

Publications

1. H.H. Sawin, D.D. Wilkinson, W.M. Chang, S. Smiriga, and R.P. Merrill, "Broad-Frequency Chopper With Adjustable Duty Cycle" *J. Vac. Sci. Tech.* **14**, 1205 (1977).
2. H.H. Sawin and R.P. Merrill, "Angularly Resolved Temperature Programmed Decomposition--Nitrogen Emission From the Decomposition of Hydrazine on Ir(111)" *J. Chem. Phys.* **73**, 996 (1980).
3. H.H. Sawin and R.P. Merrill, "Fourier Analysis of Linear Surface Kinetics in Reactive Molecular Beam Scattering," *J. Vac. Sci. Tech.* **19**, 40, (1981).
4. H.H. Sawin and L.R. Reif, "Plasma Processing in Integrated Circuit Fabrication," *Chemical Engineering Education* **XVII**(4), 148 (1983).
5. H.H. Sawin, A.D. Richards and B.E. Thompson, "Plasma-Assisted Processing: The Etching of Polysilicon in a Cl_2 Discharge," Symp. Chemical and Physical Processing of Integrated Circuits, *ACS Sympo. Series 290*, p.164, Davis, CA, March 1984.
6. R.S. Manton, H.H. Sawin, R.M. Scharfman, C. Sigal, C.G. Vayenas, and J. Wei, "Cogeneration of Electrical Power and Nitric Oxide in a Solid-Electrolyte Fuel Cell," Energy Technology XI. 'Applications and Economics.' *Proc. 11th Energy Tech. Conf.*, 794, Govern. Inst., Washington, D.C., March 1984.
7. H.H. Sawin and M.T. Mocella, "The Kinetics of Polysilicon Etching in Chlorine Bearing Discharges," Semicon East, Boston, MA (1984).
8. H.H. Sawin, B.E. Thompson, and A.D. Richards, "The Kinetics of Polysilicon Etching in Cl_2 Discharges," *Proc. Fifth Sympo. Plasma Processing* **85-1**, G.S. Mathad, G.C. Schwartz, and G. Smolinsky, eds., Electrochemical Society, p 534-544 (1985).
9. H.H. Sawin, A. Yokozeki, A.J. Owens, and K.D. Allen, "Kinetic Analysis of Chlorofluorocarbon Discharges," *Proc. Plasma Synthesis Etch. of Elect. Mat -Materials Res. Soc. Symp.*, Eds: Chang, Abeles, **38**, 235, Boston, November (1984).
10. M.T. Mocella, M.W. Jenkins, H.H. Sawin, and K.D. Allen, "Parametric Characterization of Plasma Etching Processes," *Proc. Plasma Synthesis Etch of Elect. Mat. - Materials Res. Soc. Symp.*, Eds: Chang, Abeles, **38**, 227, Boston, November (1984).
11. R.A. Rossen and H.H. Sawin, "Ion-Enhanced Gas-Surface Kinetics: the $\text{Si-Cl}_2\text{-Ar}^+$ System," *Appl. Phys. Lett.* **45**, 860 (1984).

12. R.A. Rossen and H.H. Sawin, "Comment on 'Ion-enhanced gas-surface kinetics: The Si-Cl₂-Ar⁺ System'," *Appl. Phys. Lett.* **46**, 613 (1985).
13. R.A. Rossen and H.H. Sawin, "Summary Abstract: Ion-Enhanced Gas-Surface Kinetics of the Si-Cl₂-Ar⁺ System," *J. Vac. Sci. Tech. A* **3**, 881 (1985).
14. H.H. Sawin, "A Review of Plasma Processing Fundamentals," *Solid State Tech.* **28**, 211, (1985).
15. H.H. Sawin, K.D. Allen, M.W. Jenkins, and M.T. Mocella, "Parametric Modeling of Plasma Etching Processes," *Proc. Tegal 11th Plasma Sem.*, p. 17, Palo Alto, CA, May 1985.
16. K.D. Allen and H.H. Sawin, "Thermodynamics of the Silicon- Chlorine-Hydrogen System: Chemical Potential for Homogeneous Nucleation," *J. Electrochem. Soc.* **133**, 421 (1986).
17. B.E. Thompson, K.D. Allen, A.D. Richards, and H.H. Sawin, "Ion Bombardment Energy Distributions in Radio Frequency Discharge Systems," *J. Appl. Phys.* **59**, 1890 (1986).
18. H.H. Sawin, "Alternative Chemical Pathways for Chemical Vapor Deposition," *Proc. Electrochem. Soc. Sympos. on the Fundamentals of Reduced Temperature Processing*, October 1985, Sect. 86-5, 24 (1986).
19. J.P. Schwartz, H.H. Sawin, and T.A. Hatton, "Frequency Response Analysis of Nonsuperimposable Systems Using a Pseudo-Transfer Function: Application to Systems with Coverage-Dependent Adsorption," *Chem. Engr. Sci.* **41**, 495 (1986).
20. B.E. Thompson and H.H. Sawin, "Comparison of Measured and Calculated SF₆ Breakdown in rf Electric Fields," *J. Appl. Phys.* **60**, 89, (1986).
21. M.T. Mocella, H.H. Sawin, and K.D. Allen, "Polysilicon Etching By Freon 13B1 (CF₃Br): Process Trends and Sensitivities," *Proc. 12th Plasma Process Sem.*, p. 23, Tegal Corporation, Palo Alto, CA, May (1986).
22. M.T. Mocella, B.E. Thompson and H.H. Sawin, "Directional Plasma Etching of Polysilicon in SF₆ / CFCl₃ Discharges," *Proc. Plasma Proc. Symp.- Material Res. Soc.*, Eds. Coburn, Gottscho, Hess, 281 (1986).
23. M.W. Jenkins, M.T. Mocella, K.D. Allen, and H.H. Sawin, "The Modeling of Plasma Etching Processes Using Response Surface Methodology," *Solid State Technology* **29**, 175 (1986).

24. B.E. Thompson and H.H. Sawin, "Polysilicon Etching in SF₆ RF Discharges: Characteristics and Diagnostic Measurements," *J. Electrochem. Soc.* **133**, 1887 (1986).
25. K.D. Allen, H.H. Sawin, M.T. Mocella, and M.W. Jenkins, "The Plasma Etching of Polysilicon with CF₃Cl/Argon Discharges: I. Parametric Modeling and Impedance Analysis," *J. Electrochem. Soc.* **133**, 2315 (1986).
26. K.D. Allen and H.H. Sawin, "The Plasma Etching of Polysilicon with CF₃Cl/Argon Discharges: II. Modeling of Ion Bombardment Energy Distributions," *J. Electrochem. Soc.* **133**, 2326 (1986).
27. K.D. Allen, H.H. Sawin, and A. Yokozeki, "The Plasma Etching of Polysilicon with CF₃Cl/Argon Discharges: III. Modeling of Etching Rate and Directionality," *J. Electrochem. Soc.* **133(11)**, 2331 (1986).
28. J. Wormhoudt, A.C. Stanton, A.D. Richards, and H.H. Sawin, "Atomic Chlorine Concentration and Gas Temperature Measurements in a Plasma Reactor," *J. Appl. Phys.* **61**, 142 (1987).
29. J. Wormhoudt, A.C. Stanton, A.D. Richards, and H.H. Sawin, "Concentration Measurements of Chlorine Atoms in a Plasma Reactor," *Proc. Materials Res. Soc.* **68**, 115, Palo Alto, CA (1986).
30. D.A. Fisher, B.E. Thompson, and H.H. Sawin, "Monte Carlo Modeling of Ion Transport Through RF Glow Discharge Sheaths," *Proc. Materials Res. Soc.*, Eds. Coburn, Gottscho, Hess, **68**, 231, Palo Alto, CA (1986).
31. B.E. Thompson, H.H. Sawin, and A. Owens, "Continuum Modeling of Charged Particle Transport: rf Breakdown and Discharges of SF₆," *Proc. Materials Res. Soc.*, **68**, 243, Palo Alto, CA (1986).
32. M.T. Mocella, B.E. Thompson, and H.H. Sawin, "Directional Plasma Etching of Polysilicon in SF₆/CFCl₃ Discharges," *Proc. Materials Res. Soc.* **68**, 281, Palo Alto, CA (1986).
33. A.D. Richards, B.E. Thompson, and H.H. Sawin, "Continuum Modeling of Argon Radio Frequency Glow Discharges," *Appl. Phys. Lett.* **50**, 492 (1987).
34. A.D. Richards, B.E. Thompson, and H.H. Sawin, "Atomic Chlorine Measurements in a Plasma Etching Reactor. I. A Comparison of Infrared Absorption and Optical Emission Actinometry," *J. Appl. Phys.* **62**, 792 (1987).

35. A.D. Richards, and H.H. Sawin, "Atomic Chlorine Measurements in a Plasma Etching Reactor. II. A Simple Predictive Model," *J. App. Phys.* **62**, 799 (1987).
36. R.A. Rossen and H.H. Sawin, "Time-of-Flight and Surface Residence Time Measurements for Ion-Enhanced Si-Cl₂ Reaction Products," *J. Vac. Sci. Tech. A* **5(4)**, 1595 (1987).
37. G.A. Dittmer, D.A. Rudman, H.H. Sawin, and C.G. Sodini, "An Interdisciplinary Course in Microelectronics Fabrication," *Proc. University/Government/Industry Microelectronics Symp.*, (Cat.87CH2401-8) IEEE, 57 (1987).
38. Michael T. Mocella, Herbert H. Sawin, and Linda D. Baston, "A Quantitative Study of Gas Impurities Effects in Plasma Etching Processes," *Proc. Inst. Enviro. Sci.*, (1987).
39. G.S. Selwyn, L.D. Baston, and H.H. Sawin, "Detection of Cl and Chlorine-Containing Negative Ions in rf Plasmas By Two-Photon Laser-Induced Fluorescence," *Appl. Phys. Lett.* **51(12)**, 898 (1987).
40. B.E. Thompson, H.H. Sawin, and D.A. Fisher, "Monte Carlo Simulation of Ion Transport through RF Glow Discharge Sheaths," *J. Appl. Phys.* **63**, 2241 (1988).
41. J-P Nicolai, K.D. Allen, and H.H. Sawin, "Measurement of Atomic Chlorine Concentrations in Plasma Processes," *Proc. Mater. Res. Soc.* **117**, 35, Reno, Nevada, April 1988.
42. S.S. Cooperman, H.K. Choi, H.H. Sawin, and D.F. Kolesar, "Reactive Ion Etching of GaAs and AlGaAs in a BCL₃-Ar Discharge," *J. Vac. Sci. Tech. B* **7**, 41 (1989).
43. E. Gogolides and H.H. Sawin, "n⁺ Polysilicon Etching in CCl₄/He Discharges: Characterization and Modeling," *J. Electrochem. Soc.* **136(4)**, 1147 (1989).
44. E. Gogolides, J-P Nicolai, and H.H. Sawin, "Comparison of Experimental Measurements and Model Predictions for rf Ar and SF₆ Discharges," *J. Vac. Sci. Technol. A* **7**, 1001 (1989).
45. H.H. Sawin and E. Gogolides, "Continuum Modeling of RF Glow Discharges," *Proc. SPIE – Int. Soc. Optical. Engr.*, **1185**, 198 (1990).
46. J.W. Butterbaugh and H.H. Sawin, "Characterization of SiO₂ Etching in a Narrow-Gap CF₄ Glow Discharge," *Proc. 8th Symp. Plasma Processing.*, Eds: G.S. Mathad & D.W. Hess, Electrochem.Soc., **PV 90-14**, 240, (1990).
47. H.H. Sawin and E. Gogolides, "Continuum Modeling of Plasma Processes," The Electrochemical Society Conference, Montreal, Canada (1990).

48. J.W. Butterbaugh, L.D. Baston, and H.H. Sawin, "Measurement and Analysis of rf Glow Discharge Electrical Impedance and Network Power Loss," *J. Vac. Sci. Technol. A* **8**, 916 (1990).
49. J. Liu, G.L. Huppert, and H.H. Sawin, "Ion Bombardment in RF Plasmas," *J. Appl. Phys.* **68**, 3916 (1990).
50. G. Zau, L.D. Baston, D. Gray, I. Tepermeister, M.T. Mocella, and H.H. Sawin, "Threshold Levels and Effects of Feed Gas Impurities on Plasma Etching Processes," *J. Electrochem. Soc.* **137**, 3526 (1990).
51. H.H. Sawin, J. Liu, and G. Huppert, "Ion Bombardment in RF Plasmas", *Proc. 8th Symp. Plasma Processing.*, Eds: G.S. Mathad & D.W. Hess, Electrochem.Soc., **PV 90-14**, 11, (1990).
52. S.K. Kulkarni, S.M. Gates, C.M. Greenlief, and H.H. Sawin, "Kinetics and Mechanisms of Si₂H₆ Surface Decomposition on Si," *J. Vac. Sci. Tech. A* **8**, 2956 (1990).
53. S.K. Kulkarni, S.M. Gates, C.M. Greenlief, and H.H. Sawin, "Mechanisms of Disilane Decomposition on Si(111)-7x7," *Surface Science* **239**, 26 (1990).
54. S.K. Kulkarni, S.M. Gates, B.A. Scott, and H.H. Sawin, "Modulated Molecular Beam Scattering of Disilane on Silicon," *Surface Science* **239**, 13 (1990).
55. H.H. Sawin and S.K. Kulkarni, "Kinetic Mechanism of Si₂H₆ Decomposition on Silicon Surfaces," 3rd Micro Process Conf., Chiba City, Japan (1990).
56. S.M. Gates, S.K. Kulkarni, and H.H. Sawin, "Mechanisms and Models of Si Film Growth from SiH₄ and Si₂H₆," *Proc. Second Int. Sympos. on Process Physics and Modeling in Semiconductor Tech.*, Montreal, Canada (1990).
57. S.M. Gates, C.M. Greenlief, S.K. Kulkarni, and H.H. Sawin, "Surface Reactions in Si Chemical Vapor Deposition from Silane," *J. Vac. Sci. Tech. A* **8**, 2965 (1990).
58. L.D.B. Kiss and H.H. Sawin, "Measurement and Modeling of CF₄, CF₃Cl, and C₂F₆+Cl₂ Kinetics in RF Plasmas by Power Modulation," Techon 90, San Jose, CA (1990).
59. D.C. Gray, J.W. Butterbaugh, and H.H. Sawin, "Quantification of Film Formation Effects in Fluorocarbon Plasma Etching," Techon 90, San Jose, CA (1990).
60. G.C.H. Zau, J.W. Butterbaugh, P. Rummel, and H.H. Sawin, "Monitoring and Control of Real Power in RF Plasma Processing," *J. Electrochem. Soc.* **138**, 872 (1991).

61. D.C. Gray, H.H. Sawin, and J.W. Butterbaugh, "Quantification of Surface Film Formation Effects in Fluorocarbon Plasma Etching of Polysilicon," *J. Vac. Sci. Tech. A* **9**, 779 (1991).
62. Tepermeister and H.H. Sawin, "Polyimide Etching in Ar, O₂, and O₂/F₂ Gas Mixtures: Effect of Ion Energy," *J. Vac. Sci. Tech. A* **9**, 790 (1991).
63. J.C. Arnold and H.H. Sawin, "Charging of Pattern Features During Plasma Etching," *J. Appl. Phys.* **70**, 5314 (1991).
64. J.W. Butterbaugh, D.C. Gray, and H.H. Sawin, "Plasma-surface Interactions in Fluorocarbon Etching of Silicon Dioxide," *J. Vac. Sci. Tech. B* **9**, 1461 (1991).
65. D.C. Gray and H.H. Sawin, "Quantification of Plasma-Surface Interactions in Fluorocarbon Plasma Etching of Silicon and Silicon Dioxide," Dry Process Sympos., September 1991.
66. E. Hyman, K. Tsang, I. Lottati, A. Drobot, B. Lane, R. Post, and H. Sawin, "Plasma Enhanced Chemical Vapor Deposition Modeling," *Surface and Coatings Technology* **49**, 387 (1991).
67. G.C.H. Zau and Herbert H. Sawin, "Effects of O₂ Feed Gas Impurity on Cl₂ Etching of Polysilicon," *J. Electrochem. Soc.* **139**, 256 (1992).
68. Tepermeister and H.H. Sawin, "Modeling and Construction of a Novel Electron Energy Analyzer for Rapid XPS Spectra Acquisition, *Rev. Sci. Instr.*, **63**, 3828 (1992).
69. L.D.B. Kiss and H.H. Sawin, "Evaluation of CF₄ Plasma Chemistry by Power Modulation," *Plasma Chem. & Plasma Proc.* **12**, 523 (1992).
70. L.D.B. Kiss and H.H. Sawin, "Power Modulation Study of Chemical Kinetics in rf Discharges," *Plasma Chem. & Plasma Proc.* **12**, 495 (1992).
71. L.D.B. Kiss, J-P. Nicolai, W.T. Conner, and H.H. Sawin, "CF and CF₂ Actinometry in a CF₄/Ar Plasma," *J. Appl. Phys.* **71**, 3186 (1992).
72. L.D.B. Kiss and H.H. Sawin, "Comparison of CF₃Cl and C₂F₆+Cl₂ Plasma Chemistry by Power Modulation," *J. Electrochem. Soc.* **139**, 1414 (1992).
73. J.W. Butterbaugh, L.D.B. Kiss, and H.H. Sawin, "Erratum: Measurement and Analysis of Radio Frequency Glow Discharge Electrical Impedance and Network Power Loss," *J. Vac. Sci. Tech. A*, **10**, 578 (1992).

74. D.C. Gray and H.H. Sawin, "Design Considerations for High Flux Collisionally-Opaque Molecular Beams," *J. Vac. Sci. Tech. A*, **10**, 3229 (1992).
75. W.T. Conner, and H.H. Sawin, "Concentration Profiles of CF in a CF₄ RF Discharge via LIF and Actinometry," *Appl. Phys. Lett.* **60**, 557 (1992).
76. E. Gogolides and H.H. Sawin, "Continuum Modeling of Radio-Frequency Glow Discharges I: Theory and Results for Electropositive and Electronegative Gases," *J. Appl. Phys.* **72**, 3971 (1992).
77. E. Gogolides and H.H. Sawin, "Continuum Modeling of Radio-Frequency Glow Discharges II: Parametric Studies and Sensitivity Analysis," *J. Appl. Phys.* **72**, 3988 (1992).
78. E. Gogolides, H.H. Sawin, and R.A. Brown, "Direct Calculation of Time-Periodic Steady-States of Continuum Models of Radio-Frequency Plasmas," *Chem. Engr. Sci.*, **47**, 3839 (1992).
79. Tepermeister and H.H. Sawin, "XPS Study of Polymer Surface Reactions in F₂ and O₂ Gases and Plasmas," *J. Vacuum Sci. Tech. A*, **10**, 3149 (1992).
80. P.J. Hargis Jr., K.E. Greenberg, P.A. Miller, J.B. Gerardo, J.R. Torczynski, M.E. Riley, G.A. Hebner, J.R. Roberts, J.K. Olthoff, J.R. Whetstone, R.J. Van Brunt, M.A. Sobolewski, H.M. Anderson, M.P. Splichal, J.L. Mock, P. Bletzinger, A. Garscadden, R.A. Gottscho, G. Selwyn, M. Dalvie, J.E. Heidenreich, J.W. Butterbaugh, M.L. Brake, M.L. Passow, J. Pender, A. Lujan, M.E. Elta, D.B. Graves, H.H. Sawin, M.J. Kushner, J.T. Verdeyen, R. Horwath and T.R. Turner, "The GEC RF Reference Cell: A Defined Parallel-Plate Radio-Frequency System for Experimental and Theoretical Studies of Plasma-Processing Discharges," *Rev. Sci. Instr.*, **65**, 140 (1994).
81. D.C. Gray, I. Tepermeister, and H.H. Sawin, "Phenomenological Modeling of Ion-Enhanced Kinetics in Fluorine-Based Plasma Etching," *J. Vacuum Sci. Tech. B*, **11**, 1243 (1993).
82. T.J. Dalton, J.C. Arnold, H.H. Sawin, S. Swan, and D. Corliss, "Microtrench Formation in Polysilicon Plasma Etching Over Thin Gate Oxide," *J. Electrochem. Soc.*, **140**, 2395 (1993).
83. J.C. Arnold, D.C. Gray, H.H. Sawin, "Influence of Reactant Transport on Fluorine Reactive Ion Etching of Deep Trenches in Silicon," *J. Vac. Sci. Tech. B*, **11**, 2071 (1993).
84. D.C. Gray, V. Mohindra, H.H. Sawin, "Redeposition Kinetics in Fluorocarbon Plasma Etching," *J. Vac. Sci. Tech. A*, **12**, 354 (1994).

85. J.C. Arnold, H.H. Sawin, M. Dalvie, S. Hamaguchi, "Simulation of Surface Topography Evolution During Plasma Etching by the Method of Characteristics," *J. Vac. Sci. Tech. A*, **12**, 620 (1994).
86. T.J. Dalton, W.T. Conner, and H.H. Sawin, "Interferometric Real-Time Measurement of Uniformity for Plasma Etching," *J. Electrochem. Soc.*, **141**, 1893 (1994).
87. Tepermeister, N. Blayo, F.P. Klemens, D.E. Ibbotson, R.A. Gottscho, J.T.C. Lee, and H.H. Sawin, "Comparison of Advanced Plasma Sources for Etching Applications I: Etching Rate, Uniformity, and Profile Control in a Helicon and a Multipole Electron Cyclotron Resonance Source," *J. Vac. Sci. Tech. B*, **12**, 2310 (1994).
88. H.H. Sawin, "Challenges in Dry Etching: Uniformity, Selectivity, Pattern Dependencies, Damage, and Cleaning," from the Proceedings of **Microcircuit Engineering 93**, *J. Microelectronics Engr.*, **23**, 15 (1994).
89. H.H. Sawin and T.J. Dalton, "Full Wafer Interferometry Measurement for Uniformity and End Point, Control," *Proc. 6th Annual Tegal European Plasma Seminar*, Geneva, Switzerland, April, 1994.
90. D.S. Boning, J.L. Claman, K.S. Wong, T.J. Dalton and H.H. Sawin, "Plasma Etch Endpoint via Interferometric Imaging," *Proc. Am. Control Conf. '94*, (Cat. # 94CH3390-2) IEEE, 1,897 Baltimore, MD, June 1994.
91. G.L. Huppert, H.H. Sawin and R.A. Brown, "Spectral Element Analysis of Radio-Frequency Glow Discharges," *Chem. Engr. Sci.*, **49**, 1601 (1994).
92. V. Mohindra, H.H. Sawin, M.T. Mocella, J.M. Cook, J. Flanner, O. Turmel, "Alternatives to Perfluorocarbons as Plasma Processing Gases: SiO₂ Etching in C₂F₅H and C₂F₄H₂," *Proc. 10th Symp. Plasma Processing*, Eds.: G.S. Mathad & D.W. Hess, Electrochem. Soc., **PV94-20**, 300, San Francisco, May 1994.
93. M.T. Mocella, V. Mohindra and H.H. Sawin, "Options for Environmentally Impacted Perfluorinated Gases Used in Plasma Processing," *Proc. 10th Symp. Plasma Processing*, Eds: G.S. Mathad & D.W. Hess, Electrochem. Soc., **PV94-20**, 192, San Francisco, CA, May 1994.
94. Tepermeister, D.E. Ibbotson, J.T.C. Lee, and H.H. Sawin, "Comparison of Advanced Plasma Sources for Etching Applications. II. Langmuir Probe Studies of a Helicon and a Multipole Electron Cyclotron Resonance Source," *J. Vac. Sci. Tech. B*, **12**, 2322 (1994).
95. G.W. Gibson, Jr., H.H. Sawin, I. Tepermeister, D.E. Ibbotson, and J.T.C. Lee, "Comparison of Advanced Plasma Sources for Etching Applications III: Ion Energy

- Distribution Functions for a Helicon and a Multipole Electron Cyclotron Resonance Source," *J.Vac.Sci.Tech. B* **12**, 2333 (1994).
96. N. Blayo, I. Tepermeister, J.L. Benton, G.S. Higashi, T. Boone, A. Onuoha, F.P. Klemens, D.E. Ibbotson, and J.T.C. Lee, "Comparison of Advanced Plasma Sources for Etching Applications IV: Plasma Induced Damage in a Helicon and a Multipole ECR," *J.Vac.Sci.Tech. B*, **12**, 1340 (1994).
 97. A.J. Muscat, A.S. Lawing, H. Xu, and H.H. Sawin, "Etching of Silicon Oxide by HF/Solvent Mixtures Condensed from a Vapor Phase," Topical conference preprints: Synthesis and Process. of Electronic Materials, AIChE Annual Meeting, Nov. 14-16, 1994, San Francisco, p.218..
 98. C.A. Wolden, G. Zau, W.T. Conner, H.H. Sawin, and K.K. Gleason, "A Novel Molecular Beam Reactor for the Study of Diamond Surface Chemistry," *Mat.Res. Soc. Gas-phase and Surface Chem. in Elect. Mat. Process. Symp.*, Mat.Res.Soc., **334**, 123 Pittsburgh, PA, Dec. 1993.
 99. A.C. Westerheim, A.H. Labun, J.H. Dubash, J.C. Arnold, H.H. Sawin, V. Yu-Wang, "Substrate bias effects in high-aspect-ratio SiO₂ Contact Etching Using an Inductively Coupled Plasma Reactor," *J.Vac.Sci.Tech. A*, **13**, 853 (1995).
 100. A.J. Muscat, A.S. Lawing, H.H. Sawin, J. Butterbaugh, D. Syverson, and F. Hiatt, "Characterization of Oxide Etching in Gas Phase HF/vapor Mixtures," *Electrochem. Soc. Proc.* **95-20**, 371 (1996).
 101. D.C. Gray, J.W. Butterbaugh, C.F. Hiatt, A.S. Lawing, and H.H. Sawin, "Photochemical Dry Etching of Doped and Undoped Silicon Oxides," *J. Electrochem. Soc.*, **142**, 3859 (1995).
 102. D.C. Gray, J.W. Butterbaugh, C.F. Hiatt, A.S. Lawing, and H.H. Sawin, "Photochemical Dry Stripping of Silicon Nitride Films," *J. Electrochem. Soc.*, **142**, 3919 (1995).
 103. V. Mohindra, H.Y. Chae, H.H. Sawin and M.T. Mocella, "Abatement of Perfluorocompounds (PFCs) in a Microwave Tubular Reactor using O₂ as an Additive Gas," *IEEE Trans. Semicond. Manuf.*, **10(3)**, 399(1997).
 104. J.R. Woodworth, M.E. Riley, D.C.Meister, B.P. Aragon, M.S. Le and H.H. Sawin, "Ion Energy and Angular Distributions in Inductively Coupled Radio Frequency Discharges in Argon," *J.Appl.Phys.*, **80**, 1304 (1996).

105. K. Wong, D.S. Boning, H.H. Sawin, S.W. Butler and E.M. Sachs, "Endpoint Prediction for Polysilicon Plasma Etch via Optical Emission Interferometry," *J. Vac.Sci.Tech.A*, **15**, 1403 (1997.)
106. J. Chang, Z. Zhang, H.Xu and H.H. Sawin, "Transition Metal Residue Removal with Hot/Thermal Beams," *J. Vac. Sci. & Tech. A*, **15**, 2959 (1997).
107. A.S. Lawing, A.J. Muscat and H.H. Sawin, "Integrated dry cleaning after reactive ion etching of SiO₂ in fluorocarbon gases," *J.Vac.Sci.& Tech.*, (in press 1997).
108. K.S. Wong, D.S. Boning and H.H. Sawin, "On Endpoint Detection of Plasma Etching via Optical Emission Interferometry, *Proc. Electrochem. Soc. 11th Int. Symp. Plasma Process.*, ISBN 1-56677-164-1, 210, Los Angeles, May 1996.
109. J. Chang and H.H. Sawin, "Kinetic Study of Low Energy Ion-enhanced Polysilicon Etching using Cl, Cl₂ and Cl⁺ Beam Scattering, *J.Vac.Sci. & Tech A*, **15**, 610(1997).
110. J. Chang, J.C. Arnold, G.C.H. Zau, H-S. Shin and H.H. Sawin, "Kinetic Study of Low Energy Argon Ion-enhanced Plasma Etching of Polysilicon with Atomic/Molecular Chlorine, *J.Vac.Sci. & Tech. A*, **15**, 1853(1997).
111. J. Chang, A.P. Mahorowala and H.H. Sawin, "Plasma-Surface Kinetics and Feature Profile Evolution in Chlorine Etching of Polysilicon," *J.Vac.Sci. & Tech. A*, **16**, 217 (1997).
112. A.S. Lawing, T. Fayfield and H.H. Sawin, "The Mechanisms of Copper Removal in Ultra-violet Excited Chlorine," *J.Vac.Sci. & Tech.*, (in press 1997).
113. T.P. Chiang, H.H. Sawin, and C.V. Thompson, "Ion-induced Chemical Vapor Deposition of High Purity Cu Films at Room Temperature Using a Microwave Discharge H Atom Beam Source," *J.Vac.Sci. & Tech. A*, **15**(5), 1 (1997).
114. T.P. Chiang, H.H. Sawin, and C.V. Thompson, "Surface Kinetic Study of Ion Induced Chemical Vapor Deposition of Copper for Focused Ion Beam Applications," *J.Vac.Sci. & Tech.A*, **15**(6), 1 (1997).
115. A.S. Lawing, H.H. Sawin and T. Fayfield, "Mechanism of Copper Removal from a Bare Silicon Surface with Ultraviolet Excited Chlorine," *Electrochem. Soc. Proceed. 5th Int. Symp. On Cleaning Technology*, Eds. J. Ruzyllo and R.E. Novak, **97-35**, 299, Paris, France, August 1998.
116. Y-P. Han, A.S. Lawing and H.H. Sawin, "Characterization of Silicon Oxide Etching in HF Vapor Process," *Electrochem. Soc. Proceed. 5th Int. Symp. On Cleaning Technology*, Eds. J. Ruzyllo and R.E. Novak, **97-35**, 423, Paris, France, August 1998.

117. A.S. Lawing, Y-P. Han and H.H. Sawin, "Surface Analysis of Clustered Dry Cleaning of Residue from an ICP Oxide Etch," *Electrochem. Soc. Proceed. 5th Int. Symp. On Cleaning Technology*, Eds. J. Ruzyllo and R.E. Novak, **97-35**, 431, Paris, France, August 1998.
118. A.P. Mahorowala, J.P. Chang, and H.H. Sawin, "Feature Profile Evolution During High Density Plasma Etching of Patterned Polysilicon," *Electrochem. Soc. Proceed. Int. Symp. On Thin Films, Processes, Reliability and Applic.*, Eds. G.S. Mathad, M. Meyyappan, and M. Engelhardt, 24, Paris, France, August 1998.
119. B.E. Goodlin, D.S. Boning, and H.H. Sawin, "Time Series Modeling for Low Open Area Endpoint Detection," *I.E.E.E. Trans. Semicond. Manuf.*, (submitted 7/00).
120. A.P. Mahorowala and H.H. Sawin, "In Situ Measurement of RIE Lag during Polysilicon Etching in a Lam TCP using Full Wafer Interferometry," *TECHCON '96*, September 1996, Phoenix, AZ, SRC website paper Z96175.
121. J.P. Chang and H.H. Sawin, "Notch Formation by Stress Enhanced Spontaneous Etching of Polysilicon," *J. Vac. Sci. Tech.*, **19(5)**, 1870 (2001).
122. A.A. Ayon, K. Kshihara, R.A. Braff, H.H. Sawin and M.A. Schmidt, "Application of the Footing Effect in the Micromachining of Self-Aligned, Free-Standing, CMOS-Compatible Structures," *J. Vac. Sci. & Tech. A*, **17(4)**, 2274 (1999).
123. D.C. Gray, I. Tepermeister and H.H. Sawin, "Ion-Enhanced Reaction of CF₂ on Silicon and Silicon Dioxide Surfaces," *J. Vac. Sci. & Tech.* (submitted 1999).
124. H. Chae and H.H. Sawin, "Plasma Kinetics of Silicon Dioxide Cleaning with Perfluorocompounds (PFCs) and non-Perfluorocompounds (non-PFCs)," *J. Vac. Sci. & Tech.* (submitted 1999).
125. J. Chang and H.H. Sawin, "Molecular-beam Study of the Plasma-Surface Kinetics of Silicon Dioxide and Photoresist Etching with Chlorine," *J. Vac. Sci. & Tech. B*, **19(4)**, 1319 (2001).
126. A.A. Ayon, R. Braff, C.C. Lin, H.H. Sawin and M.A. Schmidt, "Characterization of a Time Multiplexed Inductively Coupled Plasma Etcher," *J. Electrochem. Soc.*, **146**, 339 (1999).
127. R. Bayt and H.H. Sawin, "Etching Characteristics and Profile Control in a Time Multiplexed Inductively Coupled Plasma Etcher," *Tech. Digest. S.S. Sensor and Actuator Workshop*, 41, Hilton Head Island, SC, June 1998.

128. T.H. Smith, B.E. Goodlin, D.S. Boning, C.O. Oji, J.E. Chung, and H.H. Sawin, "Bias and Variance in Single and Multiple Response Surface Modeling," *Proc. 3rd Inter. Workshop on Statistical Metrology*, **98EX113**, 60, IEEE, Honolulu, HI, June 1998.
129. M.S. Le, T.H. Smith, D.S. Boning, and H.H. Sawin, "Run-to-run Process Control on a Dual-coil Transformer Coupled Plasma Etcher with Full Interferometry and Spatially Resolved Optical Emission Spectroscopy," *Proc. 2nd Inter. Sympos. on Process Control, Diagnostics and Modelling in Semicon. Manuf.*, Electrochem. Soc., 3, Montreal, Cand., May 1997.
130. A.S. Lawing, A.J. Muscat, H.H. Sawin and T. Fayfield, "Integrated Dry Cleaning of Contamination Resulting from Reactive Ion Etching of Silicon Dioxide," *Proc. 3rd Int. Symp. Ultra Clean Process. of Silicon Surfaces*, UCPSS '96 Acco., 111, Leuven, Belgium, Sept. 1996.
131. J.P. Chang, Z. Zhang, H. Xu, H.H. Sawin and J.W. Butterbaugh, "Metal Removal with ClF_3 Beam at Room Temperature," *Proc. 4th Int. Symp. Cleaning Tech. in Semicond. Device Manuf.*, Eds.: R.E. Novak & J. Ruzyllo, Electrochem. Soc., 158, Chicago, IL, Oct. 1995.
132. A.S. Lawing, A.J. Muscat, H.H. Sawin and J.W. Butterbaugh, "UV/ Cl_2 Etching and Cleaning of Wafer Surfaces," *Proc. 4th Int. Symp. Cleaning Tech. in Semicond. Device Manuf.*, Eds.: R.E. Novak & J. Ruzyllo, Electrochem. Soc., 150, Chicago, IL Oct. 1995.
133. J.W. Butterbaugh, D.C. Gray, C.F. Hiatt, H.H. Sawin, and A.S. Lawing, "Recent Results of UV-initiated Processes for Cleaning and Etching of Silicon," *Proc. 2nd Int. Symp. Ultra-Clean Process. Silicon Surfaces*, UCPSS '96, Acco., 229, Leuven, Belgium, Sept. 1994.
134. A.A. Ayon, R.A. Braff, R. Bayt, H.H. Sawin and M.A. Schmidt, "Influence of Coil Power in the Etching Characteristics in a High Density Plasma Etcher," *J. Electrochem. Soc.*, **146**, 2730 (1999).
135. S.A. Vitale, H-Y. Chae and H.H. Sawin, "Silicon Etching Yields in F_2 , Cl_2 , Br_2 , and HBr High Density Plasmas," *J. Vac. Sci. Tech. A, J. Vac. Sci. Technol. A*, **19**(5), 2197 (2001).
136. B.E. Goodlin, D.S. Boning, and H.H. Sawin, "Signal to Noise Characterization for Endpoint Detection," *I.E.E.E. Trans. Semiconductor Manuf.*, (submitted 2000).
137. S.A. Vitale, H-Y. Chae and H.H. Sawin, "Etching chemistry of benzocyclobutene (BCB) low-k dielectric films in F_2+O_2 and Cl_2+O_2 high density plasmas," *J. Vac. Sci. Technol. A*, **18**, 2770 (2000).

138. S.A. Vitale and H.H. Sawin, "Abatement of C₂F₆ in rf microwave plasma reactors," *J. Vac. Sci. Technol. A*, **18**, 2217 (2000).
139. B.E. Goodlin, D.S. Boning, H.H. Sawin and M. Yang, "Wafer edge and Interferometry Limitations in Low Open Area Etch Endpoint Detection Using Optical Emission Spectroscopy," *Proc. Plasma Processing XII, 197th Electrochemical Society National Mtg*, May, 2000, Toronto, Canada.
140. B. Cruden, K. Chu, K. Gleason and H.H. Sawin, "Thermal decomposition of low-k pulsed Plasma fluorocarbon films," *Proc. I.E.E.E. Int. Interconnect Technol. Conf.* 155 (1999).
141. B. Cruden, K.Chu, K. Gleason, and H.H. Sawin, "Thermal decomposition of low dielectric constant pulsed plasma fluorocarbon films. I. Effect of precursors and substrate temperature," *J. Electrochem. Soc.*, **146**, 4590 (1999).
142. B. Cruden, K.Chu, K. Gleason, and H.H. Sawin, "Thermal decomposition of low dielectric constant pulsed plasma fluorocarbon films. II. Effect of postdeposition annealing and ambients," *J. Electrochem. Soc.*, **146**, 4597 (1999).
143. B. Cruden, K.Chu, K. Gleason, and H.H. Sawin, "Thermal decomposition of low-k pulsed plasma fluorocarbon films," *Proc. Electrochem. Soc.* **98**, 153 (1999).
144. A.A. Ayon, K.-S. Chen, K.A. Lohner, S.M.Spearing, H.H. Sawin and M.A. Schmidt, "Deep reactive ion etching of silicon," *Proc. Mat. Res. Soc. Symp.*, **546**, 51 (1999).
145. A.A. Ayon, K. Ishihara, R.A. Braff, H.H. Sawin, and M.A. Schmidt, "Microfabrication and testing of suspended structures compatible with silicon-on-insulator technology," *J. Vac. Sci. Tech. B*, **17**, 1589 (1999).
146. B. Cruden, K. Chu, K. Gleason and H.H. Sawin, "Effects of ambient and annealing on the thermal stability of pulsed plasma deposited fluorocarbon films," *Proc. Electrochem. Soc.*, **99-31**, 291(2000).
147. Bayt. R; Sawin,H.H. "Etching characteristics and profile control in a time multiplexed inductively coupled plasma etcher" Technical Digest. Solid-State Sensor and Actuator Workshop. Transducer Res. Found, Cleveland, OH, USA; p. 41 1998.
148. Vitale, S.A.; Chae, H.; Sawin, H.H. "Silicon etching yields in F₂, Cl₂, Br₂, and HBr high density plasmas" *J. Vac.Sci. & Tech .A*, **19**, 2197, 2001.
149. Chang.J.P.; Sawin, H.H.; "Notch formation by stress enhanced spontaneous etching

- of polysilicon" *J. Vac. Sci. & Tech. B*, **19**, 1870 (2001)
150. Ayon, A.A.; Chen, D.Z.; Khanna, R.; Braff, R.; Sawin, H.H.; Schmidt, M.A.; "A novel integrated MEMS process using fluorocarbon films deposited with a deep reactive ion etching (DRIE) tool" Materials Science of Microelectromechanical Systems (MEMS) Devices II. Symposium (*Materials Research Society Symposium Proceed.* Vol. **605**). Mater. Res. Soc, Warrendale, PA, USA; 2000; 314 pp.
 151. Chang, J.P.; Sawin, H.H.; "Molecular-beam study of the plasma-surface kinetics of silicon dioxide and photoresist etching with chlorine" *J. Vac. Sci. & Tech. B*, **19**, 1319 2001.
 152. Cruden, B.A.; Gleason, K.K.; Sawin, H.H.; "Time resolved ultraviolet absorption spectroscopy of pulsed fluorocarbon plasmas", *J. App. Phy.*, **89**, 915, 2001.
 153. Cruden, B.; Chu, K.; Gleason, K.; Sawin, H.H.; "Effects of ambient and annealing on the thermal stability of pulsed plasma deposited fluorocarbon films" Interconnect and Contact Metallization for ULSI. Proceed. Internat. Symp. (*Electrochemical Society Proceedings* Vol.**99-31**). Electrochem. Soc, Pennington, NJ, USA; 291-302, 2000.
 154. Vitale, S.A.; Sawin, H.H.; "Abatement of C₂F₆ in rf and microwave plasma reactors" *J. Vac. Sci. & Tech. A*, **18**, 2217,2000.
 155. White, D.A.; Goodlin, B.E.; Gower, A.E.; Boning, D.S.; Chen, H.; Sawin,H.H.; Dalton, T.J. "Low open-area endpoint detection using a PCA-based T² statistic and Q statistic on optical emission spectroscopy measurements", *IEEE-Transact. Semiconductor Manuf.*, **13**, 193,2000
 156. Cruden, B.; Chu, K.; Gleason,K.; Sawin, H.H. "Thermal decomposition of low dielectric constant pulsed plasma fluorocarbon films. II. Effect of postdeposition annealing and ambients", *J. Electrochem. Soc.* **146**, 4597, 1999.
 157. Cruden, B.; Chu, K.; Gleason, K.; Sawin, H.H. "Thermal decomposition of low dielectric constant pulsed plasma fluorocarbon films. I. Effect of precursors and substrate temperature" *J. Electrochem. Soc.* **146**, 4590, 1999
 158. Mahorowala, A.P.; Sawin, H.H.; "Feature profile evolution during the high density plasma etching of patterned polysilicon", Proceed. Twelfth Internat. Sympos. Plasma Processing, Electrochem. Soc, Pennington, NJ, USA; 71,1998
 159. Smith, T.H.; Goodlin, B.E.; Boning, D.S.; Sawin, H.H.; "A statistical analysis of single and multiple response surface modeling", *IEEE Transact. Semiconductor Manufacturing.* **12**, 419,1999.

160. Ayon, AA; Braff, R.A; Bayto, R; Sawin, H.H.; Schmidt, M.A.; "Influence of coil power on the etching characteristics in a high density plasma etcher" *J. Electrochem. Soc.* **146**, 1999; p.2730-6
161. Mahorowala, A.P.; Sawin, H.H., "Feature profile evolution during the high density plasma etching of patterned polysilicon" Proceed. of the Twelfth International Symposium on Plasma Processing. Electrochem. Soc, Pennington, NJ, USA; 1998
162. Smith, T.H.; Goodlin, B.E.; Boning, D.S.; Sawin, H.H., "A statistical analysis of single and multiple response surface modeling" *IEEE Transact. Semiconduct. Manufacturing.* **12**, 419, 1999
163. Weidong, Jin; Vitale, S.A.; Sawin, H.H., "Plasma-surface kinetics and simulation of feature profile evolution in Cl_2 +HBr etching of polysilicon" *J.Vac. Sci. & Tech. A* (Vacuum, Surfaces, and Films.) Nov. 2002; **20**(6): 2106-14
164. Cruden, B.A.; Gleason, K.K.; Sawin, H.H., "Optical emission spectroscopy of pulsed hexafluoropropylene oxide and tetrafluoroethylene plasmas" *J. Appl. Physics.* **15** June 2002; 91(12): 9547-55
165. Mahorowala, A.P.; Sawin, H.H., "Etching of polysilicon in inductively coupled Cl_2 and HBr discharges. IV. Calculation of feature charging in profile evolution" *J. Vac. Sci. Tech-B* (Microelectronics-and-Nanometer-Structures.) May 2002; **20**(3): 1084-95
166. Mahorowala, A.P.; Sawin, H.H., "Etching of polysilicon in inductively coupled Cl_2 and HBr discharges. III. Photoresist mask faceting, sidewall deposition, and microtrenching" *J. Vac. Sci. Tech-B* (Microelectronics-and-Nanometer-Structures.) May 2002; **20**(3): 1077-83
167. Mahorowala, A.P.; Sawin, H.H., "Etching of polysilicon in inductively coupled Cl_2 and HBr discharges. II. Simulation of profile evolution using cellular representation of feature composition and Monte Carlo computation of flux and surface kinetics," *J.Vac. Sci. Tech-B* (Microelectronics-and-Nanometer-Structures.) May 2002; **20**(3): 1064-76
168. Mahorowala, A.P.; Sawin, H.H.; Jones, R.; Labun, A.H., "Etching of polysilicon in inductively coupled Cl_2 and HBr discharges. I. Experimental characterization of polysilicon profiles," *J.Vac.Sci. & Tech.B*-(Microelectronics and Nanometer Structures.) May 2002; **20**(3): 1055-63
169. Vitale, S.A.; Sawin, H.H., "Etching of organosilicate glass low-k dielectric films in halogen plasmas," *J. Vac.Sci.Tech A*, (Vacuum, Surfaces, and Films.) May 2002; **20**(3): 651-60

170. Cruden, B.A.; Gleason, K.K.; and Sawin, H.H., "Ultraviolet absorption measurements of CF_2 in the parallel plate pyrolytic chemical vapour deposition process" *J. Physics-D Applied-Physics*. 7 March 2002; **35**(5): 480-6
171. Cruden, B.A.; Gleason, K.K.; and Sawin, H.H., "Relationship of CF_2 concentration to deposition rates in the pyrolytic chemical vapor deposition process," *J. Vac. Sci. Tech.-B (Microelectronics-and-Nanometer-Structures)*. March 2002; **20**(2): 690-5
172. Allgood, C.; Mocella, M.; Chae, H-Y; and Sawin, H.H., "Evaluation of octafluorocyclobutane as a chamber clean gas in a plasma-enhanced silicon dioxide chemical vapor deposition reactor" *J. Electrochem. Soc.*, **150**(2), Feb. 2003, p G122-6
173. Chae, H.; Vitale, S.A.; and Sawin, H.H., "Silicon dioxide etching yield measurements with inductively coupled fluorocarbon plasmas," *J. Vac. Sci. Tech. A (Vacuum, Surfaces, and Films)*, v 21, n 2, March 2003, p 381-7
174. Jin, W.; and Sawin, H.H., "Feature profile evolution in high-density plasma etching of silicon with Cl_2 ," *J. Vac. Sci. & Tech. A (Vacuum, Surfaces, and Films)*, **21**(4), July 2003, p 911-21
175. Ross, F.; Thompson, C.V.; Chiang, T.; and Sawin, H.H., "Ion-induced chemical vapor deposition of copper films with nanocellular microstructures", *Appl. Phys. Lett.*, **83**(6), 11 Aug. 2003, p 1225-7
176. Jin, W.; and Sawin, H.H., "Profile evolution simulation of oxide fencing during via-first dual damascene etching processes," *J. Electrochem. Soc.*, **150**, Nov. 2003, p G711-17
177. Goodlin, B.E.; Boning, D.S.; Sawin, H.H.; and B.M Wise, "Simultaneous fault detection and classification for semiconductor manufacturing tools," *J. Electrochem.Soc.* **150**(12), Dec. 2003, p G778-84
178. Mahorowala, A.P.,; Goldfarb, D.L.; Temple, K.; Petrillo, K.E.; Pfeiffer, D.; Babich, K.; Angelopoulos, M.; Gallatin, G.; Rasgon, S.; Sawin, H.H.; Allen, S.D.; Lang, R.N.; Lawson, M.C.; Kwong, R.W.; Kuang-Jung Chen; Wenjie Li; Varanasi, P.R.; Sanchez, M.I.; Ito, H.; Wallraff, G.M.; Allen, R.D., "Impact of thin resist processes on post-etch LER," *Proceed, SPIE Internat. Soc. Optical Engr.* **5039**, 2003, p 213-24