32nd IEEE Semiconductor Interface Specialists Conference

SISC 2001

November 29 – December 1, 2001
The Westin Grand, Washington, D.C.

IEEE

Session 1 – High-K Gate Dielectrics - I

Thursday, November 29, 2001
Session Chair: Kathy Krisch

8:00 AM **Welcome and Opening Remarks**

8:10 AM **1.1 *Invited* – Integration challenges for high-k gate stack engineering,** Howard R. Huff, A. Agarwal, L. Perrymore, C. Sparks, M. Freiler, G. Gebara, B. Bowers, P. J. Chen, P. Lysaght, J. Barnett, D. Riley, B. Nguyen, Y. Kim, J.E. Lim, S. Lim, G. Bersuker, P. Zeitzoff, G.A. Brown, C. Young, B. Foran, F. Shaapur, A. Hou, C. Lim, H. Alshareef , S. Borthakur, D. J. Derro, R. Bergmann, L. A. Larson, M. I. Gardner, J. Gutt, R. W. Murto, K. Torres and M. D. Jackson (International SEMATECH, Inc.)

8:50 AM **1.2 - Low Weibull slope of breakdown distributions in high-k layers,** Thomas Kauerauf, Robin Degraeve, Charlotte Soens, Guido Groeseneken (IMEC), Eduard Cartier (IBM/IMEC)

9:10 AM **1.3 - A localized molecular orbital model for the electronic structure of transition metal silicate and alumina alloys,** G Lucovsky, Y Zhang, G Appel, GB Rayner, H Ade and JL Whitten (N.C. State University)

Poster Session I: High K

Thursday, November 29, 2001
Session Chair: Lori Lipkin

9:30 AM **P-1 - An empirical approach for interpretation of chemical shifts in XPS/AES features in non-crystalline high-k transition metal silicate and aluminate alloys,** G.B. Rayner Jr., K. Mai, M. Schultz, D. Hong and G. Lucovsky (N.C. State University)

9:33 AM **P-2 - Properties of zirconium silicate thin films with high zirconium concentrations**, K.Torii, M.Hiratani, and T. Onai (Central Research Laboratory, Hitachi Ltd.)

9:36 AM **P-3 - Spectroscopic studies of bulk and interface electronic structure of Ta_2O_5-Al_2O_3 Alloys for Gate Dielectric Applications,** M. Ulrich, R. Johnson, J.G. Hong, J. Rowe and G. Lucovsky (N.C. State University)

9:39 AM **P-4 - Kinetics of silicon consumption during CVD of ultra-thin high-k's on silicon,** G. N. Parsons, D. Niu, and R. W. Ashcraft (N.C. State University)

9:42 AM **P-5 - Inelastic electron tunneling spectroscopy study of ultra-thin HfO_2,** Wei He, T.Tamagawa*, Why-Kei Lye**, Tso-Ping Ma, and Richard C. Barker (Yale University)

9:45 AM **P-6 -Effect of UV oxygen annealing on the properties of Ta_2O_5 films formed by UV assisted, liquid injection source, CVD,** BJ O'Sullivan, PK Hurley (MNRC), J-Y Zhang, Q Fang, IW Boyd (University College London), MA Audier, JP Senateur (INPG), T Leedham (Inorgtech Ltd), and B Semmache (J.I.P. Elec.)

9:48AM **BREAK**

Session 2 – Traps, Defects & ESR

Thursday, November 29, 2001
Session Chair: Beall Fowler

10:15 AM **2.1 – *Invited* -Capacitively-detected magnetic resonance on semiconductor/oxide interfaces and field effect transistors**, Martin S. Brandt, T. Graf, R. T. Neuberger, and M. Stutzmann (Walter Schottky Institut, Technische Universität München), S. Baldovino and M. Fanciulli (Laboratorio MDM-INFM)

10:55 AM **2.2 - Proton-induced defect generation at the Si-SiO_2 interface**, S. N. Rashkeev, D. M. Fleetwood, R. D. Schrimpf, and S. T. Pantelides (Vanderbilt University)

11:15 AM **2.3 - A mechanism for spontaneous proton generation at the Si-SiO_2 interface**, A. H. Edwards, H. P. Hjalmarson, and P. A. Schultz (Sandia National Labs)

11:35 AM **2.4 - The role of hydrogen in hole trap generation in oxides and oxynitrides,** J.F.Zhang, H.K.Sii, A.H.Chen, C.Z.Zhao (Liverpool John Moores University), M.J.Uren (DERA), G.Groeseneken and R.Degraeve (IMEC)

Poster Session II: Traps, Defects & ESR

Thursday, November 29, 2001
Session Chair: Andre Stesmans

11:55 AM **P-7 – Properties of electron traps generated in the gate oxide**, W.D. Zhang, J.F. Zhang, M. Lalor, D. Burton (Liverpool John Moores University), G. Groeseneken, and R. Degraeve (IMEC)

11:58 AM **P-8 – Annealing induced degradation of thermal SiO_2 on (100)Si: atomic assessment by electron spin resonance,** A. Stesmans, B. Nouwen, D. Pierreux, and V. V. Afanas'ev (University of Leuven)

12:01 PM **P-9 – Paramagnetic interface defects in HfO_2 and Al_2O_3 films on silicon,** G.J. Gerardi (William Paterson University of New Jersey), D. Neumayer, J.H. Stathis, E.P. Gusev, N.A. Bojarczuk, and S. Guha (IBM)

12:04 PM **Adjourn for Lunch**

Session 3 – Traditional Insulators

Thursday, November 29, 2001
Session Chair: Nelson Saks

2:00 PM **3.1 – *Invited* - Impact of oxide breakdown on FET and circuit operation and reliability,** B. Kaczer, R. Degraeve, A. De Keersgieter, K. Van de Mieroop, M. Rasras, V. Simons, P. J. Roussel, and G. Groeseneken (IMEC, Kapeldreef)

2:40 PM **3.2 - Interaction of electrons with defects created by hot holes in ultra-thin silicon dioxide,** E. M. Vogel, D. Heh, B. Wang, C. E. Weintraub, J. S. Suehle, M. D. Edelstein, and J. B. Bernstein (National Institute of Standards and Technology)

Poster Session III: Wide Bandgap & Remaining High K

Thursday, November 29, 2001
Session Chair: Xiewen Wang

3:00 PM **P-10 – Metal-Oxide-Semiconductor structures in inductively coupled plasma etch damaged 6H- and 4H- SiC,** S.-M. Koo, S.-K. Lee, C.-M. Zetterling, and M. Östling (KTH Royal Institute of Technology)

3:03 PM **P-11 - Improving the 4H-SiC:SiO_2 interface using N_2O**, L.A. Lipkin, M.K. Das and J.W. Palmour (Cree, Inc.)

3:06 PM **P-12 - GaP MIS capacitors with JVD SiN as the gate insulator,** A. Chen, J. Woodall, X.W. Wang (Yale University)

3:09 PM **P-13 - High mobility HfO_2 n- and p- channel transistors,** F. Chen, S. A. Campbell, T. Z. Ma, R. Smith, and W. L. Gladfelter (University of Minnesota)

3:12 PM **P-14 - Ultra-thin hafnium silicate films with TaN and polysilicon gates for gate dielectric application,** S. Gopalan, E. Dharmarajan, K. Onishi, R. Nieh, C. S. Kang, R. Choi, H-J. Cho, and J. C. Lee (University of Texas at Austin)

3:15 PM **P-15 - Ultrathin Al_2O_3 gate dielectrics with built-in interfacial silicon oxide,** Y. Shimamoto, K. Obata, S. Saito, K. Torii, and M. Hiratani (Hitachi Ltd.)

3:20 PM **30 minute BREAK**

Session 4 – Thin Oxides - Radiation Effects

Thursday, November 29, 2001
Session Chair: Bernie Mrstik

3:50 PM **4.1 *Invited* - Characterization of post-soft breakdown conduction in ultra-thin oxides induced by ionizing radiation and constant voltage stress,** John S. Suehle (NIST)

4:30 PM **4.2 - Wear-out and breakdown of ultra-thin oxides after exposure to ionizing radiation,** A. Cester, L. Bandiera, A. Paccagnella, G. Ghibaudo, and G. Ghidini (Università di Padova)

Poster Session IV: Traditional Insulators

Thursday, November 29, 2001
Session Chair: Carl-Mikael Zetterling

4:50 PM **P-16 – Density gradient in SiO_2 films on silicon as revealed by positron annihilation spectroscopy**, A. G. Revesz (Revesz Associates), W. Anwand, and G. Brauer (Forschungszentrum Rossendorf), H. L. Hughes, and W. Skorupa (NRL)

4:53 PM **P17 – Interface structures generated by negative-bias temperature instability in Si/SiO_2 and Si/SiO_xN_y interfaces,** J. Ushio, K. Kushida-Abdelghafar, and T. Maruizumi (Advanced Research Laboratory, Hitachi, Ltd.)

(no Oral) **P-18 – Degradation mechanism due to nitrogen incorporation in $SiO_2/Si(001)$**, T. Yamasaki and C. Kaneta (Fujitsu Laboratories Limited)

(no Oral) **P-19 – Investigation of distribution of boron and fluorine at the polySi-SiO_2 and polySi-Si_3N_4 interfaces**, S. Gupta (PolarFab)

4:56 PM **P-20 – Border trap characterization in ultra-thin JVD nitride capacitors**, K.N. ManjulaRani, V. Ramgopal Rao and J. Vasi (Indian Institute of Technology)

4:59 PM **P-21 – Extraction of effective mass of carriers in Si_3N_4 by accurate modeling of gate tunneling current,** Deleep R. Nair, Mahesh B. Patil, J. Vasi (Indian Institute of Technology)

5:02 PM **Adjourn**

7 P.M. Thursday Evening ***Poster Reception***

Session 5 –SiC / Wide Bandgap

Friday, November 30, 2001
Session Chair: Sima Dimitrijev

8:00 AM **Morning Announcements**

8:10 AM **5.1 *Invited* – The 4H-SiC/SiO_2 interface,** J. K. McDonald, A. Franceschetti, S.T. Pantelides, R.A. Weller and L.C. Feldman (Vanderbilt University) G. Chung, C.C. Tin and J.R. Williams (Auburn University), C.-Y. Lu, B.S. Um and J.A.Cooper, Jr. (Purdue) and M.K. Das (Cree Inc)

8:50 AM **5.2 Interfacial oxide traps in n-type 4H- and 6H-SiC MOS structures**, H.Ö. Ólafsson, E.Ö. Sveinbjörnsson, T.E. Rudenko, V.I. Kilchytska, I.P. Tyagulski, and I.N. Osiyuk (Microtechnology Centre at Chalmers)

9:10 AM **5.3 Using the Hall effect to measure interface trap densities in silicon and SiC MOS devices**, N. S. Saks, M.G. Ancona, and R.W. Rendell (Naval Research Laboratory)

9:30 AM **5.4 Effect of an interfacial nitride layer on SiO_2/4H-SiC interface,** X.W. Wang, H.M. Bu, T.P. Ma and X.W. Wang (Yale University), B.L. Laube (United Technologies Research Center), C. Caragianis-Broadbridge (Southern Connecticut State University)

9:50 AM **BREAK**

Session 6 – High K with Hf

Friday, November 30, 2001
Session Chair: Bich-Yen Nguyen

10:20 AM **6.1 *Invited* - Comparative study of high-k CVD films of Hf and Zr Silicate for CMOS devices,** M.J. Bevan, M.R. Visokay, J.J. Chambers, A.L.P. Rotondaro, H. Bu, A. Shanware, D.E. Mercer, R.T.Laaksonen, L. Colombo (Texas Instruments Incorporated)

11:00 AM **6.2 Thermal stability of hafnium oxide and hafnium aluminum oxide**, W. Zhu and T.P. Ma (Yale University)

11:20 AM **6.3 Thermal stability of high-k gate dielectrics on Si: Studies of metal incorporation from silicates into Silicon,** M. Quevedo-Lopez, M. El-Bouanani, S. Addepalli, J. L. Duggan, B. E. Gnade, R. M. Wallace (University of North Texas) M.R.Visokay, M.Douglas, M.J.Bevan, A.Rotondaro and L. Colombo (Texas Instruments Incorporated)

11:40 AM **6.4 Semi-empirical correlation of equivalent oxide thickness C-V extraction routines,** K. Ahmed, P. Kraus, C. Olsen, F. Nouri, and G. Miner (Applied Materials, Inc.)

12:00 PM **Adjourn**

7 P.M. Friday Evening ***Conference Banquet and Limerick Contest***

Session 7 – High-K Gate Dielectrics - II

Saturday, December 1, 2001
Session Chair: Eric Vogel

8:00 AM **Morning Announcements**

8:10 AM **7.1 *Invited* - High K gate dielectric university research,** John R. Hauser (N.C. State University)

8:50 AM **7.2 - Hole trapping in thin ALCVD layers of Al_2O_3, ZrO_2 on (100)Si,** V. V. Afanas'ev and A. Stesmans (University of Leuven)

9:10 AM **7.3 – Properties of high k / ultra pure Si_3N_4 / Si stacks**, M. Shriver, A. Gabrys, X. Shi, S. A. Campbell, and T. K. Higman (University of Minnesota)

9:30 AM **7.4 - An investigation into the electrical properties of ultra-thin zirconia dielectrics,** S. Ramanathan, P. McIntyre (Stanford University), G.D. Wilk and D.A. Muller (Agere)

9:50 AM **BREAK**

Session 8 – High K with Rare Earth, Al

Saturday, December 1, 2001
Session Chair: Andre Stesmans

10:20 AM **8.1 - Interface reactions of high-k Y_2O_3 gate oxides with Si,** B.W. Busch, J. Kwo, M. Hong, J.P. Mannaerts, B.J. Sapjeta (Agere Systems), W.H. Schulte, E. Garfunkel, and T. Gustafsson (Rutgers University)

10:40 AM **8.2 - High-k gate dielectrics of single crystalline Rare-Earth metal oxides directly grown on Si(111),** Y. Nishikawa, N. Fukushima and N. Yasuda (Toshiba Corporation)

11:00 AM **8.3 - Charging effects on the effective mobility of high-k dielectric based metal-oxide-semiconductor field-effect transistors,** L.-Å. Ragnarsson, N. A. Bojarczuk, S. Guha, E. Gusev, J. M. Karasinski (IBM)

11:20 AM **8.4 - Ultra-thin titanium aluminates with improved thermal stability for CMOS gate application,** Z. J. Luo, T. P. Ma, H. H. Tseng, J. Conner, T. Tamagawa (Yale University)

11:40 AM **8.5 - Measurement of barrier heights in high permittivity gate dielectric films,** S. Zafar, E. Cartier and E. P. Gusev (IBM)

12:00 PM **Closing Remarks**