

TABLE OF CONTENTS

PREFACE	iii
ORGANIZATION OF EIGHTH SYMPOSIUM ON PLASMA PROCESSING	iv
MODELING, MECHANISMS, AND MEASUREMENTS	
Plasma Technology Challenges for Tomorrow's Manufacturing. G.K. Herb and D. Ranadive	1
Ion Bombardment in RF Plasmas. H.H. Sawin, J. Liu, and G.L. Huppert	11
Simulation of Simultaneous Etching and Deposition Profiles. J.P. McVittie, A.J. Bariya, S. Ravi, and C.W. Frank	25
"RIE LAGS" in Reactive Ion Etching. Y.H. Lee and Z.H. Zhou	34
Size Dependent Etching of Small Shapes. H.C. Jones, R. Bennett, and J. Singh	45
Tradeoffs between Etch Rate and Uniformity in Plasma Etching Systems. A.S. Kao and H.G. Stenger, Jr.	
Experimental and Modeling Studies of Chlorine RF Glow Discharges. E.S. Aydil and D.J. Economou	77
Mechanisms and Modeling of Plasma Polymerization. S.W. Butler, I. Trachtenberg, and T.F. Edgar	95
CHF ₃ Plasma Polymerization in an RIE System. A.J. Bariya, J.P. McVittie, and C.F. Frank	108
Investigation of Atomic Chlorine Kinetic Energies in RF Plasmas. P.W. May, D. Field, and D.F. Klemperer	125

Electron and Ion Energy Distributions in RIE Plasmas. P.W. May, D. Field, D.F. Klemperer, and Y.P. Song	136
Reactive Ion Etching of Silicon in SF₆/O₂ Mixtures. P.M. Kopalidis and J. Jorne	149
Reactive Ion Etch/Real Time Monitor and Control. D. Angell and G.S. Oehrlein	171
Modeling and Analysis of Pulsed-Plasma CVD and Etching Reactors. D.J. Economou and S-K. Park	185
Particles Generated in a Plasma Etch Reactor: Source Material, Plasma Chemistry, and Process Effects. J.A. Durham and Ch. Steinbruchel	207
Particles Generated in a Plasma Etch Reactor: Excitation Frequency and Etch Rate Effects. J.L. Petrucci and Ch. Steinbruchel	219
Impedance Measurements of RF Etching Glow Discharges in Electropositive and Electro-Negative Gases. H. Shan, J.P. McVittie, and S.A. Self	229
Characterization of SiO₂ Etching in a Narrow Gap CF₄ Glow Discharge. J.W. Butterbaugh and H.H. Sawin	240
SURFACE DAMAGE AND MODIFICATIONS	
Silicon Surface Damage Phenomena due to Ion Assisted Processing. S. Ashok	254
Silicon Etching in HBr Reactive Ion Etching Plasmas. T.D. Bestwick, G.S. Oehrlein, G.M.W. Kroesen, F. Cardone, and G.J.Scilla	285
A Study of HBr RIE Damage in Silicon. O.S. Nakagawa, S. Ashok, and J.K. Kruger	293

Evidence for Gettering Resulting from Dry Etching Damage. R.H. Herlocher III and S.J. Fonash	304
Luminescent Centres in Reactive-Ion-Etched n-Type Silicon. A. Henry, O.O. Awadelkarim, B. Monemar, J.L. Lindstrom, T.D. Bestwick, and G.S. Oehrlein	309
Hole Traps in Annealed Reactive-Ion-Etched Silicon. A. Henry, O.O. Awadelkarim, C. Hallin, J.L. Lindstrom, and G.S. Oehrlein	317
Reactive Ion Etching of PECVD n a-Si:H and Plasma Damage to PECVD Silicon Nitride Film. Y. Kuo and M.S. Crowder	324

ECR AND MICROWAVE PLASMA PROCESSES

A Permanent Magnet ECR Source. T.D. Mantei and O.D. Krogh	335
Characterization of an ECR Plasma by Optical Emission Spectroscopy. O.D. Krogh and T.D. Mantei	339
Low Pressure ECR Plasma for Anisotropic Ion Etching. M. Yamada, T. Ebata, and J. Yamada	347
Tri-Level Resist Etching by ECR Plasma. S. Mihara and N. Abe	362
Electron Cyclotron Resonance Microwave Plasma Etching of Submicron Polysilicon Gate Structures. C-H. Chen, M.S. Chang, C-L. Yang, and T. Ebata	368
Dry Process Development with the Flowing After-Glow Reactor. J.E. Spencer	377
Microwave Plasma Etching of Al Metalization Films. Y. Kakehi, R. Fukuyama, M. Nawata, N. Nakazato, Y. Kawasaki, and H. Kawahara	393

The Effects of Plasma-Wafer Distance in O₂ + N₂ Downstream Ashing. K. Shinagawa, S. Fujimura and H. Yano	403
Downstream Plasma Removal of Mobile Ion Impurity from SiO₂. W.K. Chung	416
Resist Descum and Reduced Temperature Processing in a Single Wafer Downstream Asher. J.I. McOmber, W. Marsh, and J. Ngo	423
Characterization of an Isotropic Anisotropic Contact Etch. J. Ding, K.Y. Fung, G.W. Hills, X.C. Mu, and R.A. Shepard	437
Plasma Etch of Several Oxides at Elevated Temperatures. G.B. Powell, D. Drage, and W.G.M. van den Hoek	452
MAGNETRON PLASMA PROCESSES	
Magnetic Enhanced RIE of Silicon Deep Trench. Y.T. Lii, H.Y. Ng, and D.A. Danner	462
Anisotropic Etching of Single-Crystal Silicon With Pure Chlorine Plasmas in a Magnetically Confined Reactor. M. Engelhardt, V. Grewal, and S. Schwarzl	470
Selective Etching of Silicon Nitride in a Magnetically Enhanced Plasma Reactor. C.J. Yang, B.C. Nguyen, K.L. Devries, and W. Babie	481
Substrate Trenching Mechanism during Plasma and Magnetically-Enhanced Polysilicon Etching. S.V. Nguyen, D. Dobuzinsky, S. Stiffler, and G. Chrisman	491
Dry Etch Process for Resist-Mask Submicron Tungsten Interconnect Patterning. U.C. Sridharan, J. Hackenberg, and D. De Vout	509

PECVD PROCESSES

Highly Soluble PECVD-Oxide Films: A Special Application to Disposable Sidewall Spacer Technology. D.C.H. Yu, C.Y. Lu, and J.M. Sung	517
Electrical Characterization of PECVD TEOS Based Oxides. R. Srinivasan and D.A. Buchanan	525
Planarizing Silicon Dioxide Layers by Distributed ECR Deposition. M.J. Cooke and N. Sharrock	538
Low Temperature Deposition of Silicon Dioxide By Distributed Electron Cyclotron Resonance Plasma Enhanced Chemical Vapor Deposition. F. Plais, B. Agius, F. Abel, J. Siejka, M. Puech, and P. Alnot	544
Temperature Dependence of Hydrogen Content in SiO ₂ Films Deposited by Electron Cyclotron Resonance CVD. D.R. Denison, M.T. Weise, T. Ebata, and Y. Inudo	553
Deposition of Diamondlike Carbon by ECR-RF Hybrid Plasma Technique. S. Sritharan, J.S. Wilson, P. Barbier, J.I. Pankove, A. Nelson, R. Matson, N. Wada, and C-H. Qiu	560
Improved Silane Base PECVD Silicon Oxide Film Deposition Process for Passivation and Interlevel Dielectrics. A.K. Ray	565
A Novel PECVD BPSG Process from TRIS (Tri-Methylsiloxo) Boron and Trimethylphosphite Glow Discharges. H. Treichel, O. Spindler, R. Braun, T.A. Brooks, and R. Nowak	574
Energy Considerations in the Deposition of High Quality PECVD Silicon Dioxide. J.D. Chapple-Sokol, W.A. Pliskin, R.A. Conti, E. Tierney, and J. Batey	593

PECVD Silicon Nitride and Oxynitride Films: Characteristics and Study of Voltage Stressing. J. Vuillod	605
Processes in Dual-Mode Microwave/Radio Frequency Plasmas. L. Martinu, O.M. Kuttel, J.E. Klemberg-Sapieha, and M.R. Wertheimer	616
Plasma Assisted Gas Jet Deposited Dielectric Films. B.A. Chen, D. Wang, T.-P. Ma, J.W. Golz, B.L. Halpern, and J.J. Schmitt	628
Advanced Compound Semiconductor Deposition Diagnostic Development Using Tunable Infrared Diode Laser Absorption in a Long Path Plasma Reactor. J. Wormhoudt	650

ETCHING PROCESSES

Selective Dry Etching of Germanium with respect To Silicon and Vice Versa. G.S. Oehrlein, T.D. Bestwick, P.L. Jones, M.A. Jaso, and J.L. Lindstrom	661
Shallow Trench RIE in Chlorinated Plasma H.Y. Ng, D.A. Danner, and M. Jost	681
Etching of Amorphous Silicon Spacers for Disposable Sidewall Spacer Technology. S. Franssila	689
Plasma Etching of WSi ₂ /SiO ₂ and Polycide Structures Using NF ₃ -Mixed Halocarbon Etchants. J.M. Parks, R.J. Jaccodine, J.G. Langan, and M.A. George	701
High Selectivity SiO ₂ Etching and Taper Angle Control by Wafer Temperature Control RIE. T. Toyosato, T. Tamaki, and T. Tsukada	716
Very High Selectivity Silicon Dioxide Etching And Effective Etch Profile Control at Low Wafer Temperature. G.Z. Yin, B. Schwarz, P. Keshwad, R. Lindquist, C-T.M. Kao, and M.S. Chang	724

Enhanced Slope Multi-Tier Contact Etch Process. R.K. Berglund and K.E. Mautz	737
Development of a Tapered Via Etch Process. M.F. Leahy	746
Residue Free Single Wafer Reactive Ion Etching Of Multilayer Resist. C. Cunningham	759
Reactive Ion Etching of Indium Tin Oxide with Fluorochlorocarbon Gases. Y. Kuo and J.R. Crowe	765
AUTHOR INDEX	773
SUBJECT INDEX	777