paper: Time dependent response of MOS systems to ionizing radiation – F. Barry McLean, Harry Diamond Lab)

V.2: Oxide thickness dependence of interface trap buildup – D. B. Brown and N. S. Saks (Naval Research Lab)

V.3: Hole-trapping/hydrogen transport (HT)<sup>2</sup> model for interface-trap buildup in MOS devices – M. R. Shaneyfelt, J. R. Schwank, D. M. Fleetwood, and P. S. Winokur (Sandia National Labs)

### **Coffee Break**

V.4: Generation of interface traps at the Si/SiO<sub>2</sub> interface via exposure to molecular hydrogen – D. I. Semon and P. M. Lenahan (Penn State University)

V.5: Transport and trapping of radiation-generated charge in SIMOX buried oxides – H. E. Boesch, Jr., C. A. Pennise, and T. L. Taylor (Harry Diamond Lab)

V.6: Relationship between atomic level stress and radiation induced defects in SiO<sub>2</sub> – W. L. Warren, P. M. Lenahan (Penn State University) and C. J. Brinker (Sandia National Labs)

### **Saturday Afternoon, December 8, 1990 (1:00 – 3:00)**

#### **Session VI: Hot Carriers**

Chairs: Y. Nishioka (Hitachi) and M. Heyns (IMEC)

VI.1: Invited Paper: Investigation of the different defect components in hot carrier stressing of nMOS transistors – B. Doyle and K. R. Mistry (Digital Equipment Corp.)

VI.2: Homogeneous hole injection into gate oxide layers of MOSFETs: injection efficiency, hole trapping, and Si/SiO<sub>2</sub> interface state generation – A.v. Schwerin and M. M. Heyns (IMEC)

VI.3: Influence of avalanche injected holes on radiation-induced (100) Si/SiO<sub>2</sub> interface traps – L. Vishnubhotla and T. P. Ma (Yale University)

VI.4: Soft X-ray induced core level photoemission as a probe for hot electron relaxation in SiO<sub>2</sub> – E. Cartier, F. R. McFeely, L. J. Terminello, A. Santoni, and M. V. Fischetti (IBM)

VI.5: Spectrally resolved visible light emission from Si MOSFETs – K. Hublitz and S. A. Lyon (Princeton University)